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ANNEXES 1 to 4

ANNEXES

to the

COMMUNICATION FROM THE COMMISSION

Guidelines on State aid for broadband networks

ANNEX I

MAPPING OF FIXED AND MOBILE ACCESS NETWORKS – BEST PRACTICES REFERRED TO IN SECTION 5.2.2.4.1 OF THESE GUIDELINES

1. SCOPE

This Annex outlines best practices on how to carry out the mapping exercise to support State aid interventions for the deployment of fixed access and mobile access networks.

This Annex aims to help Member States design a transparent methodology to gather and assess information on the availability and performance of networks.

This Annex builds on and complements, for the purposes of State aid, the methodology developed in accordance with Article 22 of Directive (EU) 2018/1972 of the European Parliament and of the Council¹ and the implementing guidelines of the Body of European Regulators for Electronic Communications (BEREC) on geographical surveys of network deployments².

This Annex sets out, for fixed access networks and for mobile and fixed wireless access networks, best practices on:

- (a) the criteria for mapping the performance of the networks;
- (b) the information that the competent public authorities may collect to verify the accuracy of the information provided;
- (c) the additional information about infrastructure that the competent public authorities may request operators to provide in specific situations, when it is duly justified in order to carry out an in-depth assessment³.

2. MAPPING OF FIXED ACCESS NETWORKS

2.1. CRITERIA FOR MAPPING THE PERFORMANCE OF FIXED ACCESS NETWORKS

Pursuant to paragraph 73(a) of these Guidelines, Member States must assess the performance of networks expressed at least in terms of download and upload speeds that are or will be available to end users under peak-time conditions.

Peak-time conditions as defined in paragraph 19(k) of these Guidelines should be understood as the conditions that exist whenever a minimum of 10 % of the users⁴ are transmitting concurrently at the nominal peak rate⁵ provided by the operator to each of

¹ Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (OJ L 321, 17.12.2018, p. 36).

² BoR (20) 42 and related BoR (21)82.

³ This may be subject to confidential treatment in accordance with national law, as relevant.

⁴ This includes both connected and potential users.

⁵ This is the peak rate included in the end users' contracts.

them, both downstream and upstream, which correspond to the usual oversubscription ratio definition⁶.

2.2. INFORMATION FOR VERIFICATION PURPOSES

To limit risks of opportunistic behaviours by stakeholders and ensure that the information provided is sufficient, consistent, and can be relied on, with a view to avoiding delay to the delivery of services in the target area, the competent public authorities carrying out the mapping exercise may decide to require stakeholders to submit further information regarding their networks for verification purposes.

The competent public authorities may ask stakeholders to provide the full description of the methodology used to calculate their achievable performance, including, but not limited to:

- (a) the access network technology used (FTTH, FTTB, ADSL, VDSL, VDSL + vectoring, DOCSIS.x, etc.), with full specification of the corresponding standard;
- (b) the topology of the network (for instance P2P or a P2MP), including a simplified graph that reflects the physical layout of the cables/fibres (for instance, a tree topology in a GPON);
- (c) the bottleneck links in the topology of the network, defined as the network segments with larger statistical multiplexing gain, including clear information concerning either (i) the oversubscription ratio used for dimensioning such a link (for instance in the backhaul network) or (ii) the capacity planning exercise performed for such bottleneck links. In any case, the public authority may request a statistical characterization of the achievable speed for an end user (for instance the average or typical speed or probability of achieving the nominal speed to be provided to the end user at any point in time, with indication of the user model assumptions).

2.3. INFORMATION FOR IN-DEPTH VERIFICATION PURPOSES

The competent public authorities may decide to require stakeholders to submit further information on network components and their locations for in-depth verification purposes, for instance to review the methodology used to calculate the performance submitted.

The competent public authorities may thus ask stakeholders to submit further information on the access part of the fixed network, including but not limited to:

- (a) the location of the cabinets and the wiring distance from the cabinet to the household;
- (b) clear information on link-budget calculations (for instance on how the received signal power level is mapped to bit-rates, link-budget margins used etc.). The competent public authorities may ask operators to provide all applicable link-budgets used to design and dimension the network services, with their key parameters, including the description of the methodology followed by the operator to develop the link-budget and the rationale.

