



OFFICE FOR COMMUNICATIONS  
PRINCIPALITY OF LIECHTENSTEIN

# Analysis of the Wholesale Market for Physical Access to Subscriber Lines provided locally at Fixed Locations

(in short: "local loop market")

Analysis of the wholesale market M3a in accordance with the EFTA Surveillance  
Authority Recommendation of 11 May 2016 on Relevant Product and Service  
Markets in the Electronic Communications Sector

**Notification to EFTA Surveillance Authority**

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## 1. Management Summary

According to art. 21 of the Communications Act ("KomG"), market analyses must be reviewed periodically. The present market analysis, which is carried out in accordance with the planning of the new market analysis round 2019+<sup>1</sup>, takes into account current market developments - in particular the replacement of the old twisted pair copper wire and HFC coaxial connection networks with a fibre-optic connection network - as well as the changes in European regulatory requirements which have occurred since then.

In the last round of market analyses in 2009, the Office for Communications determined that Liechtensteinische Kraftwerke ("LKW") had a dominant market position with regard to access to the physical infrastructure in the access and core network area, so that in 2009 and 2014 corresponding ex ante obligations were imposed, including the obligations to charge cost-oriented fees and to publish a reference offer. The LKW is currently still subject to this regulation, however, in particular the completion of the fibre optics<sup>2</sup> access network, and the dismantling of the old twisted pair copper and HFC coax access networks as well as the significant reduction of central offices in the years 2017-2023 make it necessary to approve access and charges for the newly built fibre-based local loops and for the ancillary services and to ensure transparency and equal treatment for the market participants with the obligation to publish the reference offer.

The Office for Communications ("AK") renews<sup>3</sup> with the present market analysis the regulation of the wholesale market for physical access to subscriber lines provided locally at fixed locations (hereinafter referred to as "local loop market"). This is essentially the access to unlit fibre in the access network (local loop fibre). The supplementary access to cable ducts and the other services of the LKW which are required for the use of locally provided access to subscriber lines, so-called ancillary services, are also regulated in the present market analysis procedure.

The EFTA Surveillance Authority's ("ESA") current Market Recommendation of 5 November 2016<sup>4</sup> ("Market Recommendation 2016") includes the wholesale market for locally provided access to local loops at fixed locations as Market 3a, so that the market consistently defined in the present analysis is eligible for ex ante regulation.

<sup>1</sup> Available at <https://www.llv.li/files/ak/marktanalyse-2019-plus-v20.pdf>

<sup>2</sup> Point-to-point FTTB architecture with dedicated fibre connections for each usage unit, between the central office and the house connection, analogous to the previous architecture of the copper-wire access network.

<sup>3</sup> Succession of the regulatory round based on the market analysis of physical network access (M4) in 2009 and the market analysis of physical access to infrastructures in the core network in 2014, both available at: <https://www.llv.li/de/landesverwaltung/amt-fuer-kommunikation/elektronische-kommunikation/marktanalysen-und-sonderregulierung/aktueller-stand>. The measures of the market analyses were implemented in the market from 2014 onwards, in 2014 with the approval of the cost accounting model and in 2015 with the approvals of the cost-oriented charges, the reference offer for copper local loops and the reference offer for collocation, all available at: <https://www.llv.li/de/landesverwaltung/amt-fuer-kommunikation/entscheidungen>.

<sup>4</sup> Official Journal of the European 30.3.2017, page L84/7, available at <https://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=OJ:L:2017:084:FULL&from=FR>

The defined market of the present analysis contains the locally provided, wholesale physical access to local loops, which are defined in a technologically neutral manner. The market covers the entire territory of Liechtenstein.

The analysis of the market shows that there is a lack of, or absence of, effective competition due to insurmountable barriers to entry for network infrastructures. This lack remains in the foresight. The situation is unchanged compared to the last round of market analysis, i.e. i) the basic electronic communications infrastructures such as fibre networks, cable ducts and central offices with national coverage are only provided and operated by the LKW and ii) the LKW offers physical access to subscriber lines (local loop fibre), core network fibre, cable ducts and all ancillary services to other service providers as a wholesale only operator, i.e. without themselves providing further wholesale or retail electronic communications services.

**Thus, the obligations imposed on the LKW in 2009 regarding the local loop market, with regard to access, separate accounting and cost orientation of the charges, as well as non-discrimination and transparency with the obligation to publish the approved reference offer, are to be continued, whereby the use of cable ducts and the ancillary services required for the use of subscriber connections, such as core network fibres, rack space and private rooms in central offices, will continue to be included in the regulation.**

The updated cost accounting model created in the last regulatory round is used in combination with benchmarking for the cost-oriented charge setting, which results in an efficient, size-compatible approach that is in line with the relevant recommendation of the European Commission on consistent non-discrimination obligations and costing methodologies<sup>5</sup>.

