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Subject: **State Aid SA.46805 – Germany**
             VULA product (Follow-up NGA Germany, case SA.38348)

Sir,

I. SUMMARY

(1)   I am pleased to inform you that the Commission has assessed the virtual access products ("VULA", "virtual unbundled local access") provided by DNS:NET, Deutsche Telekom and NetCologne which were notified by Germany on the basis of Commission decision of 15 June 2015 in case SA.38348 Next Generation Access Germany ("the *NGA Germany* decision")[1]. This decision authorised the measure "*Scheme of the Federal Government in support of the expansion of comprehensive next generation broadband access (NGA)"* ("the German NGA scheme") and defined that vectoring may be used by any beneficiary of the scheme under the condition that an adequate VULA product, subject to a separate notification to the Commission, is made available.

(2)   The Commission has decided that the three VULA products provided by DNS:NET, Deutsche Telekom and NetCologne fulfil the requirements set out in the *NGA Germany* decision for an adequate VULA product and can therefore be approved.

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[1]   Commission decision of 15 June 2015 in the case SA.38348 NGA Germany, OJ C 292, 4.9.2015, p. 4.

Seiner Exzellenz Herrn Sigmar GABRIEL
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II. PROCEDURE

(3)   On 1 September 2016, Germany notified to the Commission three VULA products from three different companies ("VULA applicants"). With the notification, Germany provided the results of a public consultation as well as an opinion of the national regulator (Bundesnetzagentur, BNetzA) – both raised a number of concerns.

(4)   On 8 December 2016 (after consultation with Germany), a technical expert was appointed by the Commission with the task to technically analyse the three submitted VULA products. The technical expert study was delivered on 15 February 2017, setting out the technical requirements for assessing whether a proposed VULA product is in line with the conditions of the *NGA Germany* decision. The study identified a number of technical shortcomings of the three VULA products submitted by Germany. In the following, the technical expert submitted updates to the original study taking into account the changes and clarifications provided by the three VULA applicants. Following such up-dates and including further confirmations by the companies as well as the revised contracts provided by the VULA-applicants, the technical expert confirmed that, in its view, all three improved VULA products comply with the technical requirements.

III. CONTEXT

(5)   On 15 June 2015, the Commission approved by its decision SA.38348 the German NGA scheme. With this scheme Germany aims to foster investments into a country-wide coverage with "Next Generation Access" (NGA) infrastructure in line with the "Digital Agenda" targets. The German NGA scheme provides funding of broadband infrastructure in "NGA-white" areas of Germany (i.e. mostly rural and sparsely populated). Germany had also notified the possible use of vectoring to the copper lines as part of the NGA Germany scheme. The application of vectoring was approved by the Commission under the condition of the separate notification of an adequate VULA product and its approval by the Commission.

(6)   The most relevant technology under the German NGA scheme is fibre to the cabinet ("FTTC") together with the application of VDSL[2] allowing for high-speed internet services. A further increase of bandwidths can be achieved by vectoring. Vectoring increases speeds by removing interferences between copper cables. However, vectoring technology can only be applied effectively if all bundled copper lines are technically controlled by one company. With vectoring it is therefore technically no longer possible for competitors to get access to the copper network via physical unbundling (or "physical access"). In Germany such physical access is only prevented for the high bandwidths achieved via VDSL and vectoring, while lower bandwidths remain unaffected. With vectoring, competitors are therefore still able to offer lower speed internet services using physical unbundling, but they will not be able to upgrade their offers to higher speeds. Vectoring can therefore have significant effects on competition.

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[2]   Very High Speed Digital Subscriber Line

(7)   Physical access lost due to vectoring can be replaced by a virtual access product. If an access product only comprises data transport without any technical autonomy it is considered as a general "bitstream product". If the product in addition provides access seekers on a virtual basis with a technical autonomy over the relevant copper lines coming close to the one for physical unbundling, this virtual access product is considered as a VULA product. Only on the basis of a VULA product, competitors can continue innovating and differentiating their services and effectively compete with the network operator's offers.

(8)   According to the *NGA Germany* decision, vectoring may be used in the areas receiving State aid under the German NGA scheme, provided that adequate VULA products are offered to the market. The decision sets out that the VULA product has to be "*functionally equivalent to physical unbundling based on the relevant Commission criteria*"[3], thereby making reference to the *Explanatory Note* of the Commission accompanying the *Commission Recommendation on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation*[4] ("Explanatory Note").

(9)   The Explanatory Note sets out the following cumulative conditions for a VULA:

(a)   *"Access occurs locally. This means that traffic is handed over at a level which is much closer to the customer premises than access at the national or regional level as generally granted with traditional bitstream access. Such "localness" is typically given in a scenario where access is granted at or close to the central office/MDF (including newly built ODF) or the street cabinet. However, while the virtual access product should aim to replicate LLU [Local Loop Unbundling] effectively, the number of interconnection points does not necessarily need to be equivalent to the copper network's points of interconnection.*

(b)   *Access is generic and provides access seekers with a service-agnostic transmission capacity uncontended in practice, i.e. providing guaranteed bandwidths according to the access seekers' needs, whereby respective access requests are subject to the principle of proportionality, and would normally not require the SMP operator to deploy new physical infrastructure. Uncontended access requires in principle the establishment of a dedicated logical connection between the customer facilities and the point of handover. The technical features of the connection (backhaul connecting the street cabinet and central office and capacity dimensioning in particular) should only be limited by the inherent capabilities of the access technologies deployed and support LLU-like services (e.g. multicast where appropriate).*

(c)   *Access seekers need to have sufficient control over the transmission network to consider such a product to be a functional substitute to LLU and to allow for product differentiation and innovation similar to LLU. In this regard, the access seekers' control of the core network elements,*

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[3]   See recital 30 of the Germany NGA decision.