⁶ The same network infrastructure can provide different performance levels to the end users depending on how many users are being multiplexed in bottleneck links and what their nominal speeds are. Performance depends on the number of users concurrently active (which is higher during peak-time conditions). Such ‘statistical multiplexing gain’ (minimum 10 % meaning 1:10 activity level) requires also that accurate- enough user traffic distribution models are employed by operators.

3. MAPPING OF MOBILE AND FIXED WIRELESS ACCESS NETWORKS

3.1. CRITERIA FOR MAPPING THE PERFORMANCE OF MOBILE AND FIXED WIRELESS ACCESS NETWORKS

For the purpose of this mapping method, the Member State should request stakeholders to calculate their network performance taking into account the following principles:

- (a) use the best industry practices⁷ considering all the major effects on the wireless signal propagation⁸;
- (b) base the calculation on a 95 % cell edge probability⁹ of reaching the declared performance and in any case no less than 95 % probability of reaching the declared performance in each of the grid points considering possible variations of propagation conditions due to random effects and possible variations among the points within the area considered (at address level or on the basis of maximum 100 meter×100 meter grids);
- (c) assume peak-time conditions as follows:
 - (i) for mobile networks, a nominal cell load¹⁰ not lower than 50 %, or higher in the case of peak-time traffic conditions being significantly higher;
 - (ii) for fixed wireless access networks, the expected realistic peak-time traffic conditions should be used to derive the appropriate cell load for calculations¹¹;
- (d) provide the performance per end user and based on outdoor antennas. If a receiving antenna is shared among multiple end users, the overall performance should be considered equally shared among end users¹²;
- (e) provide the performance per technology and per operating frequency in case of coverage with multiple technologies¹³ and multiple frequencies¹⁴, considering the bandwidth actually available per frequency. In case of use of unlicensed frequencies, this should be clearly stated.

⁷ Best industry practices mean modelling parameters, tools, planning, and error boundaries that are common in planning of wireless communications systems and business, and which can be deemed to be faithful and correct enough by experts in the field if they were to verify the methodology.

⁸ Such as terrain, building, and clutter when predicting the received signal power.

⁹ The ‘cell edge probability’ means the likelihood that the minimum performance will be met at the ultimate edge of the coverage area (maximum claimed coverage distance in the area considered). The calculation needs to be based on realistic propagation simulations, link-budget calculations, and sufficient margins.

¹⁰ The ‘cell load’ (cell loading) means the average percentage of the resources of a base station that are used by end-users with respect to a certain service.

¹¹ If peak-traffic estimation is not used, the nominal 90 % cell load for fixed wireless access should be used. The higher cell load for fixed wireless access (compared to mobile networks) reflects the expected different usage pattern resulting in higher competition for the use of the shared resources of the serving base station.

¹² In fixed wireless access, this may be the case for shared rooftop antennas for a multi-dwelling building.

¹³ Technologies include: 3G UMTS and HSPA technologies; 4G LTE or LTE-Advanced technologies; 5G either the 3GPP Release 15 New Radio (NR) non-standalone (with 4G core network) or NR standalone (with a native 5G core network) and further developments (such as 3GPP Release 16). It is recommended that the public authority collects information on the used 3GPP based technologies (at least the 3GPP release levels).

¹⁴ This is to separate sub-6 GHz and mm-wave frequency bands as they are often used for different categories of services.

When providing information to the requesting body, operators should consider in particular:

- (a) the type¹⁵ of backhaul and its capacity for each base station¹⁶;
- (b) for fixed wireless access networks, the number of served and of passed premises present in each calculated grid.

3.2. INFORMATION FOR VERIFICATION PURPOSES

To limit risks of opportunistic behaviours by stakeholders and ensure that the information provided is sufficient, consistent, and can be relied on, with a view to avoiding delay to the delivery of services in the target area, the competent public authorities carrying out the mapping exercise may decide to require stakeholders to submit further information for verification purposes.

The competent public authorities may thus ask stakeholders to provide the full description of the methodology used to calculate their coverage maps, including, but not limited to:

- (a) propagation models and key parameters for propagation simulation;
- (b) general information on network components and in particular on antennas (for instance transmission power, MIMO, antenna site locations);
- (c) key information on link-budget calculation (for instance, how the received signal power level is mapped to bit-rates, link-budget margins used etc.). Stakeholders should provide all applicable link-budgets used to design and dimension the network services, with their key parameters, including also the description of how the stakeholder developed the link-budget and the rationale;
- (d) the location of cell sites;
- (e) characteristics of the backhaul.