For the main services<sup>6</sup>, the present regulation limits the charges to the following amounts:

**(Charges as presented in the public consultation from July 18 to August 28)**

• Local loop fibre, SLA 1:	21.95 CHF/month
• Core network fibre, SLA 1:	0.48 CHF/m/year
• Core network fibre pair, SLA 1:	0.96 CHF/m/year
• Central office – private room:	25.00 CHF/m <sup>2</sup> /month
• Central office - 1/1 rack:	500.00 CHF/month
• Central office - 1/2 rack:	250.00 CHF/month
• Central office - 1/3 rack:	167.00 CHF/month
• Central office – single height unit:	11.00 CHF/month
• Cable duct core network area:	0.128 CHF/m/month
• Cable duct local loop network:	0.107 CHF/m/month

As soon as the decision of the subsequent special regulation procedure becomes final, the LKW is obliged to offer the regulated network and infrastructure services to all wholesale

<sup>5</sup> 2013/466/EU: Commission Recommendation of 11 September 2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment; OJ L 251, 31 September 2013, p. 13 et seq.

<sup>6</sup> The reference offer enclosed with the consultation shows all charges in the annex "Entgelte".

customers on a non-discriminatory basis and in compliance with these maximum charge limits. The new charges will be introduced without a glide path in order to spare the market an elaborate sequence of price adjustment steps. In addition, the LKW must publish the approved reference offer for access to the passive network infrastructure<sup>7</sup> of the LKW's communications network on the website.

The market consultation was started on July 18, by public and direct mailing information to the notified providers and operators, and ended on August 28. Nine providers gave comments in due time. The comments received, and the evaluation document are published on the AK website<sup>8</sup>. The comments are taken into account in the further processing of the analysis of the local loop market, insofar as they are of significance in the opinion of the AK. The AK will take the further steps according to the Figure 1 carry out.

	2023						2024		
	Q3			Q4			Q1		
	J	A	S	O	N	D	J	F	M
Market consultation	■	■	■						
Notification to EFTA Surveillance Authority			■				■		
Ordinance on regulatory measures / approval of cost accounting model, charges, reference offer					■	■			
Implementation of regulation in the market							■	■	■

Figure 1: Rough planning of the market analysis [Source: AK].

#### On the structure of the document:

This document introduces in chapter 2 the principles and legal aspects of the market analysis process, followed by chapter 3 on the generic market structure, on the regulatory and legal starting position as well as on the prerequisites, conditions and completion of the fibre optic local loops.

In chapter 4 examines the most significant developments of the market situation in the Liechtenstein fixed network sector with regard to network infrastructures.

In chapter 5 the relevant market is defined. The state of competition and the market power relations are reviewed in chapter 6, which also deals with market failures and (potential) competition problems in the local access market.

The overall assessment of whether competition prevails in the market under investigation or whether self-sustaining competition would exist without regulation, or which competition problems and factors, if any, stand in the way of this, is discussed in chapter 6.3.

Chapter 7 finally discusses the regulatory measures available to address the competition problems identified and identifies the specific measures of special regulation.

<sup>7</sup> The network infrastructure of LKW is understood to be the access network and the core network, both implemented in fibre, the cable ducts and central offices with the facilities for access to fibres of the access and core network area. As the fibres are not connected, the AK speaks of "passive" network infrastructure.

<sup>8</sup> Available at <https://www.llv.li/de/landesverwaltung/amt-fuer-kommunikation/konsultationen/abgeschlossene-konsultationen/marktanalyse-teilnehmeranschluss>

The basic information on the cost-oriented determination of the charges by means of a cost accounting model as well as the calculation of the cost of capital are set out in the accompanying documents «Beschreibung der Kostenrechnung» («Description of Cost Accounting») und «WACC Berechnung» («WACC Calculation»).

## 2. Principles and Legal Aspects of Market Analysis

The bases for special regulation are found in particular in art. 20 et seq. KomG. They define how the regulatory authority delineates markets, how these are regularly analysed ex officio, and how the regulatory authority takes measures of special regulation to eliminate or reduce the negative consequences of the lack of competition.

According to art. 20 KomG, the regulatory authority, i.e. the AK, must regularly check ex officio whether there is effective competition on the electronic communications markets in Liechtenstein. If there is no effective competition, i.e. if one or more providers have significant market power, the regulatory authority must take the necessary measures of special regulation (art. 23 KomG) to eliminate or reduce the identified competition problems. This procedure is called market analysis. The overall process of market analysis and special regulation is divided into the following stages according to Figure 2:

Overall process of market analysis and special regulation	1	Collect and evaluate the necessary market and business data.	
	Market analysis in the broader sense	2	Delineation of the relevant markets in the national context in product and geographic terms.
		3	Identification of companies with significant market power.
		4	Identify current and potential competition issues.
		5	Identification and design of special regulation measures to be imposed.
		6	Consultation of interested national parties, namely the affected companies, on the planned measures.
	7	Notification of the market analysis and the planned measures for review by the EFTA Surveillance Authority and the regulatory authorities in the EEA.	
	8	Imposing the necessary measures by means of an order.	
	9	Control of the implementation of and compliance with the imposed measures.	

