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## Supplementary decision in Market 3a – determination of final requirements for VULA fibre - Draft

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## 1 Introduction

### 1.1 Background

On 20 December 2018, the Norwegian Communications Authority (Nkom) adopted a decision (*M3a decision/Decision*) on the designation of Telenor ASA (Telenor) as a provider with significant market power, and an order concerning special obligations in the wholesale market for local access to fixed access networks (Market 3a). The decision requires Telenor to comply with any reasonable request for local virtual access to fibre-based GPON networks (VULA product/access product) and it also sets certain requirements that the access product is to fulfil. Nkom upheld that on developing an access product that fulfils the requirements set in the M3a decision, Telenor's starting point may be the access product already offered by Telenor in Market 3b<sup>1</sup>. Nkom furthermore indicated plans for an industry dialogue before the final requirements of the access product would be established.

### 1.2 Industry dialogue

The industry dialogue related to the final requirements of the new access product took place in the form of meetings of the Broadband Forum. The meetings took place on 4 February and 11 March 2019.

Before the meeting on 4 February, Nkom distributed a document describing areas we considered particularly relevant in terms of requirements of the VULA product and requested answers from the participants to specific questions. The document and questions were reviewed and discussed at the first meeting.

Based on the dialogue at the first meeting, at the meeting on 11 March Telenor presented a proposal for a further developed VULA product. After the meeting, Telenor distributed the presentation, as well as the document "Interface to Telenor – Broadband Forum 11 March 2019" to the forum participants, and requested any comments. Telenor did not receive any comments concerning the proposal. At the meeting on 11 March, Nkom furthermore presented its preliminary assessments. Nkom's presentation was also distributed to the meeting participants, with an invitation to make comments, but no comments were received.

At the meeting, Nkom finally expressed how it would be feasible that, based on Telenor's presentation and the feedback from the other participants in the Broadband Forum, for us to enter into a dialogue with Telenor concerning technical factors related to the requirements concerning the VULA product. Nkom stated that in the dialogue it would be important to find an appropriate balance between clarifying functional requirements and avoiding the requirements being so detailed that they prevent appropriate further development of the product on the basis of technology and market developments. The Broadband Forum supported this approach, and Nkom held meetings with Telenor on 3 June and 13 June 2019.

### 1.3 Notification of supplementary decision

On 2 September 2019, Nkom published for consultation a draft supplementary decision to determine final requirements of VULA fibre. The main conclusions in the draft were as follows:

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<sup>1</sup> The wholesale market for centralised access to fixed access networks

- a) There is no need to extend the access obligation for VULA fibre to also include access at OLT level.
- b) Telenor's wholesale product VULA fibre must fulfil the functionality requirements discussed in the industry dialogue.
- c) There is no need for access buyers to use their own ONT.
- d) The solution outlined by Telenor for the access buyers' interface towards Telenor in principle fulfils the requirements for information and support systems in the M3a decision.
- e) VULA fibre must be ready for delivery within six months of the entry into force of the decision. The reference offer for access to VULA fibre must be published on Telenor's website within three months of the entry into force of the decision.
- f) There is no need to maintain the access obligation for VUA fibre in Market 3b. At the same time, Telenor must be required to create a rollout plan for the new VULA product, to ensure a smooth transition from VUA fibre in Market 3b to VULA fibre in Market 3a.

## 1.4 Consultation responses and other comments

GlobalConnect, NextGenTel, Telenor and Telia have commented on the notification.

On 2 October 2019, Nkom invited the parties to comment before 21 October on the consultation responses received. Telenor has made such comments.

All of the comments are available on Nkom's website.<sup>2</sup>

Below, Nkom summarises the comments on the notification, including Telenor's comments on consultation responses from other providers. The summary is mainly organised by subject and according to the individual items of the notification. The most important and most frequent comments are stated here. Nkom also states its views on the relevant comments and how we have processed this input. Nkom has noted all of the input, and in the same way as verbal feedback from meetings with operators etc., the input has been taken into account in the finalization of this decision.

### 1.4.1 Concerning the legal basis - Market delineation

**Telenor** disagrees with the legal basis for the decision, and refers to the appeal being considered by KMD (Ministry of Local Government and Modernisation). In addition, Telenor takes the view that much of the functionality that is sought appears to be driven by a wish to facilitate greater competition in Market 4<sup>3</sup>.

**Nkom** emphasises that the specific functionality requirements associated with VULA are a consequence of the limited opportunities for physical access to fibre access points included in GPON solutions<sup>4</sup>. This creates a need for access through active equipment that reflects the characteristics of physical access to the greatest possible extent. In the same way as the copper network, systematically developed fibre networks, which to a great extent serve the consumer market, also give an opportunity to provide services to certain segments of the business market. Nkom cannot see that Telenor's choice of GPON as development technology should entail restrictions to the access buyers' opportunity to offer services adapted to the business market, when compared to the opportunities that access buyers would have had if

<sup>2</sup> <https://www.nkom.no/marked/markedsregulering-smp/anbefaling-2016/marked-3a>

<sup>3</sup> The wholesale market for high-quality access to a fixed access networks

there had been the same opportunities to provide physical access to GPON networks as there are for point-to-point networks<sup>4</sup>.

Nkom also emphasises that the obligations imposed in this decision apply to access in Market 3a and not in Market 4. In this respect we refer to Chapter 2.4.6 of the market analysis for Markets 3a and 3b, where Nkom has delineated Markets 3a and 3b in relation to Market 4. It is stated in sections 253 and 254 that Nkom assumes that it is possible to use wholesale products in Markets 3a and 3b as an input factor for retail offers in the market for high-quality access products. This takes place to a significant degree for copper-based products in Markets 3a and 3b, and will, in Nkom's assessment, also be relevant for fibre-based products such as VULA.

#### 1.4.2 About the point of handover

**GlobalConnect** questions whether Nkom has a correct and objective image of the situation when Nkom assumes that, in Telenor's network, OLT is to a great extent co-located with BNG.

GlobalConnect states that the company has a need for further transparency and flexibility in backhaul traffic management, which entails that it is necessary to give access at OLT level. Nkom's proposal entails that competitors are denied the same opportunity to produce services as Telenor's retail arm. Stricter requirements for priority management between OLT and BNG are not sufficient.

GlobalConnect contends that Nkom does not mention the most central argument for imposing access at OLT level. By requiring wholesale customers to buy access further into the network, Telenor is in practice charging for use of the network that has not been requested. GlobalConnect refers to Section 4-6, third paragraph, of the Electronic Communications Act, which states that as a provider with significant market power Telenor cannot require that the access requester should pay for services, functions or benefits that have not been requested. By noting that requests for access to OLT are not deemed to be reasonable, Nkom seeks to limit or revoke this obligation, for which Nkom does not have competence.

Furthermore, GlobalConnect disagrees with Nkom's reasoning related to the connection between Telenor's costs and access price. Whether the existing price regulation will lead to a price reduction if the access buyer has the opportunity to purchase access further out in the access network is not a relevant argument against providing such access. If Telenor can maintain an artificially high price level by charging for services which the wholesale customer does not need, this documents a weakness of the existing regulation. GlobalConnect believes there is a correlation between reduced costs and the price of access. The margin squeeze model is based on all relevant costs. In addition, the M3a decision requires non-discrimination in terms of price.

GlobalConnect also has problems with following Nkom's reasoning regarding resilience. The operators compete in terms of both price and quality, and resilience is one of the key parameters determining the quality of otherwise homogeneous services. GlobalConnect refers among other things to how many customers prefer Telenor as a consequence of the perception that the company offers secure services.