3.3. INFORMATION FOR IN-DEPTH VERIFICATION PURPOSES

The competent public authorities may decide to require stakeholders to submit further information on network components and their locations for in-depth verification purposes, for instance to review the methodology used to calculate the performance submitted. The competent public authorities may thus ask stakeholders to submit further information on their networks, including but not limited to:

- (a) number of transmitters at each site;
- (b) the ground elevation of such transmitters;
- (c) number of sectors at each cell site;
- (d) used technology at transmitters including MIMO-order, available channel bandwidth;
- (e) the effective isotropic transmission power employed by each transmitter.

¹⁵ Fibre optic, carrier grade copper Ethernet, wireless, etc.

¹⁶ In the case of optical fibre connection, this can be normally assumed to be sufficient.

ANNEX II

INFORMATION TO BE PUBLISHED BY MEMBER STATES PURSUANT TO PARAGRAPH 202(B) OF THESE GUIDELINES

The information on individual awards referred to in paragraph 202(b) of these Guidelines must include the following¹:

- (a) identity of the individual aid beneficiary:
 - (i) name;
 - (ii) aid beneficiary's identifier;
- (b) type of aid beneficiary at the time of application:
 - (i) SME;
 - (ii) large enterprise;
- (c) region in which the aid beneficiary is located, at NUTS level II or below;
- (d) the main sector or activity of the aid beneficiary for the given aid, identified by the NACE group (three-digit numerical code)²;
- (e) aid element expressed in full in the national currency. For schemes in the form of tax advantage, the information on individual aid amounts³ can be provided in the following ranges (in EUR million):
 - [0,1-0,5];
 - [0,5-1];
 - [1-2];
 - [2-5];
 - [5-10];
 - [10-30];
 - [30-60];
 - [60-100];
 - [100-250]
 - [250 and over];

¹ With the exception of business secrets and other confidential information in duly justified cases and subject to the Commission's agreement [Commission communication on professional secrecy in State aid decisions, C(2003) 4582 (OJ C 297, 9.12.2003, p. 6)].

² Regulation (EC) No 1893/2006 of the European Parliament and of the Council of 20 December 2006 establishing the statistical classification of economic activities NACE Revision 2 and amending Council Regulation (EEC) No 3037/90 as well as certain EC Regulations on specific statistical domains (OJ L 393, 30.12.2006, p. 1).

³ The amount to be published is the maximum allowed tax benefit and not the amount deducted each year (for instance in the context of a tax credit, the maximum allowed tax credit shall be published rather than the actual amount which might depend on the taxable revenues and vary each year).

- (f) where different from the aid element, the nominal aid amount, expressed in full in the national currency⁴;
- (g) aid instrument⁵:
 - (i) grant/interest rate subsidy/debt write-off;
 - (ii) loan/repayable advances/reimbursable grant;
 - (iii) guarantee;
 - (iv) tax advantage or tax exemption;
 - (v) risk finance;
 - (vi) other (please specify);
 - (vii) date of award and date of publication;
 - (viii) objective of the aid;
- (h) identity of the granting authority or authorities;
- (i) where applicable, name of the entrusted entity, and the names of the selected financial intermediaries;
- (j) reference of the aid measure, as stated in the decision approved under these Guidelines.

⁴ Gross grant equivalent, or where applicable, the amount of the investment. For operating aid, the annual aid amount per aid beneficiary can be provided. For fiscal schemes, this amount can be provided by the ranges set out point e of this Annex. The amount to be published is the maximum allowed tax benefit and not the amount deducted each year (for instance in the context of a tax credit, the maximum allowed tax credit shall be published rather than the actual amount, which might depend on the taxable revenue and vary each year).

⁵ If the aid is granted through multiple aid instruments, the aid amount shall be specified by instrument.