Figure 2: Overview of the overall process of market analysis and special regulation [Source: AK].

The AK uses the annual data collection to monitor market conditions. Results are published annually in the form of a commentary on the latest market development as well as with the

telecommunications market statistics and the market share statistics on the AK's website<sup>9</sup> (level 1 in Figure 2).

In the market analysis, the regulatory authority defines the relevant product and geographic communications markets in accordance with art. 21 of the Communications Act in the so-called market delineation (Level 2 in Figure 2). The regulatory authority then examines the competitive conditions in the defined markets. The existence of significant market power - which corresponds to a dominant position in general EEA competition law - is to be determined based on the criteria set out in art. 31 of the Ordinance on Electronic Communications Networks and Services (hereinafter referred to as "VKND") (Level 3 in Figure 2).

If the regulatory authority identifies one or more providers with market power in a defined market, it shall identify existing and potential competition problems (level 4). The regulatory authority subsequently determines and orders - after national and international consultation - the necessary and proportionate measures of special regulation in accordance with art. 33 et seq. VKND, which are suitable for eliminating or reducing the (potential) competition problems identified in the market concerned (levels 5 - 8).

In the market analysis, the AK relies on the Liechtenstein legal basis of the KomG, with which the relevant EEA Directives were implemented nationally.

The second sentence of art. 20 para. 1 KomG in conjunction with art. 6 para. 2 of the Ordinance on the Tasks and Powers of the Regulatory Authority in the Electronic Communications Sector ("RKV") stipulate that the regulatory authority in the special regulation shall observe the decisions of the ESA pursuant to art. 7 para. 4 of the Framework Directive and take the utmost account of its relevant recommendations and guidelines. These are in particular the Markets Recommendation 2016, the ESA Recommendation of 2 December 2009 on Notifications, Deadlines and Consultations under art. 7 of the Framework Directive ("Notification Recommendation") and the ESA Guidelines on Market Analysis and the Assessment of Significant Market Power of 16 November 2022<sup>10</sup> ("SMP Guidelines").

Furthermore, the AK also takes into account recommendations of the European Commission, which were issued in connection with the Framework Directive and were included in the EEA Agreement. In the present market analysis, the AK takes particular account of i) the Commission Recommendation of 11 September 2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment (2013/466/EU) concerning the recommended costing methodology for access to network infrastructures and civil engineering infrastructures, and ii) the Commission Recommendation of 20 September 2010 on regulated access to next generation

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<sup>9</sup> Available at <https://www.llv.li/de/landesverwaltung/amt-fuer-kommunikation/elektronische-kommunikation/marktstatistik>

<sup>10</sup> EFTA Surveillance Authority Guidelines of 16 November 2022 on market analysis and the assessment of significant market power under the regulatory framework for electronic communications networks and services referred to in Annex XI of the Agreement on the European Economic Area, available at <https://www.eftasurv.int/cms/sites/default/files/documents/gopro/ESA%20New%20Guidelines%20on%20market%20analysis%20and%20SMP%20assessment.pdf>



access networks (NGA)". September 2010 on regulated access to Next Generation Access (NGA) networks, (2010/572/EU)<sup>11</sup>, which specifies access obligations.

The "Commission Notice on the calculation of the cost of capital for legacy infrastructure in the context of the Commission's review of national notifications in the EU electronic communications sector"<sup>12</sup>, will be applied by ESA in the same way to the notifications of the EEA-EFTA States<sup>13</sup>, so that the AK will set the weighted average cost of capital rate used in the calculation of cost-oriented charges in accordance with this Communication.

The relevant regulatory approaches and concrete procedures in connection with the market analysis are set out in Appendix 2; the relevant directives, recommendations, guidelines and other documents from the ESA, the European Commission and BEREC<sup>14</sup> are given in Appendix 4 are compiled.

## 2.1 Market Consultation

If the AK intends to take measures of special regulation which are likely to have a considerable impact on the market concerned, it shall announce this to interested parties in accordance with art. 24 para. 1 KomG and give them the opportunity to comment within a reasonable period of time. For this purpose, the AK shall in particular carry out public consultations in accordance with art. 46 KomG.

The consultation procedure pursuant to art. 24 para. 1 and art. 46 para. 1 KomG for the purpose of market analysis is a non-contentious administrative procedure of its own kind. It serves to review the competitive situation and to promote transparency through the early and public discussion of the market analysis and measures planned by the regulatory authority<sup>15</sup>.