**Telenor** agrees with Nkom's conclusion that the access obligation for VULA fibre should not be extended to include access at OLT level. Telenor believes, however, that the proposed text of a

<sup>4</sup> Reference is made to Chapter 2.4, in which it is stated that Nkom will consider requiring Telenor to give access to fibre strands in fibre cables that have been developed in order to establish GPON networks, but are not connected to GPON equipment.

new section 467 might create misunderstandings and should therefore be corrected so that it correctly reflects the actual access obligation.

**Nkom** refers to GlobalConnect's comment concerning whether Nkom has a correct and objective picture of the situation when Nkom assumes that, in Telenor's network, OLT is to a great extent co-located with BNG. Nkom acknowledges that this description did not provide a correct situational picture of Telenor's network. OLTs in Telenor's network are to some extent co-located with BNG, but this does not apply to most OLTs. However, the degree of co-location between OLT and BNG was not a key factor in Nkom's conclusion concerning the access point in the notification.

Nkom shares Telenor's view that the notified text of a new section 467 might create misunderstandings and has therefore adjusted this text in the decision. The change is not of significance concerning to which geographical locations access should be given.

Among other things on the basis of the consultation response from GlobalConnect, Nkom sees a need to assess the connection point for VULA fibre on a more detailed basis than in the notification. This applies to transparency and flexibility, resilience and the relationship between access level and access prices. With regard to Global Connect's comments related to these matters, Nkom refers to Chapter 2.3 in which these topics are discussed.

GlobalConnect furthermore believes that Nkom is seeking to limit or revoke Telenor's obligation in Section 4-6, third paragraph, of the Electronic Communications Act by noting that requests for access at OLT level are not considered to be reasonable. Nkom cannot see that there is any basis for the conclusion that Global Connect here seems to draw concerning the extent of Section 4-6, third paragraph, of the Electronic Communications Act. The fact that the provision directs that providers with significant market power in the relevant markets must prepare a reference offer and that the reference offer must be sufficiently unbundled, etc., cannot, in Nkom's view, be taken to indicate that a VULA product in Market 3a must entail access at OLT level, pursuant to the Electronic Communications Act. Nkom also refers to our updated assessments and conclusions in Chapter 2.3.2 below.

### 1.4.3 Concerning service quality parameters

**GlobalConnect** can see a need for Nkom to specify that the requirements in Chapters 3.2.2 to 3.2.7 of the notification are binding minimum requirements.

**Telenor** points out that the lack of data availability from Telenor's network elements (BNG/OLT/ONT) concerning the quality parameters specified in the notification (maximum values for the share of lost frames, frame delay and variation in frame delay) indicates that the obligation must be changed from a requirement that Telenor must fulfil, to an opportunity for the access buyer to be able to perform measurements of the relevant parameters. Telenor also points to how these parameters are calculated on a "general basis".

**Nkom** refers to how the individual points concerning the functionality of the new access product will be binding by virtue of this decision. The decision does not otherwise preclude Telenor from choosing to offer functionality that extends beyond the minimum requirements set out in the decision. Nkom does not see any need for this to be specified in the decision.

With regard to Telenor's comment, Nkom cannot see that an opportunity for an access buyer to measure parameter values is an adequate measure. An amendment to allow the access buyer to perform measurements will not give the access buyer a right in relation to Telenor and will thereby not be sufficient to ensure that the accesses fulfil the relevant functional requirements.

Any such change will furthermore create an unacceptable lack of predictability for access buyers. Nkom assumes that Telenor, either based on data the company has available on a general basis, or by performing its own measurements for a number of VULA accesses, will be able to specify maximum values for the relevant parameters. In this context, Nkom refers to how other operators who are required to publish reference offers for VULA have adopted specific threshold values for such parameters in their reference offers<sup>5</sup>.

#### 1.4.4 About the use of own termination equipment

**Telia** believes that Telenor must offer an ONT that serves as an actual media converter/ONU, so that access buyers can have their own “residential gateway” behind ONT delivered by Telenor.

**Nkom** has received confirmation from Telenor that the standard ONT solution has an Ethernet interface that facilitates the connection of the access buyer’s own CPE equipment. Reference is also made to the obligation referred to in Chapter 3.2.6 of this decision concerning protocol transparency, and to section 336 of the M3a decision, in which it is stated that Telenor is required to develop a process for handling requests for changes and additions to the reference offer for the VULA product in Market 3a.

#### 1.4.5 Concerning access to information and support systems

**GlobalConnect** believes that it is not possible for the company to determine whether the solution outlined fulfils the specified requirements or the company’s needs, without having tested the actual solution. GlobalConnect must have the opportunity to test the solution, report faults, and present requirements for any changes and improvements. GlobalConnect also believes that Nkom must verify that access buyers will have access to functionality equivalent to Telenor’s own retail activity.

**NextGenTel** believes it is important that the APIs are the same for the access buyers as for Telenor. The outlined solution appears to be solely an overall and unfinished API description. It is therefore important that Nkom follows up on this outline, to ensure completion of the final API solution that ensures access buyers equivalent access to Telenor’s.

**Telenor** points out that opening a new API for external ISPs will provide a new attack vector against Telenor’s infrastructure. The decision should state that this risk has been assessed and found acceptable compared to the benefits to the access buyers of any such API.

**Nkom** refers to our assessment in Chapter 5 below, from which it appears that the solution must facilitate the effective fulfilment of the requirements for VULA fibre functionality. At the same time, NextGenTel, which as of today is the only buyer of Telenor’s existing VUA fibre product in Market 3b, has expressed the wish that the functionality for ordering access to standardised accesses is not made more complicated as a consequence of additional functionality for the new product. In Nkom’s view, the solution outlined also takes this consideration into account.

With regard to the question of whether the IT-technical solution meets the needs of access buyers at a more overall level, for example with regard to the type of interface, cf. the comment from GlobalConnect, Nkom believes that both efficiency considerations and the consideration of having a final solution in place within a reasonable time indicate that access buyers should have the opportunity to submit views on this before the IT solution is fully developed. Here, Nkom

<sup>5</sup> Cf. e.g. Table 12, p. 65 of [Telecom Italia’s VULA reference offer for 2019-2020](#) or Table 7 of A1 Telekom Austria’s VULA reference offer as at 23 November 2018.

points out that it has been possible to comment on the proposal concerning an API interface through the work in the Broadband Forum, and believes that the access buyers have thus had sufficient opportunities to influence the overall choice of solution.

With regard to the comments from NextGenTel and GlobalConnect concerning the access buyer's need for access to interfaces that are equal or equivalent to Telenor's own retail activity, Nkom refers to the current non-discrimination requirement in the M3a decision, cf. Chapter 5 below. The M3a decision states, among other things, that Telenor is to offer wholesale products to external access buyers with the same functionality as applies to Telenor's internal retail activity. Nkom refers to how, according to the same decision, Telenor must document that this requirement is fulfilled.

Concerning Telenor's comment regarding security risks on using API, Nkom refers to how the individual provider is responsible for the protection of communication and data in its own electronic communication networks and services, cf. Section 2-7 of the Electronic Communications Act and Chapter 8 of the Electronic Communications Regulation. As a provider, Telenor itself can best assess how the obligations arising from this decision can be complied with in such a way that the statutory and regulatory requirements are fulfilled.