[4]   Explanatory Note (SWD(2014) 298) accompanying the Commission Recommendation on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation. https://ec.europa.eu/digital-single-market/en/news/explanatory-note-accompanying-commission-recommendation-relevant-product-and-service-markets

network functionalities, operational and business process as well as the ancillary services and systems (e.g. customer premises equipment) should allow for a sufficient control over the end user product specification and the quality of service provided (e.g. varying QoS parameters)."[5]

(10) During the study, the expert set out a number of technical parameters for these criteria taking into account also which of those parameters are met by already existing VULA products approved by national regulatory authorities, reports by BEREC[6] as well as enquiries from market participants. This has resulted in a list of criteria, which can be grouped under the sub-headings "Local access"[7], "Generic access", "Access seeker's control", "Migration" and "Pricing". The list of criteria was complemented by benchmarks for a VULA product that would meet the requirements set out in the *NGA Germany* decision and which would mimic as closely as possible the lost physical access and thereby be capable of functionally replacing physical unbundling in an equivalent manner:

Characteristic	Best practice implementation
Local access	1. VULA should be available at least at the MDF[8] level of network hierarchy, or if not feasible, a higher (regional) network level. 2. The number of wholesale access seekers per handover location should not be limited. 3. The size and number of handover interfaces should be determined by the capacity required by end-users of each access seeker. 4. A single interface should be available for all current and future VULA technologies and a single VULA product family should be defined
Generic access	5. VULA should be offered through the layer 2 (Ethernet) protocol[9] 6. A pure uncontended VULA should be available. This may be most achievable with MDF (or cabinet) handover. If VULA is made available at the BNG (Broadband Network Gateway)[10], it should be offered in such a way that it could be dimensioned as uncontended or at a contention ratio determined by the access seeker 7. 10Gbit/s interfaces should be available as required to avoid contention at the handover interface 8. VLAN tagging[11] should be available. There should be at least 4 VLANs per end customer with the potential for 8 as a reserve for future differentiation[12] 9. The MTU (Message Transfer Unit)[13] size should be at least 1580 Bytes 10. There should be at least one dedicated logical connection per end-customer between the handover interface and the CPE (customer premises equipment), and a unique customer ID which can be used by the access provider and access seeker 11. Multicast frame replication[14] is not required at cabinet level, but should be offered at any level above

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[5]   Explanatory Note, point 4.2.2.1, in particular pages 43-44.

[6]   Body of European Regulators for Electronic Communications

[7]   The expert study uses as title for this sub-category "Point of handover" or "Point of local handover" covering the criteria 1-4 set out in table 1. Here the title "Local access" is used in order to avoid confusion with the first point within this sub-category which specifically deals with the location of the handover point for data traffic within the network.

[8]   The main distribution frame ("MDF") at a local exchange is a location within the network architecture above the street cabinet level, i.e. in further distance from the end-customers' premises. In Germany, there are approximately 330 000 street cabinets and 7 900 MDFs.

[9]   "Layer 2" and "Layer 3" refer to different protocol layers within the multi-layered communication model of computer networking

Access seeker's control	12. There should be free choice of the end-customer's CPE e.g. via a whitelist, with the potential to apply for approval for further CPE
	13. The access seeker should have control of the whole technical capacity of the access line – bandwidth control and traffic prioritization would be performed by the access seeker alone
	14. Ideally, access seekers should be able to operate or control their end-customer ports (down to the DSL-profiles) in an MSAN[15] (Multi-Service Access Node)[16]
	15. Access seekers should be able to apply any security measures at layer 3 and above
	16. Access seekers should have fault management capabilities through access to real time line state information and monthly line state reports. An availability criterion and a clear fault definition shall exist.
	17. Compliance with service levels (SLAs) for provisioning and repair (mean time to repair, MTTR) should be monitored through KPIs (key performance indicators) with automatic compensation if targets are not met
	18. Access seekers should have control of the operational and business support processes for their end-customers
Migration	19. An early announcement and mutually agreed migration plan should be made
	20. An automated process should be available for bulk forced migration
	21. There should be specific KPIs applied for bulk migration with automatic compensation in the event that targets are not met
	22. In the event of forced migration, there should be compensation for stranded assets valued at the net book value on the day of migration

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[10] Broadband Network Gateway ("BNG") is a location within the network architecture above/at MDF-level. It is a subset of the MDF locations, forming the next higher network level, all hosting BNG equipment in addition to the pure MDF level locations. In Germany, there are approximately 900 BNGs.

[11] Virtual Local Area Networks ("VLANs") allow a single physical Ethernet network to be used as multiple logical networks. Tagging allows for a clear allocation of data to these different VLANs.