The consultation participants have a (pure) right to be heard. According to art. 47 para. 1 KomG, "participation in a public consultation [...] does not give rise to any legal rights beyond".

The AK publishes the consultation document, the evaluation of the comments and the comments themselves, insofar as they are not subject to a confidentiality obligation, on its website<sup>16</sup>. The consultation procedure is concluded with the publication of the final version of the market analysis pursuant to art. 11 let. e RKV (on the same website).

<sup>11</sup> available at <https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=celex%3A32010H0572>

<sup>12</sup> available at <https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=CELEX%3A52019XC1106%2801%29>

<sup>13</sup> Communication from ESA to AK of 5 December 2022: "When it comes to the application of the WACC Notice by ESA, we refer to the homogeneity principle enshrined in Article 1(1) EEA Agreement (i.e. the aim 'to promote a continuous and balanced strengthening of trade and economic relations between the Contracting Parties with equal conditions of competition, and the respect of the same rules, with a view to creating a homogeneous European Economic Area')".

<sup>14</sup> Body of European Regulators for Electronic Communications (BEREC), <https://www.berec.europa.eu/en>

<sup>15</sup> A distinction must be made between the market consultation procedure and the subsequent, contentious special regulation procedure according to art. 23 para. 1 KomG, in the context of which the AK imposes individual concrete "obligations with an order (special regulation measures)" on a company with market power.

<sup>16</sup> available under <https://www.llv.li/de/landesverwaltung/amt-fuer-kommunikation/elektronische-kommunikation/marktanalysen-und-sonderregulierung/aktueller-stand/zugang-zum-teilnehmeranschluss>

## 2.2 Notification Procedure of ESA

In order to ensure that special regulatory measures envisaged at national level, which are likely to have an effect on trade between EEA Contracting States, do not have a negative impact on the internal market or the objectives pursued by the European regulatory framework, the AK has notified the draft measures to the ESA and the other national regulatory authorities ("NRAs") of the EEA in the notification procedure pursuant to art. 24 para. 2 KomG (or art. 7 para. 2 of the Framework Directive). This EEA-wide consultation serves to create transparency and consolidate the internal market. Further details are set out in the notification recommendation<sup>17</sup>.

The notification documents should include the special regulatory measures proposed by the NRA to address the identified market failure, as well as the justification for the measures. If the draft measure relates to a market that is found to be competitive and for which special regulation measures are already in place, the notification should also contain the proposals for the removal of these obligations.

The draft measures notified by the AK should be accompanied by the documents required by the ESA to fulfil its tasks. For the draft measures notified with the short notification form, the ESA basically does not need any additional documents to fulfil its tasks.

In the first phase, the ESA has one month to assess the submitted analysis and the planned measures. If the ESA expresses justified doubts about the compatibility of the submitted measures with applicable EEA law, it may extend the deadline for further investigation of the facts by two months. If there are no such doubts, the regulatory authority may order the national measures submitted. If, on the other hand, the ESA comes to the conclusion within the extended period that the market definition or the determination of significant market power violates applicable EEA law, it may prohibit the regulatory authority from putting the planned measure into effect.

With regard to the design of the concrete measures of the special regulation *per se*, i.e. the obligations imposed on the operator, the ESA only has the competence to comment, but not to prohibit. If the ESA comments on a submitted draft measure, the AK must take the comments into account as far as possible.

All documents and information published within the framework of the notification by the AK can be viewed in the electronic register<sup>18</sup> of the ESA. All documents published within the framework of the national consultations can be viewed on the website<sup>19</sup> of the AK.

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<sup>17</sup> in particular recitals 2, 11, 13 and points 1 (b), 4, 5, 6 (a)

<sup>18</sup> available at <https://www.eftasurv.int/internal-market/notifications-and-applications/ecom-notifications>

<sup>19</sup> available at <https://www.llv.li/de/landesverwaltung/amt-fuer-kommunikation/elektronische-kommunikation/marktanalysen-und-sonderregulierung/aktueller-stand/zugang-zum-teilnehmeranschluss>

## 2.3 Time Horizon

Article 21 para. 2 KomG stipulates that the competitive conditions in the defined markets are to be regularly reviewed by the regulatory authority. The time horizon of market analyses is specified in art. 16 para. 6 of the Framework Directive with a three-year period. The successor Directive (EU) 2018/1972 on the European Electronic Communications Code<sup>20</sup>, which will apply in the EU as of 21 December 2020, provides in art. 67(5)(a) for an extended time horizon of five years, which can be extended by one year, and justifies the extended period compared to the Framework Directive with greater stability and improved regulatory predictability.