#### **1.4.6 Concerning the deadline for completion of a new VULA fibre product**

**GlobalConnect** requests Nkom to assess whether it is possible to shorten the six-month deadline for completing the VULA product. Telenor has had the opportunity to prepare for the launch of the service, and in GlobalConnect's assessment only limited technical changes remain. Commercial adjustments to the terms should be feasible within a very short time (weeks).

**NextGenTel** underlines the importance of the framework conditions for VULA fibre being determined as quickly as possible, and the company is concerned that the further process of notification of the supplementary decision to ESA will be protracted.

**Telia** points to how the importance of VULA fibre will increase in the near future. Due to the competition in the market, it is important that the further developed VULA product becomes available to the access buyers as soon as possible.

**Telenor** believes the deadline for completion of a new product is too short. There is complexity and many dependencies and relations on both the product and support system sides. When, parallel to this, requirements are also made for publication and reference offers after only three months, too little time has been allowed for responsible product development. Telenor requests that the deadline for completion of the new product be set at nine months and that the requirement for the publication of reference offers be set midway during the product development period.

**Nkom** shares the view that it is important that this decision can be effective as quickly as possible and has found a basis to use the exemption that gives the opportunity for notification of ESA after the decision has been taken. At the same time, Nkom also points out that the extended functionality of the access product requires a new IT interface, and that any adjustment of the commercial terms alone will not be sufficient to fulfil the requirements in this decision. In Nkom's assessment, the need to develop a new IT interface with the necessary related functionality indicates that it is not realistic to require a shorter development time than six months.

Based on the above and comments from access buyers that Telenor has for some time been aware that the industry has not had significant objections to the new functionality requirements, and that Telenor has previously indicated a possible development time of six months, Nkom maintains that the VULA product must be developed within a six-month deadline. Nkom will closely follow the progress of Telenor's process of developing the new VULA product.

#### 1.4.7 Concerning the relationship to the Market 3b decision<sup>6</sup>

**GlobalConnect** believes that, before the access obligation for VUA fibre in Market 3b is withdrawn, Nkom must verify that there is a one-to-one relationship between available VULA fibre accesses and VUA fibre accesses. GlobalConnect also requests Nkom to review its prices, price model and cost model.

**Telenor** understands the wish to safeguard the transition for existing customers who purchase VUA fibre. Telenor also points out that the new VULA product only provides properties additional to the existing VUA product. Nkom should therefore allow Telenor to choose to further develop the existing VUA product, rather than developing a new VULA product. This allows for a simpler transition solution between VUA in Market 3b and VULA in Market 3a than assumed by Nkom in the notification. Telenor also states that it will not be necessary for access buyers to make any changes to their configuration before they might wish to implement the extended functionality. In such case, transitional arrangements will be superfluous.

Telenor furthermore believes that if Nkom maintains a transitional arrangement of 12 months, Nkom must justify the need to maintain the adjusted obligations and ensure that the requirements are clarified. It is unclear, for example, what Nkom means by "combined" with regard to the margin squeeze tests and accounting separation. Adjustment of the migration requirements as stated in the Market 3a decision and the Market 3b decision should also be assessed.

**Nkom** believes that, as the original decision in Market 3a and this supplementary decision are worded, VULA fibre will have the same coverage in Telenor's network as VUA fibre, cf. the comment from Global Connect. The transitional regime from VUA fibre in Market 3b to VULA fibre in Market 3a, cf. Chapters 7.3 and 9.2 below, entails that there is no risk that access buyers' access rights will be more restricted than before.

Based on information received from Telenor, it will not be necessary for access buyers to make changes to their configuration unless they wish to use the extended functionality associated with the VULA product in Market 3a. Nkom takes the view that this provides a basis to simplify the transitional regime in relation to the notification, cf. the comment from Telenor. Nkom has therefore adjusted the notified changes in both decisions in this respect and required Telenor to establish a rollout plan for new functionality, cf. Chapters 9.1 and 9.2 below.

With regard to GlobalConnect's request for Nkom to review the price, price model and cost model for VULA fibre, Nkom refers to how these factors are assessed in the M3a decision, cf. Chapter 7.3.5 and section 661, as well as Chapter 7.6.7 and section 906 of the M3a decision, and which lie outside this supplementary decision. Concerning the sections of the notification related to margin squeeze tests and accounting separation, as stated in section 661 of the M3a decision, Nkom will take a separate decision on the design of the margin squeeze test for VULA fibre. In this respect, Nkom will also assess how margin squeeze tests and accounting

<sup>6</sup> Nkom's decision of 20 December 2018 in Market 3b.

separation will take place in practice in conjunction with the transition from VUA fibre to VULA fibre.

#### 1.4.8 Concerning Nkom's proportionality assessment

**Telenor** believes that Nkom has not made a real assessment of the proportionality of the new requirements for VULA in Market 3a. Even though the requirements emerged from dialogue in the industry and are based on proposals from Telenor, the company has not had any other options than to accept a process determined by Nkom. Telenor furthermore refers to how, in the proportionality assessment, Nkom has expressed how the potential for an increased supply of attractive and differentiated products in the retail market weighs more heavily than the costs incurred by Telenor. However, Nkom does not indicate which products this refers to, and Telenor therefore emphasises that any such potential must apply to products that are part of the related retail market for Market 3, and not to products in the retail market for high-quality access products, which have Market 4 as their relevant wholesale market.

**GlobalConnect** believes the adopted access obligations in Markets 3a and 3b, together with the notified requirements for VULA fibre, do not cover the access buyers' need for access to Telenor's fibre network. If the copper network is shut down before the end of 2022, no other operators will be able to compete with Telenor to win or retain multi-access customers, among other things. GlobalConnect and other competitors depend on physical access to fibre-based access services that to the greatest possible extent can replace full and shared access to Telenor's copper network. It is therefore necessary to revise the central access obligations. GlobalConnect also refers to the company's report in a letter of 15 August 2019 to Nkom.

**Nkom** first refers to how Telenor is obliged to offer VULA fibre under the M3a decision, in which the proportionality of this access obligation is assessed. The assessment of proportionality in this supplementary decision is therefore related to the content and design of the technical requirements of VULA fibre. Nkom also points out that the access obligations in the Market 3a decision are designed so that access products that are not based on physical access must be functionally equivalent to physical access to the greatest possible extent.

With regard to Telenor's submission that VULA fibre must not form the basis for products included in the retail market for high-quality access products, Nkom refers to Chapter 1.4.1 above which gives an account of the relationship between Markets 3a and 3b, Market 4 and the retail market for high-quality access products.

With regard to GlobalConnect's submissions that the access forms in Market 3a, taking the notified requirements of VULA fibre into account, do not cover the need for access, this is not a question solely related to the product characteristics of VULA. In this respect, Nkom refers to how, among other things in the light of the elimination of copper, we will assess drawing up a supplementary decision that Telenor is to give physical access to fibre strands/fibre pairs in fibre cables that Telenor has established as part of the systematically developed fibre network, cf. Chapter 2.4. Together with the views of other operators, GlobalConnect's viewpoints will be included in the assessment.

## 2 Access level

### 2.1 Need for delivery at OLT level

In the market analysis for the M3a decision, Nkom concluded that access at BNG level is considered to be the local connection level for fibre-based virtual access products. In the decision, Telenor was therefore required to develop a VULA product with a delivery point at BNG. Nkom also referred to how there might be a need to impose a delivery point at OLT level and that this would be clarified through the industry dialogue, cf. Chapter 7.2.7.4.3 of the decision. In the industry dialogue, Nkom did not perceive any clear signals for a need for delivery points at OLT locations without BNG, but has subsequently received input from the Broadband Forum that there is such a need.