[12] The access seeker's VLAN address space is technically defined at a maximum of 4 094 end-customers.

[13] The Maximum Transmission Unit ("MTU") is the size of the largest network layer protocol data unit that can be communicated in a single network transaction. The standard Ethernet frame MTU has 1 500 Byte. A large MTU size allows the wholesale seeker additional flexibility to design the own communication product. With physical access each operator could decide independently on setting the MTU size. Today support of an Ethernet frame size above 1 500 Byte up to 1 900 is state of the art.

[14] Multicast is a feature typically used for IP-TV transmission. Instead of transmitting all TV-channels down to each customer (Broadcast) they are only transmitted to those having subscribed for it. Multicast frame replication avoids the multiple transmissions of the same channels, thereby saving bandwidth. The savings increase with the number of customers (and therefore potential TV viewers). Savings through multicast are likely to be limited if handover is provided at cabinet level, where only a small number of customers can be accessed. However at higher network level, multicast would likely be essential to ensure efficient transmission of TV via internet.

[15] The MSAN is installed at the MDF or in street cabinets. It connects customers' telephone lines to the core network, to provide telephone as well as broadband such as DSL from a single platform. It is considered as largely equivalent to the Digital subscriber line access multiplexer ("DSLAM").

[16] The Commission considers that this is at least required where the network operators themselves apply product-specific profiles for their own offering (instead of, for example, using a network-wide automated optimization of the MSAN port parameters).

Pricing	23. The FTTC VULA price should be cost-based and calculated through a BU-LRIC+ methodology[17]
	24. For uncontended VULA, a single price should be calculated, based on the unconstrained bandwidth of the line (limited only by technical physical characteristics)
	25. The price for contended VULA should reflect a cost-oriented share of the uncontended cost

Table 1: "best practice" VULA criteria (source: expert study)

(11) While the VULA product should fulfil the characteristics indicated above in order to comply with the *NGA Germany* decision, a few modifications are necessary in the given context:

Point of handover (point 1)

(12) The point of handover indicates the location where the data traffic is handed over between the access provider and the access seeker – this is, at which point in the network hierarchy the VULA product should be made available for the access seeker (point 1). The expert requires in the study that the VULA product should be made available at a higher network level than the street cabinet, i.e. at the Main Distribution Frame (MDF) or – if not feasible – the Broadband Network Gateway (BNG)[18], in order to make access economically more viable for competitors. Instead of multiple deployment of equipment at each street cabinet, investments for such equipment would have to be made by access seekers only at the fewer locations at higher network level. At the same time, a significantly larger number of customers could be reached from a higher network level. At higher network level no separate access or investments into fibre would have to be undertaken by competitors in order to reach the street cabinets.

(13) This view was also voiced by market participants who also pointed to potentially high investments by competitors into parallel fibre to the cabinets. While regional players signalled some demand for access at street cabinet level, in particular competitors acting as national players stressed the importance to have a VULA at higher network level.

(14) Germany submitted that State aid under the NGA Germany scheme cannot be granted to broadband deployment projects in so-called "near shore areas"[19]. Therefore, only "far shore areas" are affected in this case. Germany and the three VULA-applicants consider that the *NGA Germany* decision does not require a

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[17] Bottom-up modelling approach using long-run incremental costs

[18] DT is currently re-organizing its network architecture and has argued that on this basis the MDF-level would be technically no longer possible and would have to be replaced by the BNG-level which can be considered as a level above MDF in the network. In the following, both MDF and BNG will be considered jointly.

[19] Near shore areas are in Germany defined as a radius of 550 meters around the MDF. Far shore areas are the areas beyond this 550 meter-radius. The conditions for deploying VDSL-equipment (MSANs/DSLAMs + line card) differed significantly between near and far shore areas in the past. While in far shore areas such equipment has always been deployed at the street cabinets, since VDSL only works over short distances to the customers, in near shore areas the deployment of VDSL-equipment in the street cabinets was originally not possible due to technological reasons. For this reason, it was in the past deployed at the MDFs within the near shore areas. The competitive conditions differed significantly on this basis. Germany has confirmed that near shore areas cannot profit from State aid under the NGA Germany scheme, since a commitment by DT to privately invest into FTTC and VDSL exists for all near shore areas.

VULA at a higher network level, but allows for a VULA at street cabinet level. Germany argues that the conditions of the *NGA Germany* decision for a VULA product are fulfilled also if only a handover point at the lower street cabinet level is offered.

(15) The Commission agrees with Germany's view that a VULA product at street cabinet level can fulfil the requirements as set out in the *NGA Germany* decision on the basis that only far shore areas are concerned in this case[20].

    (a) First of all, the criteria set out in the Explanatory Note which the *NGA Germany* decision refers to[21] require "local access" which explicitly points to the street cabinet level (alongside with the possibility to choose the MDF-level).

    (b) Moreover, the *NGA Germany* decision requires a VULA product in order to replace physical access lost due to vectoring. A VULA product at street cabinet level replaces in an equivalent manner the physical access which is lost due to vectoring. This is because in the far shore areas, VDSL-equipment is deployed at street cabinet level and accordingly vectoring is applied - after the deployment of FTTC – only on the remaining copper cable between the street cabinets and the end customers.