Due to the specific circumstances of a national network operator in the model of vertical separation and with regard to the greater stability and regulatory predictability, the AK envisages a time horizon of at least 5 years for the market in question, while continuing to keep the market under observation and providing for regulatory interventions, such as a new market analysis, in the event of serious changes in the competitive situation.

## 2.4 Competition Authority

Apart from the competition rules applicable under the EEA Agreement, there is no national competition law in Liechtenstein. Also, there is currently no independent competition authority in Liechtenstein. Competition law remedies in accordance with the applicable EEA law are therefore to be directed to the ordinary national courts or the ESA or the European Commission. Apart from this, the Office of Economic Affairs is responsible for the implementation of the competition rules pursuant to art. 2 para. 1 of the Act of 23 May 1996 on the Implementation of Competition Rules in the European Economic Area, LGBl. 1996 No. 113, insofar as the courts do not have jurisdiction. However, this implementation is essentially directed at supporting the ESA and performing sovereign acts, but not at the substantive application and enforcement of the EEA competition rules.

For these reasons, cooperation with or consultation of a competition authority within the meaning of the second sentence of art. 16(1) of the Framework Directive on the present market analysis is not possible in Liechtenstein.

## 2.5 Data Basis

Notified providers are subject to the obligation to provide information (art. 44 KomG). Within the framework of the statistical data collection, they regularly provide the AK with information on their activities and infrastructures in Liechtenstein, which form the basis for the market analysis activities of the AK.

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<sup>20</sup> Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code, OJ .L321, 17. December 2018, p. 36

The annual statistical data surveys are collected in the first half of each year for the preceding calendar year. The market data are then fully available in the survey year from September. However, follow-up figures from a preliminary data collection are already available from February. For reasons of proportionality, additional data are only collected between these intervals if this appears necessary due to rapidly changing market conditions or for other special reasons.

Thus, in this market analysis, the AK uses market data from the year 2021 as the most current data, and market data from the year 2022 for connections<sup>21</sup>.

In addition, the AK keeps the market in question, like other relevant markets, under continuous observation. This analysis is therefore also based on other current, officially known information and data.

### 3. The Local Loop Market in Liechtenstein

Physical access to the locally provided local loop, as a wholesale service at the level of passive network infrastructure, is related in many ways to other generic markets of the overall electronic communications market. In the following, the functional relationships to other markets are explained and the status of regulation to date, the legal basis for the network construction of the LKW as well as conditions for the creation of and access to the local loop and the FTTB network roll-out are discussed.

#### 3.1 Relationship of the Local Loop Market to other electronic communications Markets

The local loop market investigated in the present market analysis - the product and geographical market definition can be found in chap. 5 - forms the origin of the generic overall market model, on which (almost) all other markets are based. The relevant markets and their relationships to each other result from the generic market representation<sup>22</sup> (Figure 3).

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<sup>21</sup> The published telecommunications market statistics are available here: <https://www.llv.li/de/landesverwaltung/amt-fuer-kommunikation/elektronische-kommunikation/marktstatistik>

<sup>22</sup> See document "Market Analysis 2019+ - Basics and Planning of the Office for Communications for a New Round of Market Analysis" of 2 March 2020, available at <https://www.llv.li/files/ak/marktanalyse-2019-plus-v20.pdf>

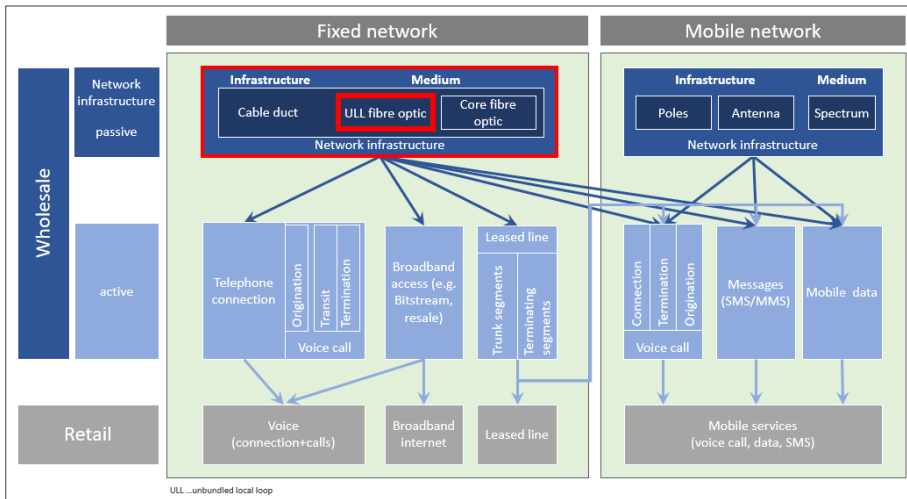


Figure 3: Overview of the overall market - hierarchy and dependencies of the generic markets [Source: AK].