### 2.2 Structure and connection levels in Telenor's fibre network

Figure 1<sup>7</sup> below shows where access buyers' connection takes place in the logical structure in Telenor's network – irrespective of the physical location of the various functions. BNG marked 1) is a BNG node where as yet no access buyers have connected to the point, so that no physical delivery point (ODP) has been established, either.

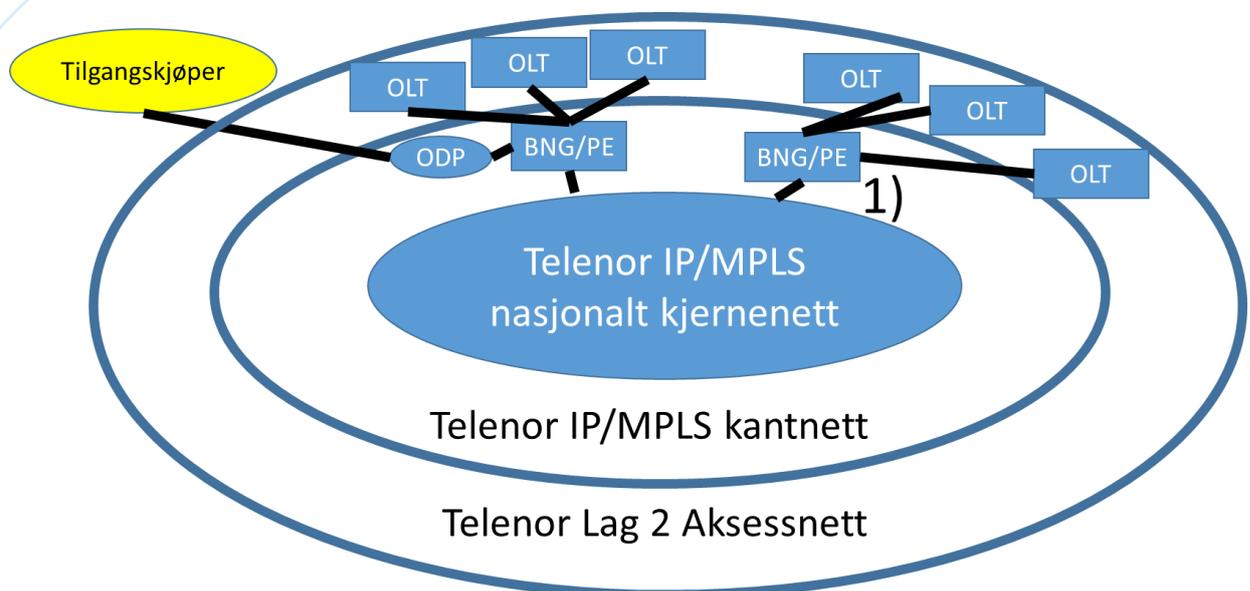


Figure 1. Access point for VULA in Telenor's logical network structure.

Figure 2 below illustrates the access scenarios based on how delivery point/ODP and equipment units are physically located in Telenor's GPON network.

<sup>7</sup> The abbreviations in the figure are explained in comments to Figure 2 below.

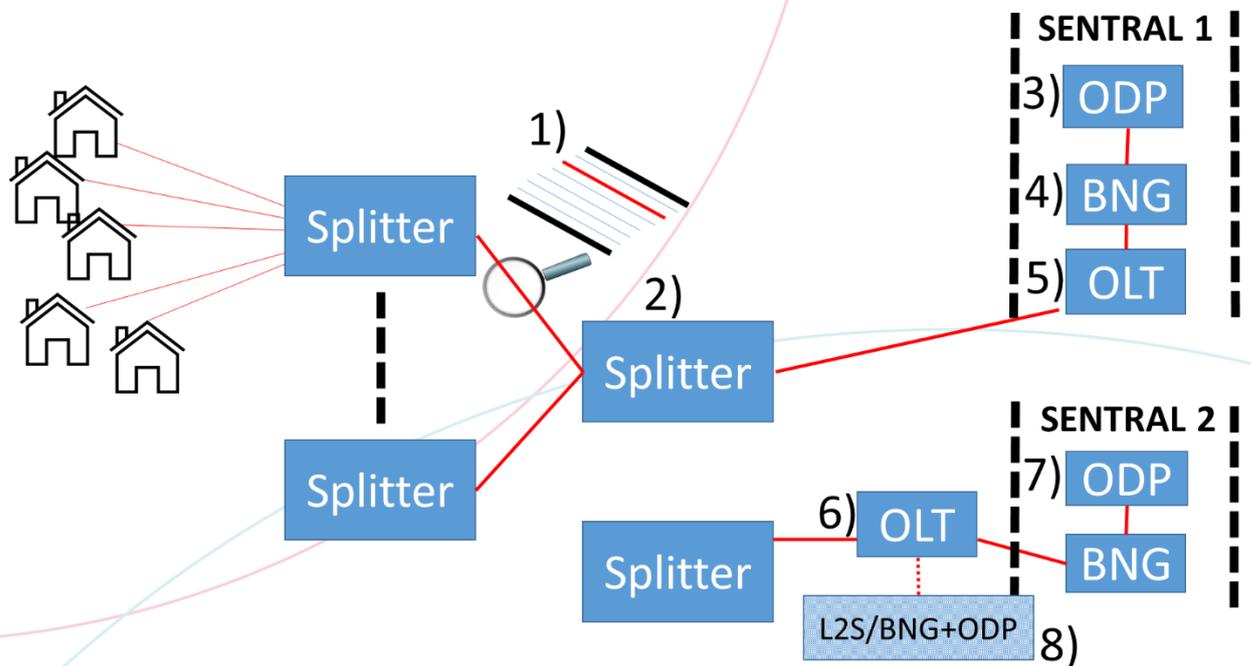


Figure 2. Access point for VULA in the light of physical equipment locations.

The numbered items below relate – with the exception of item 9) – to the corresponding numbered items in Figure 2.

- 1) The red lines show fibre strands included in the GPON structure: They are connected to passive splitters, and there may be multiple levels of splitters between the end-customer and OLT. The fibre cables in which the red fibre strands lie will often also have fibre strands that are not connected into the splitters in the GPON structure. These are marked with light-blue lines. The number of fibre strands in a fibre cable in use will vary.
- 2) A splitter is passive equipment. A splitter does not contain electronic equipment and no power supply is needed. They are easy to place in small cabinets/boxes.
- 3) ODP (Operator Delivery Point) is the delivery point to the wholesale customer. In physical terms, this is merely a connection panel for fibre cables, and not an equipment unit. ODP marked 3) is co-located with OLT closest to the customer, while ODP marked 7) is not co-located with OLT closest to the customer.
- 4) BNG (Border Network Gateway) is the first node in the network, seen from the end-customer's location, that contains layer 3/IP functionality. A BNG can nonetheless also function as a pure layer 2/Ethernet switch, and this is what happens for VULA traffic that is delivered to the access buyer on ODP. This entails that layer 3/IP information will pass transparently through BNG in layer 2, while traffic for Telenor's own end-customers will be taken up to layer 3 for processing of IP traffic in the same node.
- 5) Optical Line Termination (OLT) is the first unit with electronic equipment, seen from the end-customer's location. This is a small equipment unit, but requires a power supply. Cooling, heating and battery back-up are all required to ensure stable operation. OLT marked 5) is co-located with both BNG and ODP.