    (c) It is also worth noting, that the economic disadvantages of a handover point at street cabinet level in the case of vectoring are similar to the economic disadvantages of physical access at street cabinet level. In the counterfactual situation without vectoring (in far shore areas), competitors wanting to install parallel VDSL-equipment at the street cabinets would need to get access to or deploy own fibre from the MDF to the cabinet and receive physical access to the copper lines between street cabinet and end-customers via unbundling copper at street cabinet level. Such physical access faces similar economic problems as a VULA at street cabinet level since similar conditions apply (investments into certain equipment or shared use of equipment in each street cabinet, small number of customers connected to each street cabinet). A VULA at higher network level would on this basis lead to even better access conditions than those prevailing in the counterfactual situation of FTTC and VDSL without any use of vectoring in the far shore areas. This would go beyond the purpose of the VULA requirement as set out in the *NGA Germany* decision which is supposed to restore competition lost due to vectoring.

    (d) Open access to the subsidized infrastructure (here: FTTC) has to be granted under State aid rules.[22] The VULA product therefore

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[20] Previously competition also in the field of VDSL-offers existed to a much more significant extent in near shore areas than in far shore areas since – for technological reasons - VDSL-equipment was deployed in near shore areas at the MDFs.

[21] See recital 30 of the *NGA Germany* decision

[22] The *NGA Germany* decision (recital 61 f)) specifies that, in line with points 78(g) and 80(a) of the Broadband Guidelines, the beneficiary of the aid has to grant open access to the subsidized network, including but not limited to access to ducts, dark fibre, street cabinets, bit-stream and unbundled access to fibre. Such access has to be granted on fair and non-discriminatory terms for at least seven years and without limitation in time for any new passive infrastructure elements, such as ducts and poles.

complements this access to the newly deployed fibre by virtual access to the copper cable between street cabinet and the end-customers' premises.

(16) For these reasons, the Commission considers that a VULA at street cabinet level is sufficient to fulfil the requirements defined in the *NGA Germany* decision.

Multicast frame replication (point 11)

(17) This function is only of relevance if a VULA is provided at a higher network level (MDF, BNG). Since the relevant point of handover is the street cabinet level (see recitals (12)-(16) above), this requirement is no longer pertinent in the case at hand.

Single VULA product family (point 4)

(18) Both the *NGA Germany* decision and the Broadband Guidelines[23] require a VULA also in case of Fibre to the Home (FTTH) if physical access becomes impossible due to the technology used (point-to-multipoint structure). Also in such a case, a notification of a VULA product for FTTH is required under the *NGA Germany* decision. The use of a consistent VULA product family would in that case facilitate the notification procedure of a new VULA for FTTH by any current VULA-applicant. However, in the context of the *NGA Germany* decision, no VULA product family was specifically required as Germany had confirmed that FTTH has not played a role so far under the *NGA Germany* scheme. However, should Germany in the future also implement FTTH under that scheme, Germany has to seek approval of an adequate VULA product.

Migration (points 19-22)

(19) The requirements allowing for a smooth migration from physical access to VULA become relevant where competitors had already been present at the street cabinet with own VDSL-equipment and would now have to switch from physical unbundling in the FTTC/VDSL-context to VULA after the introduction of vectoring. However, in the target areas of the German NGA scheme, before granting the aid, no operator had installed FTTC/VDSL technology. As a result, in such areas no migration will take place. Where such migration occurs, the requirements 19-22 need to be fulfilled.

Pricing (points 23-25)

(20) The pricing for VULA should follow the regulatory framework for VULA-pricing which is set by the national regulator as defined in the *NGA Germany* decision[24]. No further requirements are necessary in this respect in this Commission decision.

IV. ASSESSMENT OF THE DNS:NET VULA PRODUCT

(21) The DNS:NET VULA product provides for the following characteristics[25] which fulfil to a sufficient extent the requirements set out in the *NGA Germany* decision as specified above (see recitals (8) - (20)).

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[23]   O.J. C25/1 26.1.2013

[24]   See recitals 38-39 of the *NGA Germany* decision

		DNS:NET
	Local access:	
1	Handover location	cabinet, BNG optional
2	No. of access seekers per handover point	not limited
3	Number of handover interfaces	10 G for max. 192 ports, expandable
4	One common VULA product family	declaration of intent
	Generic Access:	
5	L2 Protocol	offered
6	Upgrade backhaul capacity	uncontended
7	10 G interface	1-10G
8	VLAN tagging	offered
8	No. of VLAN end customer	4 094
9	Max MTU size	> 1 580
10	Dedicated connection per end-cust./ availability connection	offered
10	Unique customer ID	offered
11	Multicast frame replication	optional
	Access seeker's control:	
12	CPE: by access seeker resp. end-customer	offered
13	Bandwidth control by access seeker	offered
14	Control of MSAN port parameters	offered
15	Security: support for access seeker available	offered
16	*Fault management:*	
	Real-time diagnosis and analysis	offered
	Clear fault definition	offered
	MTR targets/ KPI monitoring	offered
17	Damage compensation	offered
18	Sufficient control of operational support system (OSS) and business support system (BSS)	offered
	Migration	
	Price	

Table 2: VULA product offered by DNS:NET (source: expert study, later updates included)

(22) "Local access": DNS:NET offers a handover point at street cabinet level with 1 Gbit/s or 10 Gbit/s interfaces and a fibre port. DNS:NET provides on a voluntary basis an optional handover point at BNG level for its VULA product via a shared use of its own backhaul link to regional BNG, an access seeker individual backhaul capacity capable of aggregating several cabinets and provided by DNS:NET or an access seeker individual backhaul fibre per MSAN. The number of access seekers at the MSAN handover is not restricted. An additional gateway will be installed in case of demand. For each handover there is in addition a spare fibre pair available. Apart from this, DNS:NET confirms in addition that in case it would engage into a subsidized FTTH deployment which would require a VULA product, the criterion of a common VULA-family would be respected.