The local loop market - in Figure 3 at the level of the passive network infrastructure under the medium of ULL fibre optic ("ULL" unbundled local loop or subscriber line) - is upstream of the wholesale services and retail level. It is a basic prerequisite for the provision of electronic communications services, in the fixed network area as well as in the mobile network area, where antenna sites are connected with optical fibres.

## 3.2 Regulatory Starting Position

The regulatory starting position for the present market analysis is shown in Figure 4.

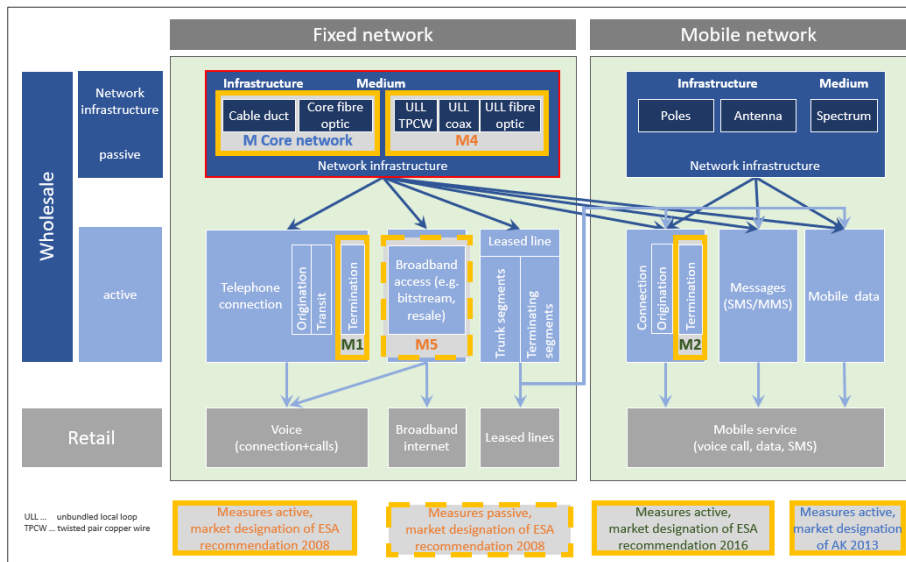


Figure 4: Markets with regulatory measures [Source: AK].

According to the measures of the special regulation in the wholesale markets for physical access to network infrastructures at fixed locations (market M4 of the ESA Market Recommendation 2008<sup>23</sup>) and for physical access to infrastructures in the core network (market as defined by the AK), the LKW is obliged, among other things, to offer access to the subscriber line of the copper-wire pairs and HFC coax access networks, access to core network optical fibres, to cable ducts and to central offices.

The markets of the passive network infrastructure subject to regulatory measures are related to the downstream markets as follows:

**Wholesale market for broadband access** (wholesale market M5 of the ESA Market Recommendation 2008)<sup>24</sup>

- In the systematics of the generic total market model, the wholesale level for broadband access represents the basis for broadband internet connections as well as for (VoIP) telephone connections at the retail level.
- Since regulation with measures of special regulation from 2009, the wholesale market for broadband access (in particular bitstream and resale connections) has lost importance as an input for providers of broadband internet connections in the retail

<sup>23</sup> Available at <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2009:156:0018:0023:EN:PDF>

<sup>24</sup> available at <https://www.llv.li/inhalt/111024/amtstellen/breitbandzugang>

market (cf. Figure 4, measures referred to as "passive"), as most providers are self-providing broadband at wholesale level, based on regulated access to the only nationwide passive network infrastructure of the LKW.

- The small demand for broadband wholesale services is currently met by four providers (cf. Table 1 below). There is effective competition on this wholesale market. For these reasons, the AK plans to repeal the existing regulatory measures following the present market analysis.
- Regulated access to the only nationwide passive network infrastructure of LKW forms the basis for the competitive situation.

#### **Market for access to internet broadband at fixed locations (retail market)**

- There is effective competition in this retail market.
- Regulated access to the only nationwide passive network infrastructure of LKW forms the basis for the competitive situation.

#### **Market for access to the public telephone network at a fixed location (retail market)**

- In the 2022 market analysis<sup>25</sup>, the AK found effective competition in the retail market.
- The AK also found a competitive situation on the wholesale market (VoIP connections).
- However, the AK held that regulated access to the only nationwide passive network infrastructure of LKW forms the basis for effective competition.