- 6) This OLT is not co-located with BNG/ODP, and the traffic is led as Ethernet traffic to BNG/ODP located further into the network. From the OLT towards the BNG/ODP, there is no GPON structure with splitters, but point-to-point connection based on Ethernet technology.
- 7) BNG/ODP location where traffic is delivered from OLTs that are not co-located with BNG. At some BNG/ODP locations, both traffic from co-located OLTs and from other OLTs that are not co-located will be delivered.
- 8) The dashed connection line and associated equipment mark a possible solution for establishing access at OLT locations that are not currently co-located with BNG, cf. the description in Chapter 2.3.2 below. This equipment does not exist today at locations in Telenor's network where OLT is not co-located with BNG.
- 9) ODF (Optical Distribution Frame) is not included in the figure. ODF is nevertheless described here, to avoid confusion with ODP (Operator Delivery Point). An ODF is a connection panel for optical fibres, equivalent to a main coupling or a distribution point in the telephony network. On an ODP (see above) there will also be an ODF, but there may also be ODFs at OLT locations without BNG. In a few cases, there are also ODFs in connection with splitters.

Below, connection/delivery "*at OLT level*" is used for connection/delivery on the OLTs that are not co-located with BNG. This applies to most of the OLTs in Telenor's network.

## 2.3 Assessment of access obligation at OLT level

### 2.3.1 Transparency and flexibility in traffic management

In section 347, the decision points to transparency and the need for flexibility in traffic management in backhaul as factors that might entail a need to impose a delivery point at OLT level. In this context, transparency concerns how the access buyer needs sufficient information about how Telenor dimensions and follows up traffic capacity in backhaul, to ensure that quality is perceived in practice as if the capacity in backhaul was not a shared resource. Here, flexibility in traffic management concerns, for example, having the opportunity for different prioritisation levels in backhaul, so that prioritised traffic takes precedence in the event of an overload situation nevertheless occurring.

To ensure that VULA appears equivalent to physical access to the greatest possible extent, Nkom sees a need for Telenor's reference offer to provide a complete description of traffic management between OLT and BNG. This requirement is set out in Chapter 3.2.3 below. For the same reason, Nkom believes that access buyers must be given greater flexibility in traffic management between OLT and BNG by introducing priority management. This requirement is set out in Chapter 3.2.1 below. On setting these requirements, Nkom does not consider it necessary to make requirements for access at OLT level, for the sake of transparency and flexibility in traffic management.

### 2.3.2 Use of the access buyer's infrastructure in backhaul and impact on access prices

In the dialogue within the Broadband Forum and in consultation responses, the wish has been expressed to be able to use own fibre instead of using Telenor's fibre on the section from OLT

to the next higher node level in the network, for example where the access buyer has established fibre in order to connect to the DSL node. It is argued, in this respect, that connecting to the next node level in the network could lead to a lower cost for Telenor and thereby provide a basis for a lower access price.

In Nkom's assessment, there are three alternatives for establishing access at OLT level:

- a) A new technical solution is developed to establish and operate the access buyer's direct connection on OLT (to the extent that connection capacity and functionality on OLT enable this). In such a solution, the box marked 8) in Figure 2 will only be an ODP/connection point.
- b) A new BNG node is established at the OLT location, cf. the box marked 8) in Figure 2. This will facilitate a technical access solution that is compatible with locations where Telenor has already established a BNG, cf. the location marked 7) in Figure 2.
- c) A new layer 2 switch (L2S) is established at the OLT location. This might be a solution if it is impractical or impossible to establish direct connection on the OLT equipment and will entail lower investment in equipment than a full BNG node as in alternative b). However, this cost saving on acquiring equipment must be weighed against the additional costs arising from developing a solution and operating a new type of equipment in the network.

For alternative a) the costs will mainly be related to the development and operation of the IT solution. For alternative b) the costs will mainly be driven by supplementary costs for new BNG at the relevant points; while in alternative c) there will be a combination of costs related to a new IT solution and location specific costs related to the acquisition and operation of the new layer 2 switch. The three alternatives share in common that they will trigger new costs related to such factors as the acquisition of equipment, development of IT solutions, and operation. The last two alternatives will entail introducing a new active element in the network and thereby a potential new fault source. In the light of the assessments and the conclusions below, Nkom cannot see any need for further quantification of the costs of the different scenarios.

As referred to above, one access buyer has shown an interest in access on OLT. Which OLTs will be subject to specific demand for access must be deemed uncertain, however. In Nkom's view, this uncertainty, combined with the costs of establishing OLT access, indicates that it will not be proportionate to impose a general obligation on Telenor to facilitate access on all OLTs.

In equivalent product markets in other countries in the EEA, access buyers tend to prefer to establish access to active equipment operated by the network owner at a more centralised level, rather than very close to the end-customer. Nkom assumes that this development is related to two factors in particular. One is the need to have a certain volume to cover the costs associated with the active equipment (both with the network owner and with the access buyer). The second is a wish to reduce the frequency of changes in connection points as a consequence of the network owner's further development of the network<sup>8</sup>. In Nkom's assessment, this factor also supports not imposing a general obligation on Telenor to facilitate access on all OLTs.

Concerning the impact on access prices of access buyers using their own fibre, in the current decision Nkom has upheld that the relevant price regulation must, on the one hand, ensure

<sup>8</sup> Cf. for example [the Commission decision on the cases NL/2018/2099 and NL/2018/20100](#)

effective competition for services in the retail market, and on the other hand safeguard Telenor's investment incentives. On this basis, Nkom has imposed a price regulation that makes requirements of the relationship between Telenor's retail prices and Telenor's wholesale prices, specifically as a margin squeeze prohibition. In the current price regulation, there is thus no direct correlation between reduced costs for Telenor and reduced access prices.

Any net effect of cost savings for Telenor by allowing access buyers to use their own fibre to a greater extent, compared to the additional costs for Telenor of facilitating the solution, would also have to be deemed uncertain, in Nkom's assessment. On this basis, Nkom cannot see that the argument concerning possibly reduced production costs might justify a general obligation to facilitate access at OLT level, irrespective of concrete demand.

Nkom assumes that the needs referred to as justification for access at OLT level can be met in a more appropriate way through other forms of access to Telenor's fibre network than VULA access. In this respect, Nkom finds reason to perform a separate assessment of whether Telenor should be required to provide physical access to fibre strands/fibre pairs in fibre cables in its systematically developed fibre network.

Against the background of the aforementioned, Nkom believes that there is insufficient basis to impose a general obligation on Telenor to facilitate access to all OLTs.

Nkom also acknowledges that in specific cases it might become necessary for the access buyer to be able to achieve OLT access. In the decision, Telenor is ordered to prepare a process for handling requests for changes and additions to the reference offer for today's VULA product, cf. sections 332 and 468 of the decision. Telenor is also ordered to ensure that a description of this process is part of the reference offer. In the light of the aforementioned, Nkom sees a need to specify that this process will also apply to the handling of requests for access at OLT level, Cf. Chapter 9.1 below.

### **2.3.3 Use of the access buyer's infrastructure in backhaul - resilience**

In the consultation responses, it has been argued that access buyers' use of their own fibre will contribute to stronger resilience. Figure 3 below illustrates how the use of access buyers' fibre could affect the resilience of retail services that are based on the VULA product, and possibly also by Telenor itself.