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[25]   See expert study of February 2017, p. 99-101, as well as the additional analysis provided by the expert on 19 April 2017, 7 June 2017 and 7 July 2017.

(23) "Generic access": As required, the DNS:NET VULA product offers a handover protocol as Layer 2 Ethernet. The bandwidth is unconstrained. The handover ports with 1 Gbit/s or 10 Gbit/s allow for an uncontended handover. VLAN tagging is implemented and allows for 4 096 customers per VLAN. The MTU size is larger than the best practice minimum of 1 580 Bytes. There is a dedicated logical connection description used to identify each wholesale seeker end-customer. The availability of an access connection is only provided as the availability of the elements of the involved network elements of the value chain, excluding the sub-loop provided by DT. Thus, the value has to be calculated by the access seeker out of the elements given. While not ideal, this can be considered as acceptable. Multicast frame replication is offered as additional option in case an access seeker chooses to use the BNG as handover point.

(24) "Access seeker's control": Free choice of CPE is guaranteed by German law. Bandwidth control is provided. Full control over MSAN port parameters by access seekers would require the technical feature of multi-tenancy which is, however, currently not available on the market. DNS:NET offers access to the port parameters for the wholesale access seekers, for example by controlling the signal to noise ratio and by having a choice between different line profiles which can be determined by the wholesale seeker in cooperation with DNS:NET. Support for access seekers with respect to security can be considered as fulfilled: DNS:NET guarantees protocol transparency for layer 2. Therefore, no security functions of higher protocol layers are affected and, moreover, DNS:NET also guarantees protocol transparency for all higher levels. An effective fault management system is provided including a real-time diagnosis, MTTR (mean time to repair) targets and KPI (key performance indicators) monitoring. DNS:NET included a clear fault definition into its contract. DNS:NET offers access seekers the option of defined automatic compensation payments which are triggered in case of deviation from certain thresholds. Sufficient control of the operational support system and the business support system is provided.

(25) The expert confirmed that the characteristics of the VULA product set out above are reflected in the contract provided by DNS:NET (version provided on 31 July 2017). The contracts can therefore be approved to the extent they indeed follow the VULA-requirements defined in the *NGA Germany* decision and as set out in recitals (8) - (20) above. DNS:NET will publish the key provisions of the contract relating to the characteristics required in this assessment on its website.

V. ASSESSMENT OF THE DEUTSCHE TELEKOM (DT) VULA PRODUCT

(26) The DT VULA product provides for the following characteristics which fulfil to a sufficient extent the requirements set out in the *NGA Germany* decision as specified above (see recitals (8) - (20)).

		DT
	Local access:	
1	Handover location	cabinet only
2	No. of access seekers per handover point	two (solutions for expansion to be sought in case of demand)
3	Number of handover interfaces	two 10G per MSAN for max. 448 ports (solutions for expansion to be sought in case of demand)
4	One common VULA product family	declaration of intent
	Generic Access:	
5	L2 Protocol	y
6	Upgrade backhaul capacity	uncontended
7	10 G interface	1-10G
8	VLAN tagging	offered
8	No. of VLAN end customer	3 872
9	Max MTU size	max. 1 950 Byte
10	Dedicated connection per end-cust./ availability connection	offered
10	Unique customer ID	offered
11	Multicast frame replication	
	Access seeker's control:	
12	CPE: by access seeker resp. end-customer	offered
13	Bandwidth control by access seeker	offered
14	Control of MSAN port parameters	offered (in case of product-specific approach)
15	Security: support for access seeker available	offered
16	*Fault management:*	
	Real-time diagnosis and analysis	offered
	Clear fault definition	offered
	MTR targets/ KPI monitoring	offered
17	Damage compensation	offered
18	Sufficient control of operational support system (OSS) and business support system (BSS)	offered
	Migration	
	Price	

Table 3: VULA product offered by DT (source: expert study, later updates included)

(27)   "Local access": DT offers a local handover at street cabinet level. An additional VULA handover point at higher network level is not offered for State Aid purposes. The number of access seekers per handover point is not restricted (at the outset, access is limited to two access seekers, but DT confirmed that it will in the framework of its technical possibilities propose solutions for further access in case additional access is demanded). With respect to the number of handover interfaces, DT has introduced a capacity restriction of 10 Gbit/s per MSAN. Also here, DT committed to offer within its technical possibilities proposals for solutions to increase this capacity in case demand should go beyond the defined

limit.[26] DT expressed its intention to pursue the aim of a common VULA-family due to the network efficiencies which can be achieved by this.