### **3.3 Initial Legal Situation regarding Network Infrastructure**

art. 7 KomG stipulates that the state must ensure a reliable and permanent universal service with electronic communications services and networks. The universal service is ensured by a) guaranteeing the universal service and b) providing the necessary infrastructure. While the government has charged Telecom Liechtenstein with ensuring a minimum range of services (the universal service), the provision of the network infrastructure for electronic communications is imposed on LKW on the basis of art. 15 KomG with art. 5 of the Liechtensteinische Kraftwerke Act<sup>26</sup> (LKWG). In conjunction with art. 9 and 10 KomG, the LKW must in particular provide a local loop at every reasonable fixed location, so that the universal service is ensured for every end user in accordance with art. 3 of the Universal Service Directive.

### **3.4 Requirements and Conditions for Access to the Local Loop**

Compliance with the obligation to provide network infrastructure for electronic communications, in particular for universal service, is divided into i) the one-off creation of a network connection where the local loop line ("subscriber line fibre optic") is connected to

<sup>25</sup> available at <https://www.llv.li/de/landesverwaltung/amt-fuer-kommunikation/elektronische-kommunikation/marktanalysen-und-sonderregulierung/aktueller-stand/zugang-zum-telefonnetz>

<sup>26</sup> Available at <https://www.gesetze.li/konso/2009355000>

the wiring of the building in the building entry point BEP (cf. Figure 5), and, if a BEP is available, at the request of a user ii) the provision of the local loop as an infrastructure wholesale service to the service provider.

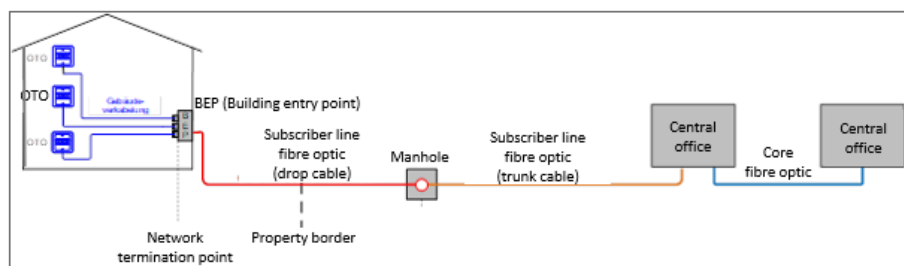


Figure 5: Subscriber connection with the elements and sections OTO (optical termination outlet) in usage unit, building cabling, BEP (building entry point), subscriber line fibre optic (local loop), and central office. Core network fibres connect central offices. [Source: LKW]

The BEP is installed at the request of the building owner to LKW and on the basis of the document<sup>27</sup> "Anschluss an das Kommunikationsnetz der Liechtensteinischen Kraftwerke (LKW), Schaan - Ausführungsbestimmungen - Technische und Betrieblichen Bedingungen (TBB-Glasfaser)" (English: Connection to the communications network of Liechtensteinische Kraftwerke (LKW), Schaan - Implementing provisions - Technical and operational conditions (TBB-Glass Fibre), "TBB") of LKW. The TBB is relevant both for the initial connection - in the course of building construction - and for redundant secondary connections.

Service providers can therefore only offer services to a demanding party when the BEP is available, which, however, is not to be ordered by the service providers but by the owner of the building. The terms and conditions for the provision of local loops to service providers on the basis of regulated access to the unbundled line are regulated in a transparent and non-discriminatory manner by means of the reference offer. The reference offer for copper local loops was approved in the last regulatory round by the AK in 2015<sup>28</sup>; while the conditions for access to the fibre local loop of the new FTTB network have been available since 2018 in the form of a so-called factsheet<sup>29</sup>, which has been examined by the AK. This is regarded as a voluntary offer and as a precursor to the reference offer of LKW to be approved in the present regulation.

### 3.5 The FTTB Network Expansion of the LKW

The construction of the complete, nationwide fibre-optic access network with a point-to-point FTTB/H architecture was carried out by the LKW on an area-by-area basis from 2017 to 2023

<sup>27</sup> Available at <https://www.lkw.li/userdata/Alle-Download-Dokumente/Netze-Kommunikation/Kollokation/20191205-tbb-kommunikationsanschluss-v4.1.pdf>

<sup>28</sup> Decision and reference offer documents are available at <https://www.lkv.li/de/landesverwaltung/amt-fuer-kommunikation/entscheidungen/15.01.2015-standardangebot-tal-kupfer>

<sup>29</sup> Available at <https://www.lkw.li/userdata/PDF/fact-sheet-fttb-v1.1.pdf>



(cf. Figure 6), in combination with a forced disconnection of the legacy infrastructure (twisted pair copper wire local loop and coaxial local loop), which took place in each case with a maximum time lag of 12 months. This means that the present market analysis can be focused on an adjusted situation with a single local loop network based on fibre, and does not have to address transitional situations.