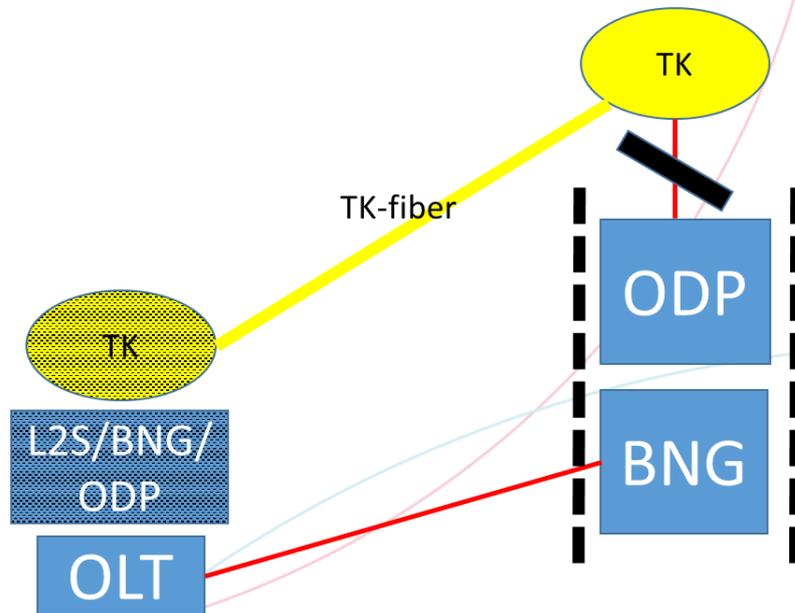


Figure 3. Possible use of access buyers' fibre ("TK-fibre") in backhaul.

Use of access buyers' own fibre as an alternative route in addition to Telenor's backhaul fibre could provide better resilience towards service outages. Here, two different scenarios might be possible:

- a) All traffic (both traffic to/from Telenor's customers and traffic to/from the access buyer's customers) can be rerouted to one other fibre if one of the fibres fails.
- b) All traffic for Telenor's end-customers is exclusively in Telenor's fibre, and the equivalent for access buyers. In this case, better resilience is not achieved at individual customer level, but for the area covered it is avoided that both the access buyer's and Telenor's end-customers will lose the service in the event of faults on one of the fibre conduits from OLT.

Nkom can see that both scenarios can be useful in terms of improving the network's resilience. Such a measure would, however, be aimed more at achieving increased resilience in the network than at promoting the competition aspect. Nkom refers to how the purpose of the obligations under the M3a decision is to remedy current competition problems in the relevant market. On this basis, Nkom cannot see that increased resilience in the network as such can provide a basis for imposing an obligation on Telenor to facilitate access on all OLTs.

## 2.4 Conclusion

Nkom concludes that it will not be proportionate to require Telenor to facilitate access at all OLT locations. Nkom refers to the aforementioned assessments, including that it must be considered uncertain to which OLTs there will be specific demand for access, and uncertainty related to the costs of facilitating such access.

Nkom acknowledges that in specific cases a need may arise with access buyers for access on OLT. Nkom underlines that the obligation imposed on Telenor in the Market 3a decision to draw up a process for handling requests for

changes and additions to the reference offer for today's VULA product, cf. sections 332 and 468 of the decision, must also include requests for access to specific OLT locations. This entails that Telenor must update the relevant parts of its standard agreement.

The conclusions in this chapter arise from the adjustment of the wording of the Market 3a decision, section 467, cf. Chapter 9.1.

## 3 Requirements of a further developed VULA product

### 3.1 Background

In the M3a decision, Nkom assumed that the discussion with the industry would also apply to traffic prioritisation and service development, cf. sections 343 and 344 of the decision.

In the light of the dialogue within the industry and the fact that the VULA product must be as close a replacement for local physical access to Telenor's fibre network as possible, Nkom determines new functionality requirements for VULA fibre. The requirements, which include service parameters and technical characteristics, are specified below and included in the M3a decision in a new section 467, cf. Chapter 9.1.

### 3.2 Further details of requirements for VULA fibre

#### 3.2.1 Class of Service

The access product must support a minimum of four different prioritisation levels for layer 2/Ethernet traffic on all product profiles based on p-bits in the Ethernet frames. Any overwriting/modification of p-bits in incoming frames to Telenor's network from the end-customer and/or on BNG must be presented in the reference offer.

#### 3.2.2 Customer VLAN

The access product must have product profiles that allow for multiple Customer VLAN (C-VLAN) on the customer access. C-VLAN must be transparent between customer access and ODP. Any limitations to the opportunity for nested C-VLAN must be stated in the reference offer. Since there will not usually be any need for more C-VLAN on a customer access aimed at the consumer market, and since the need for multicast functionality for distribution of TV signals will primarily exist in the consumer market, there is no requirement for product profiles that support both multicast and C-VLAN on the customer access, cf. sections 339 and 468 of the decision.

#### 3.2.3 Service VLAN

The set-up of Service VLAN (S-VLAN) for transport of Ethernet frames between customer location and ODP must be documented in the reference offer. It must be stated in the documentation how S-VLAN capacity between OLT and BNG is dimensioned and monitored with regard to capacity utilisation, cf. Table 5 of "*Annex 2.3 – Product sheet VULA to Agreement on Jara Broadband Access*" dated 01.06.2019. It must be clarified at which aggregation level (per S-VLAN or combined for all S-VLAN from an OLT) and at what frequency the capacity utilisation is measured, cf. Chapter 7.2.7.4.2 of the M3a decision. Where the set-up of S-VLAN

is different for different product profiles or groups of product profiles, this must be stated in the reference offer. It must also be stated whether S-VLAN is set up per single customer and/or per access buyer for different product profiles.

### **3.2.4 Multicast support**

The access product must have profiles that support multicast. Since there will not usually be any need for several C-VLANs on a customer access aimed at the consumer market, and since the need for multicast functionality for distribution of TV signals will primarily exist in the consumer market, there is no requirement for product profiles that support both multicast and C-VLAN on the customer access, cf. sections 339 and 468 of the decision.

### **3.2.5 Ethernet frame formats and frame sizes**

Supported Ethernet frame formats, including minimum and maximum frame sizes, must be stated in the reference offer. Where the frame format is different for different product profiles or groups of product profiles, this must be stated in the reference offer.

### **3.2.6 Layer 2 Ethernet protocol and protocol transparency**

As the VULA product in Market 3a must be as functionally equivalent to physical access as possible, the reference offer must include a reference to which Ethernet standard the product is based on and which limitations or options the product may have in relation to the relevant standard. It must also be stated which layer 2 protocol functions might not be transferred transparently between customer location and ODP.

### **3.2.7 Quality of service (QoS)**

For each prioritisation level, cf. Chapter 3.2.1, the following service quality parameters must be specified: Maximum proportion of lost frames, maximum frame delay and maximum variation in frame delay.

## **4 Use of own terminal equipment (ONT)**

### **4.1 Background**

In the M3a decision, Nkom required Telenor to allow access buyers to use their own ONT at the end-customer. The background to this requirement includes BEREC's "Common Position on Layer 2 Wholesale Access Products", which expresses how access buyers must be able to use and configure their own terminal equipment ("CP4").

### **4.2 Need for requirements that allow access buyers to use their own ONT**

On the basis of input that Nkom received after the M3a decision was made, both from Telenor in the form of an appeal concerning the M3a decision, and from potential access buyers, Nkom provided for the requirement concerning own ONT to be considered in the dialogue within the Broadband Forum. As Nkom perceives the dialogue within the Broadband Forum, the access buyers do not see any urgent need to be able to use their own ONT, at least not in the short term.