(28) "Generic access": DT offers a Layer 2 handover protocol. The bandwidth offered is unconstrained. The handover ports are offered with 1-10 Gbit/s. DT provides for VLAN tagging with 3 872 addressable VLANs per end-customer[27] which can be considered as sufficient. The MTU-size is at a maximum of 1 950 Byte, thus above 1 580 Bytes. There is a unique customer line-ID and dedicated logical connections per end-customer.

(29) "Access seeker's control": Free choice of CPE is guaranteed by German law. With the DT VULA product, the access seeker can make use of the maximum technical and physical capabilities of the access line, control bandwidth guarantees and bandwidth classes, traffic symmetry and traffic service classes. Full control over MSAN port parameters is not provided. DT confirms, however, that it does not use any product specific optimization in this respect, but a network-wide automated optimization for all customers. On this basis, the access seeker is not discriminated by not receiving control over MSAN port parameters but receives the same automated optimization as DT uses for its own offering. In case DT should move from automated optimization to product-specific modifications and differentiation, a possibility will be given to access seekers to ask for modified profiles in cooperation with DT. Support for access seekers with respect to security can be considered as fulfilled: DT guarantees protocol transparency for layer 2. Therefore, no security functions of higher protocol layers are affected and, moreover, DT also guarantees protocol transparency for all higher levels. An effective fault management system with real-time diagnosis and analysis, MTR targets/KPI monitoring and damage compensation is offered. Supporting their access availability, DT gives a clear definition of faults by describing technical transmission quality parameters which have to be met - otherwise a fault is assumed and repair action has to be started. Sufficient control of the operational support system and the business support system is provided.

(30) The expert confirmed that the characteristics of the VULA product set out above are reflected in the contract provided by DT (version provided on 31 July 2017). The contracts can therefore be approved to the extent they indeed follow the VULA-requirements defined in the *NGA Germany* decision and as set out in recitals (8) - (20) above. DT will publish the key provisions of the contract relating to the characteristics required in this assessment on its website.

VI. ASSESSMENT OF THE NETCOLOGNE VULA

(31) The NetCologne VULA product provides for the following characteristics which – as confirmed by the expert[28] – fulfil to a sufficient extent the requirements set out in the *NGA Germany* decision as specified above (see recitals (8) - (20)).

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[26]   The pricing will follow the general pricing provision as set out in the *NGA Germany* decision, see footnote 24.

[27]   A small part of the total addressee space of 4,094 addresses is not made available.

[28]   See expert study of February 2017, p. 99-101, as well as the additional analysis provided by the expert on 19 April 2017, 7 June 2017 and 7 July 2017.

		NetCologne
	Local access:	
1	Handover location	cabinet only
2	No. of access seekers per handover point	not limited
3	Number of handover interfaces	10 G per portcard for 48 ports each, expandable
4	One common VULA product family	
	Generic Access:	
5	L2 Protocol	offered
6	Upgrade backhaul capacity	max. 2,5 G uncontended
7	10 G interface	10G / max 2,5 G
8	VLAN tagging	offered
8	No. of VLAN end customer	4,094
9	Max MTU size	1,580
10	Dedicated connection per end-cust./ availability connection	offered
10	Unique customer ID	offered
11	Multicast frame replication	on demand , add. agreement
	Access seeker's control:	
12	CPE: by access seeker resp. end-customer	offered
13	Bandwidth control by access seeker	offered
14	Control of MSAN port parameters	offered (in case of product-specific approach)
15	Security: support for access seeker available	offered
16	*Fault management:*	
	Real-time diagnosis and analysis	offered
	Clear fault definition	offered
	MTR targets/ KPI monitoring	offered
17	Damage compensation	offered
18	Sufficient control of operational support system (OSS) and business support system (BSS)	offered
	Migration	
	Price	

Table 4: VULA product offered by NetCologne (source: expert study, later updates included)

(32)   "Local access": The handover point is located at the cabinet. A handover point at higher network level is not offered. The number of handover points can be expanded by NetCologne on demand. NetCologne explains to be open to apply the same processes of providing, operating and repairing for other future fibre based VULA products thus supporting a common VULA product family.

(33)   "Generic access": NetCologne offers a Layer 2 handover protocol. The bandwidth offered is unconstrained. The handover ports are offered with up to 10 Gbit/s. The DSLAMs used today are limited to 2.5 Gbit/s per port card. NetCologne provides for VLAN tagging with 4 094 addressable VLANs per end-customer. The MTU-size is above 1 580 Bytes. There is a unique customer line-ID and dedicated logical connections per end-customer. Multicast frame replication can be added on demand via a separate agreement.

(34)   "Access seeker's control": Free choice of CPE is guaranteed by German law. The access seeker is given control over bandwidth and profiles. Full control over

MSAN port parameters is not provided. NetCologne confirms, however, that it does not use any product specific modifications for its own offerings to end-customers and reverts to different profiles only in case of faults. On this basis the access seeker is not discriminated by not receiving control over MSAN port parameters. NetCologne confirms that in case it should turn towards product-specific modifications, the same possibility will be open to access seekers who may demand such modifications for their own products from NetCologne. Support for access seekers with respect to security can be considered as fulfilled: NetCologne guarantees protocol transparency for layer 2. Therefore, no security functions of higher protocol layers are affected and, moreover, NetCologne also guarantees protocol transparency for all higher levels. An effective fault management system with real-time diagnosis and analysis, MTR targets, KPI (key performance indicators) monitoring and damage compensation is offered. A clear fault definition supporting the availability KPI provided is offered. Sufficient control of the operational support system and the business support system is provided.