ANNEX III

INFORMATION TO BE PROVIDED BY MEMBER STATES PURSUANT TO PARAGRAPH 208 OF THESE GUIDELINES

The report referred to in paragraph 208 of these Guidelines must include, for the relevant reporting period, and for each individual project implemented in application of an aid measure approved under these Guidelines, the following information:

- (a) name of the aid beneficiary or beneficiaries;
- (b) the total cost (or estimated total cost) of the project and average cost per premises passed;
- (c) aid amount awarded and aid expenditure;
- (d) aid intensity;
- (e) sources of public financing;
- (f) the coverage rates and numbers prior to and after the State intervention;
- (g) for projects supporting the deployment of broadband networks:
 - (i) date when the network was put in use;
 - (ii) technology deployed on the publicly funded network;
 - (iii) upload and download speeds of services provided;
 - (iv) wholesale access products offered, including conditions for access and prices/pricing methodology;
 - (v) wholesale access products requested on reasonable demand, if applicable, and treatment of such requests;
 - (vi) number of access seekers and service providers using wholesale access products;
 - (vii) retail prices before and after implementation of the measure;
 - (viii) number of premises passed by the publicly funded infrastructure;
 - (ix) take-up rates;
- (h) for project supporting take-up of broadband services, such as voucher schemes:
 - (i) duration of the aid measure;
 - (ii) voucher value(s);
 - (iii) type of eligible subscriptions/services, including in the form of customer devices, as well as in-building wiring and/or drop down cable within a private domain;
 - (iv) take-up rates before and after implementation of the measure and the number of end-users having benefited from the aid measure (by category, for instance individual end-users or SMEs and by type of subscriptions/service supported);
 - (v) number of eligible broadband service providers;
 - (vi) number of broadband service providers that have actually benefited from the aid measure;

- (vii) evolution of the market position of operators by type of subscriptions/services supported, taking into account the relevant infrastructure and technologies (FTTH, FTTC, DOCSIS, FWA, etc.);
- (viii) wholesale and retail prices before and after implementation of the measure.

ANNEX IV

TYPICAL INTERVENTIONS FOR BROADBAND SUPPORT

In its case practice, the Commission has observed certain funding mechanisms used by several Member States to foster broadband deployment, which typically amount to State aid within the meaning of Article 107(1) of the Treaty. The following description of typical interventions models is illustrative and not exhaustive, as public authorities might develop different ways of supporting broadband deployment or deviate from the models described in the following paragraphs.

1. Gap funding model: In the gap funding¹ model, Member States² support the deployment of fixed or mobile networks by awarding direct monetary grants or subsidies to broadband investors³ to design, build, manage and commercially exploit a network, taking into account the relevant receipts and a reasonable profit. In the gap funding model, reasonable profit is determined as the rate of return on capital that would be required by an investor, taking into account the level of risk specific to the broadband sector and the type of services provided. The required rate of return on capital is typically determined by the weighted average cost of capital (WACC). In determining what constitutes a reasonable profit, Member States usually introduce incentive criteria relating, in particular, to the quality of service provided and gains in productive efficiency. Any rewards linked to productive efficiency gains are set at a level such as to allow balanced sharing of those gains between the broadband investor and the Member State or the end users. Under the gap funding model, the infrastructure built is usually fully owned by the aid recipient that bears the risks associated with building new infrastructure and attracting sufficient customers.
2. Support in kind model: Member States support fixed or mobile broadband deployment by putting at the disposal of broadband network operators existing or newly built infrastructures. This support takes many forms, with the most recurring being Member States providing broadband passive infrastructure by carrying out civil engineering works (for instance by digging up a road), by placing ducts or dark fibre or giving access to existing infrastructure (for instance ducts, poles or towers).
3. Direct investment model: Member States build a fixed or mobile network and operate it directly through a branch of the public administration or via an in-house operator⁴. The State-funded network is often operated as a wholesale-only network available to retail broadband services providers on a non-discriminatory basis.
4. Concessionaire model: Member States finance the roll-out of a fixed or mobile broadband network, that remains in public ownership, whereas its operation is offered through a competitive selection procedure to an electronic communication provider to manage and commercially exploit it. The network may be run by a broadband network operator to provide only wholesale services or, alternatively, to provide both wholesale and retails services.

¹ 'Gap funding' generally refers to the difference between investment costs and expected profits.

² This includes any public authority.

³ The term 'investors' denotes undertakings or broadband network operators that invest in the construction and deployment of broadband infrastructures.

⁴ Commission Decision C(2011) 7285 final of 19 October 2011, case N 330/2010 — France — Programme national «Très Haut Débit» - Volet B (OJ C 364, 14.12.2011, p. 2), which covered various intervention modalities, inter alia one in which the collectivités territoriales can operate own broadband networks as a 'régie' operation.