As referred to above, after the meetings in the Broadband Forum, Telenor has communicated its assessment of new VULA products to the forum participants. It is stated in the assessment that it will only be possible to use ONTs phased in by Telenor together with the product. Telenor did not receive any comments concerning the assessment.

In 2019, a survey was conducted among BEREC members concerning whether the regulated provider allows access buyers to use their own ONT in connection with VULA fibre. Among the ten countries that responded to the survey and which have a regulated product for VULA fibre, it is only in Spain that access buyers can use their own ONT. The other respondents<sup>9</sup> stated that the regulated provider does not permit access buyers to use their own ONT.

### 4.3 Conclusion

Nkom takes the view that there is reason to rescind the draft obligations on Telenor to allow access buyers to use their own ONT, establish a list of already approved ONTs and develop a process to assess new ONTs for approval. This conclusion entails that Telenor's appeal is upheld and that the M3a decision is reversed in this respect.

## 5 Access to information and support systems

In the Broadband Forum, Telenor outlined a solution for the access buyers' interface towards Telenor in connection with the new VULA product. The solution was distributed to the forum participants in order to obtain any comments on the proposal<sup>10</sup>. Telenor did not receive any comments concerning the proposal. On this basis, Nkom assumes that the solution outlined for the access buyers' interface towards Telenor will meet the access buyers' need for information and support system access in connection with the VULA product.

Nkom will therefore in principle assume that the solution outlined fulfils the requirements for information and support systems in Chapter 7.2.13 of the decision. In this context, Nkom assumes that the solution facilitates that the requirements of the functionality for VULA fibre, cf. Chapter 3.2, can be fulfilled on an effective basis.

Nkom assumes that Telenor will listen to the access buyers if there is a need to make changes to the outlined solution.

Telenor is furthermore obliged to involve the access buyers in the event of subsequent changes and further development of the information and support systems for VULA fibre in conjunction with section 435 of the decision.

Finally, Nkom emphasises that the obligation to provide non-discriminatory access to information and support systems, cf. section 435 of the decision, also includes access related to the functionality for testing and diagnosis. No matter which solutions Telenor chooses for its own end-customer activities, access buyers must have the opportunity to perform tests and diagnosis in such a way that the access product appears as a functional substitute for physical access, cf. section 250 of the decision.

<sup>9</sup> Ireland, Italy, Croatia, Norway, Slovakia, Slovenia, United Kingdom, Czech Republic and Austria

<sup>10</sup> Telenor's email of 22 March 2019 to the Broadband Forum participants.

On this basis, Nkom does not see any need for special changes to the M3a decision with regard to access to information and support systems.

## 6 Deadline for completion of a new VULA fibre product

### 6.1 Background

In the M3a decision, Telenor was required to accommodate any reasonable request for local virtual access to fibre-based GPON networks (VULA fibre). The access obligation is authorised in Section 4-1 of the Electronic Communications Act. In the light of the fact that Nkom saw a need for dialogue within the industry to determine final requirements for VULA fibre, no date was set for when the access product was to be completed.

### 6.2 Assessment

In the decision, Nkom stated that it is important to ensure the fastest possible introduction of local virtual access in Market 3a. Nkom maintains that it is important for the competition in the market that the further developed VULA product becomes available to access buyers as soon as possible. When Telenor became subject to an access obligation in the fibre access network in 2014, Telenor was given a 12-month deadline to develop and launch the new access product. In light of the fact that it is now a matter of further developing this access product and that, in Nkom's assessment, this does not concern very extensive new technical requirements for the further developed product, Nkom believes that the development period can be shortened considerably in relation to what applied when Telenor became subject to an access obligation concerning its fibre network. Nkom expects Telenor to take the necessary measures to meet the deadline, including by giving sufficiently high priority to the development and preparation of the access product.

Telenor, on the other hand, must have reasonable time to develop and complete the access product, including the interface to be used by the access buyers towards Telenor in connection with ordering, operation, maintenance and so on.

On this basis, Nkom believes that Telenor should be given up to six months to complete the access product.

In the notification of 20 December 2019 to change the decisions in Markets 3a and 3b Nkom has stated how an order for "Equivalence of Input" (Eol) could make it necessary to give Telenor a longer period of time to fulfil this requirement than the company is granted to develop the necessary wholesale products. Nkom has not taken a final decision on whether Eol should be imposed, but cannot see that this will have an impact on how long Telenor should be given to develop the VULA product for external access buyers. Nkom refers to how Telenor has to develop the VULA product, regardless of whether the non-discrimination obligation is based on Eol or EoO. Any Eol requirement will entail that Telenor itself will also have to use this product. In such case, Telenor could be granted more time than six months to adopt the new interface for its own retail activity, cf. also Chapter 5. Nkom thus specifies, in line with the aforementioned, that the VULA product must be available to external access buyers within six months of the entry into force of the decision.

To give access buyers the opportunity to get to know the product, the reference offer for VULA fibre should furthermore be published a certain time before the product is made available to the access buyers. Nkom believes that three months between the reference offer and the time of completion of the access product will give the access buyers sufficient time to get to know the product and to submit any viewpoints to Telenor and Nkom concerning the content of the reference offer. Nkom also believes that three months is sufficient time for Telenor to prepare the reference offer in question.

### 6.3 Conclusion

VULA fibre must be ready for delivery within six months of the entry into force of the decision. Within three months of the entry into force of the decision, Telenor must publish reference offers concerning access to VULA fibre in Market 3a on its wholesale access website, cf. new section 467 of the M3a decision in Chapter 9.1.

## 7 Relation to the Market 3b decision

### 7.1 Background and legal basis

It follows from section 188 of the Market 3b decision that when the requirements for local virtual access in Market 3a are determined, Nkom will assess the need to maintain or adjust the obligation to provide access to VUA fibre in Market 3b.

### 7.2 Assessment

Nkom has concluded, cf. Chapter 3 above, that the connection level for VULA fibre in Market 3a will be at the same level as the existing VUA product in Market 3b, called local BNG<sup>11</sup>. VULA fibre will therefore provide access buyers with the same opportunities as for today's VUA fibre to aggregate traffic to and from customers scattered in different geographical areas.

Access to VULA fibre would furthermore give access buyers greater control of the retail product compared to VUA fibre, and thereby an increased opportunity to offer differentiated services.

Nkom therefore believes that both access level and the product's greater flexibility would mean that VULA fibre will meet the access buyers' need for access to Telenor's fibre access network (GPON). The new functionality will be implemented in such a way that it is not necessary for access buyers to make changes to their configuration before they wish to adopt the extended functionality. In Nkom's assessment, it will therefore be disproportionate to uphold Telenor's obligation to offer access to VUA fibre when the new VULA product is available.

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<sup>11</sup> "Local BNG" means the BNG node to which an end-customer belongs in terms of network structure. "Local BNG" will typically be more centrally located in the network than DSLAM. Any order to also offer centralised access would entail an obligation for Telenor to facilitate that an access buyer would be able to connect with all end-customers throughout the network, either from one central BNG point at national level or a few BNGs at regional level.

### 7.3 Conclusion

In Nkom's assessment, neither the physical network connection level for access nor the consequences of new VULA functionality indicate a need to maintain the access obligation for VUA fibre in Market 3b, in addition to the access obligation for VULA fibre in Market 3a.