(35)   The expert confirmed that the characteristics of the VULA product set out above are reflected in the contract provided by NetCologne (in the version provided on 01 August 2017 except for Annexes D1 and C: Annex D1 provided on 31 July 2017 and Annex C submitted on 2 August 2017). The contracts can therefore be approved to the extent they indeed follow the VULA-requirements defined in the *NGA Germany* decision and as set out in recitals (8) - (20) above. NetCologne will publish the key provisions of the contract relating to the characteristics required in this assessment on its website.

VII.   CONCLUSION

(36)   It can be concluded that the VULA products offered by DNS:NET, DT and NetCologne fulfil the criteria for a VULA product which functionally replaces physical unbundling.

(37)   It can, moreover, be concluded that VULA products complying with the criteria set out in the *NGA Germany* decision as specified in the present decision (see recitals (8) - (20)) can be considered as functionally equivalent to physical unbundling.

VIII.   EVALUATION

(38)   The 2013 Broadband Guidelines (point 53) state that certain aid schemes may require an "…evaluation in order to verify (i) whether the assumptions and conditions which led to the compatibility decision have been realised; (ii) the effectiveness of the aid measure in light of its predefined objectives; (iii) its impact on markets and competition and that no undue distortive effects arise under the duration of the aid scheme that is contrary to the interests of the Union. Given its objectives and in order not to put disproportionate burden on Member States and on smaller aid projects, this only applies for national aid schemes and aid schemes with large aid budgets, containing novel characteristics or when significant market, technology or regulatory changes are foreseen. The evaluation shall be carried out by an expert independent from the State aid granting authority on the basis of a common methodology and shall be made public. The evaluation shall be submitted to the Commission in due time to allow for the assessment of

the possible prolongation of the aid measure and in any case upon expiry of the scheme. The precise scope and modalities of the evaluation shall be defined in the approval decision of the aid measure. Any subsequent aid measure with a similar objective shall take into account the results of that evaluation."

(39)   The NGA Germany scheme fulfils the criteria of being a national aid scheme with a large budget containing novel characteristics; therefore it will be subject to an evaluation, as provided by the Commission decision in case SA.3834829. The German authorities, in light of this provision, and taking into account the best practices recalled in the Commission Staff Working Document on Common methodology for State aid evaluation30, have notified a detailed evaluation plan for the measure. A summary of the main elements of the evaluation plan is included below.

(40)   The evaluation plan comprises 15 evaluation questions that address the direct impacts and the effectiveness of the aid scheme, a selection of indirect impacts as well as specific questions on vectoring. Furthermore, the evaluation questions address the proportionality of the aid and the appropriateness of the measure.

(41)   The questions addressing direct impacts of the aid will investigate the scheme's contributions to: broadband expansion in Germany31; a sustainable and future-proof expansion of the network32; an efficient and cost-efficient expansion of the network33; an increase or acceleration in investment in the broadband infrastructure. Also, impacts on competition and possible problems affecting the funded projects will be evaluated, including possible complaints and legal proceedings in conjunction with the granting of the aid. In addition, the incentive effect of the aid on beneficiaries will be evaluated by comparing the IRR (Internal Rate of Return) of selected projects to the WACC (Weighted Average Cost of Capital), both at the time of the application for the aid and after completion of the projects (or after clawbacks, if applicable).

(42)   A selection of indirect impacts of the aid scheme will be evaluated by measuring: general developments of broadband availability in Germany during the scheme's implementation; additional structural impacts that the aid scheme had on funded areas34; availability, quality and prices of NGA retail products in the funded

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29   Cf. in particular recitals 46, 68 and 69 of Commission decision C(2015) 4116 final.

30   Commission Staff Working Document on Common methodology for State aid evaluation, Brussels, 28.5.2014, SWD(2014) 179 final.

31   Result indicators: Number of funding projects; number of successfully completed funding projects; Number of unrealised funding projects; Number of planned connections; Planned connections according to data rate ranges; Planned connections according to the technology in use; Number of realised connections in the funded areas; Realised connections according to the data rate ranges; Realised connections according to the technology in use.

32   Result indicators: Length of newly laid fibre optic links; Number of newly created FTTB/FTTH connections; Number of new exchanges developed with fibre optic in funded areas; Remaining NGA-white areas in the project area and within the regional authority following completion of the project.

33   Result indicators: Average costs per connection; Average aid per connection; Average revenues per connection; Total investment in the funded network areas; Savings generated by way of co-fitting and joint use; Funding model selection.

34   Such as effects on public administrations, educational institutions or businesses.

areas; and by assessing effects of Open Access provisions, for example on availability and prices of wholesale products.

(43)   Two evaluation questions specifically address vectoring and will aim to clarify whether the use of said technology has any impact on competition by assessing how demand, supply and process of wholesale products develop in areas where vectoring is used (as compared to areas where this technology is not used), as well as by collecting through surveys experiences of market participants.

(44)   Proportionality and appropriateness of the aid will be evaluated, notably, by measuring amounts of investments triggered by the aid and by comparing the present aid scheme with other aid schemes implemented in Germany.

(45)   The German authorities have committed that the evaluation will be largely conducted with appropriate quantitative and statistical methods, which will be supplemented where appropriate by a qualitative assessment and, in individual cases, by surveys of market participants. To the extent possible, and notably for the evaluation questions addressing direct impacts of the aid scheme, 'control groups' of non-funded areas will be defined by the independent body conducting the evaluation, with the principal aim to evaluate whether the network expansion initiated by the aid differs materially from private network expansion.

(46)   The German authorities have confirmed that a combination of existing data sources and additional data collection will be used for conducting the evaluation. In particular, data will be collected using the tender database operated by the German Federal Broadband Office35, which is a platform handling applications for the German Federal Government's broadband funding programme and constitutes a comprehensive data pool with detailed information about the funded projects as well as data on projects that have been funded on the basis of other aid schemes or have not received any funding to date. The German Federal Government's "Breitbandatlas", which is used to systematically monitor the developments in broadband availability and is being constantly updated, will also be an important data source for the evaluation.

(47)   The German authorities have committed to select an independent body conducting the evaluation through a competitive tendering procedure. Technical competence and experience in the field of evaluation will be key selection criteria in evaluating the submitted bids.

(48)   The German authorities have committed to submit the final evaluation report to the Commission at the latest in June 2021.

(49)   The German authorities have confirmed that annual progress reports and the final evaluation report will be published on the website of the Federal Ministry for Transport and Digital Infrastructure.

(50)   The German authorities have committed to take into account the evaluation results for the development of possible future broadband aid schemes.

IX. COMPATIBILITY ASSESSMENT OF THE EVALUATION PLAN

(51)   As stipulated by point 53 of the 2013 Broadband Guidelines, a scheme with these characteristics, i.e. a national aid scheme with a large budget and containing novel

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³⁵   www.breitbandausschreibungen.de

characteristics, may be subject to ex post evaluation. Therefore, by the end of this measure, an ex post evaluation will be carried out that includes verifying if the set objectives were achieved, if initial assumptions were realised, and assessing the overall effectiveness of the State aid measure in light of its general and specific objectives and the measure's impact on competition.

(52)   The scope and modalities of the evaluation have been defined, taking into account the Commission Staff Working Document on Common methodology for State aid evaluation, in an evaluation plan that the German authorities have notified together and whose main elements are described in recitals (38) to (50).

(53)   The Commission considers that the notified evaluation plan contains the necessary elements: the objectives of the aid scheme to be evaluated, the evaluation questions, the result indicators, the envisaged methodology to conduct the evaluation, the data collection requirements, the proposed timing of the evaluation including the date of submission of the final evaluation report, the description of the independent body conducting the evaluation or the criteria that will be used for its selection and the modalities for ensuring the publicity of the evaluation.

(54)   The Commission notes that the scope of the evaluation is defined in an appropriate way. It comprises a list of evaluation questions with matched result indicators. Data sources are individually defined for each question. Moreover, the evaluation plan sets out and explains the main methods that will be used in order to identify the impacts of the scheme, and discusses why these methods are likely to be appropriate for the scheme in question.

(55)   The Commission acknowledges the commitments made by the German authorities that the evaluation will be conducted according to the notified evaluation plan by an independent evaluation body. The procedures envisaged for selecting such evaluation body are appropriate in terms of independence and skills. Moreover, the proposed modalities for the publication of the evaluation results are adequate to ensure transparency.

(56)   The Commission notes the commitment made by Germany to submit the final evaluation report in June 2021 at the latest.

X. DECISION

(57)   The Commission has decided that the VULA products of DNS:NET, NetCologne and DT fulfil the requirements set out in the *NGA Germany* decision. The Commission has accordingly decided that the application of vectoring by these companies under the aid measure "*Scheme of the Federal Government in support of the expansion of comprehensive next generation broadband access (NGA)"* is compatible with the TFEU, in accordance with Article 107 (3)(c) TFEU as long as the VULA product with the characteristics specified above is offered to all competitors who cannot use physical unbundling due to vectoring.

(58)   The Commission also remind the German authorities that the evaluation report must be submitted by the end of June 2021 at the latest.

If this letter contains confidential information which should not be disclosed to third parties, please inform the Commission within fifteen working days of the date of receipt. If the Commission does not receive a reasoned request by that deadline, you will be deemed to agree to the disclosure to third parties and to the publication of the full text of the letter in the authentic language on the Internet site: http://ec.europa.eu/competition/elojade/isef/index.cfm.

Your request should be sent electronically to the following address:

European Commission,
Directorate-General Competition
State Aid Greffe
B-1049 Brussels
Stateaidgreffe@ec.europa.eu

Yours faithfully
For the Commission

Margrethe VESTAGER
Member of the Commission

CERTIFIED COPY
For the Secretary-General,

Jordi AYET PUIGARNAU
Director of the Registry
EUROPEAN COMMISSION