In order to facilitate a smooth transition from VUA fibre in Market 3b to VULA fibre in Market 3a, Telenor is required to draw up a rollout plan for the new VULA product that will include both technical functionality and contractual conditions for operators who are currently access buyers of VUA in Market 3b. This rollout plan must be approved by Nkom, and the obligation to offer access to VUA in Market 3b will lapse from the time that this rollout plan is implemented.

See new section 188b in the Market 3b decision, cf. Chapter 9.2.

## 8 Overall assessment of the proportionality of the new requirements

The requirements imposed with regard to Telenor's VULA product in Market 3a are based on dialogue with the industry, including with Telenor, and subsequent dialogue between Telenor and Nkom, cf. the aforementioned. Nkom believes that the requirements meet the needs of access buyers for a functional, virtual fibre product in Market 3a, in order to be able to offer attractive and differentiated products in the retail market, compared to the costs and resources Telenor will devote to developing the product. On this basis, Nkom believes that the requirements of the further developed VULA product are proportionate.

Nkom furthermore refers to how the obligations related to VUA fibre in Market 3b will cease when the introduction of new VULA functionality has been implemented in accordance with the approved rollout plan. Nkom thereby does not impose access to VUA fibre for longer than is proportionate.

## 9 Decision

### 9.1 Market 3a

Nkom hereby requires Telenor to comply with any reasonable request for local, virtual access to fibre-based GPON networks in accordance with the requirements and deadlines set out above.

This decision entails that section 467 of Chapter 7.2.17 of the M3a decision is replaced with the following:

*“467. Pursuant to Section 4-1 of the Electronic Communications Act, Nkom requires Telenor to meet any reasonable request for local, virtual access to fibre-based GPON networks (VULA fibre).*

*Requests for access at BNG level will be considered reasonable. Requests for access at OLT level will follow the process described in section 468.*

*VULA fibre must fulfil the following requirements:*

- a) *VULA fibre must support a minimum of four different prioritisation levels for layer 2/Ethernet traffic on all product profiles based on p-bits in Ethernet frames. Any overwriting/modification of p-bits in incoming frames to Telenor's network from the end-customer and/or on BNG must be presented in the reference offer.*
- b) *VULA fibre must be offered with product profiles that allow for multiple Customer VLAN (C-VLAN) on the customer access. C-VLAN must be transparent between customer access and ODP. Any limitations to the opportunity for nested C-VLAN must be stated in the reference offer.*
- c) *The set-up of Service VLAN (S-VLAN) for transport of Ethernet frames between customer location and ODP must be documented in the reference offer. It must be stated in the documentation how S-VLAN capacity between OLT and BNG is dimensioned and monitored with regard to capacity utilisation, cf. Table 5 of "Annex 2.3 – Product sheet VULA to Agreement on Jara Broadband Access" dated 01.06.2019. It must be clarified at which aggregation level (per S-VLAN or combined for all S-VLAN from an OLT) and at what frequency the capacity utilisation is measured, cf. Chapter 7.2.7.4.2 of the M3a decision. Where the set-up of S-VLAN is different for different product profiles or groups of product profiles, this must be stated in the reference offer. It must also be stated whether S-VLAN is set up per single customer and/or per access buyer for different product profiles.*
- d) *VULA fibre must be offered with profiles that support multicast.*
- e) *There is however no requirement for product profiles that support both multicast and C-VLAN on the customer access, cf. sections 339 and 468 of the decision.*
- f) *Supported Ethernet frame formats, including minimum and maximum frame sizes, must be stated in the reference offer. Where the frame format is different for different product profiles or groups of product profiles, this must be stated in the reference offer.*
- g) *The reference offer must include a reference to which Ethernet standard the product is based on and which limitations or options the product may have in relation to the relevant standard. It must also be stated which layer 2 protocol functions might not be transferred transparently between customer location and ODP.*
- h) *For each prioritisation level, cf. a), the following service quality parameters must be specified: Maximum proportion of lost frames, maximum frame delay and maximum variation in frame delay.*

*Within three months of the entry into force of the decision, Telenor must publish the reference offer concerning access to VULA fibre in Market 3a on its wholesale access website. VULA fibre must be ready for delivery within six months of the entry into force of the decision. Telenor must facilitate that access buyers can test the IT solution within this six-month deadline. Telenor must furthermore, within three months of the decision's entry into force, draw up a rollout plan for new VULA functionality both in relation to the technical solution and in relation to contractual conditions. This rollout plan must be approved by Nkom, cf. also section 188b of the Market 3b decision."*

The product development process that Telenor was required to develop in section 468 of the M3a decision is a critical element in ensuring that the new VULA product will be a functional substitute for physical access, also in relation to the access buyers' ability to develop their own retail products. Nkom must therefore approve this process before it is published as part of the new reference offer. The following sentence is therefore included in section 468 of the M3a decision:



*“Telenor must submit a proposal for such a process for Nkom’s approval at least one month before the deadline for publication of reference offers concerning access to VULA fibre in Market 3a.”*

The M3a decision is reversed so that the requirement for Telenor to allow access buyers to use their own ONT will lapse. Section 340 of Chapter 7.2.7.4.1 of the M3a decision expires.

## **9.2 Market 3b**

A new section 188b is added to the Market 3b decision:

*“188b. The new VULA product that will be offered on the basis of the decision in Market 3a of 20 December 2018 and supplementary decisions in Market 3a concerning final requirements for VULA fibre of 31 March 2020 will be a further development of the VUA product that Telenor, by this decision, is required to offer in Market 3b. The development of the new VULA product will not lead to any need for changes in systems or processes of access buyers for the ordering or management of accesses for which the access buyer does not apply functionality beyond what has been available for the VUA product. Within three months of the decision's entry into force, Telenor must draw up a rollout plan for the new VULA functionality with regard to both the technical solution and the contractual conditions. This rollout plan must be approved by Nkom. Telenor’s obligation to offer VUA fibre in Market 3b will cease as from the time that this rollout plan is implemented.”*

A new section 300b is added to the Market 3b decision:

*“300b. Telenor’s obligation to offer VUA fibre in Market 3b will cease as from the time that the rollout plan for VULA fibre is implemented, cf. section 467 of the Market 3a decision.”*

## Annex 1: Abbreviations

- BNG:** “*Border Network Gateway*”: First node in the network seen from the end-customer's location that contains layer 3/IP functionality.
- Eol:** “*Equivalence of Input*”: System to ensure non-discrimination whereby the network owner's retail activity and access buyers fully use the same systems and interfaces.
- EoO:** “*Equivalence of Output*”: System to ensure non-discrimination based on how the network owner's retail activity and the access buyers fully or partly use different systems and interfaces to order and manage access products, but whereby the performance across the various systems/interfaces are equivalent in terms of functionality/quality.
- ODP:** “*Operator Delivery Point*”: The delivery point between Telenor's and the access buyer's networks.
- OLT:** “*Optical Line Termination*”: Local broadband exchange. First unit with electronic equipment in the GPON network seen from the end-customer's location.
- ODF:** “*Optical Distribution Frame*”: Connection panel for fibre cables.
- PE:** “*Provider Edge Router*”: Router with both IP and MPLS functionality.
- TK:** Access buyer (“Tilgangskjøper”)
- VLAN:** “*Virtual Local Area Network*”: Logical data network produced over public networks that appears as a local data network for users at different locations.
- VUA:** “*Virtual Unbundled Access*”: Designation of virtual access product in Market 3b.
- VULA:** “*Virtual Unbundled Local Access*”: Designation of virtual access product in Market 3a.