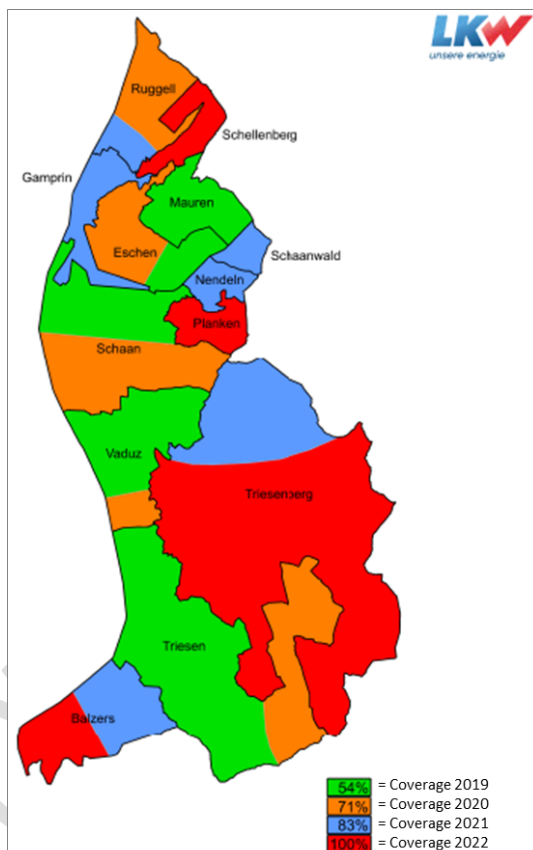


Figure 6: Area-by-area expansion of the fibre optic access network (point-to-point FTTB) [Source: LKW].

## 4. The Market Situation in Liechtenstein

### 4.1 Data Basis

The regulation of the local loop market concerns fixed network operators who are recorded in the register of residents as a prerequisite for their activity (obligation to report according to art. 43 KomG). They are subject to the obligation to provide information (art. 44 KomG) and thus regularly provide the AK with information on their activities at offer level and on their infrastructures in Liechtenstein within the framework of the statistical data collection.

### 4.2 Market Development in the Fixed Network

In the fixed network sector, the retail markets for telephony, broadband connections and leased lines are characterised by a high number of providers - relative to the size of the market (cf. Table 1). For all three markets, simple, barrier-free access to the regulated network infrastructure of the LKW is the basic prerequisite (cf. Figure 3). Figure 4 above) for the prevailing market picture.

In the broadband internet access market, providers largely provide the wholesale level themselves; there is only a small demand for wholesale connections from four providers. In 2021, only 774 broadband internet connections were based on purchased wholesale broadband connections, which corresponds to a rate of 4% in relation to the total number of broadband internet connections.

As far as the telephone access market is concerned, effective competition (cf. market analysis<sup>30</sup> of 2022) is also determined by the offers for VoIP wholesale connections, which are provided by three providers, each with its own VoIP infrastructure.

With regard to market shares<sup>31</sup> of the incumbent Telecom Liechtenstein in the end-customer markets for telephone connections and broadband internet connections, the data collected annually and published by the AK show a continuous decline that has lasted for years, since 2016 in telephony from 99% to 66%, and in broadband internet from 72% to 54%.

In the market for leased lines and data services, a large number of providers have already been active for many years, which procure the required network infrastructure from the LKW according to the demand for leased line connections.

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<sup>30</sup> The market analysis concerning access to the public telephone network at fixed locations led in 2022 to the lifting of the regulatory measures, including the obligation of Telecom Liechtenstein to lay down a reference offer for VoIP wholesale connections, available at <https://www.llv.li/de/landesverwaltung/amt-fuer-kommunikation/elektronische-kommunikation/marktanalysen-und-sonderregulierung/aktueller-stand/zugang-zum-telefonnetz>.

<sup>31</sup> See also market share statistics on the AK website: <https://www.llv.li/de/landesverwaltung/amt-fuer-kommunikation/elektronische-kommunikation/marktstatistik>



Network infrastructure	2015	2016	2017	2018	2019	2020	2021	2022
Quantities as of 31 December								
<b>Network infrastructures with local coverage</b>								
<b>TV-COM</b>								
twisted pair copper wire	0	0	0	0	0	0	0	0
coax	••••	••••	••••	••••	••••	••••	••••	••••
fibre optics	••••	••••	••••	••••	••••	••••	••••	••••

Table 2: Development of the local loop network infrastructure [Source: AK].

### Relevance of the network infrastructure of TV-COM

While the only activity of LKW in the field of electronic communications is to offer access to the network infrastructure, under regulated conditions, TV-COM uses its coaxial cable network exclusively for its own purposes, i.e. to provide telecommunications services in the municipalities of Eschen-Nendeln and Mauren-Schaanwald. In the other municipalities in the country, TV-COM provides services - like all other service providers - on the basis of the network infrastructure of LKW. TV-COM's market share in the national internet access market was 9% as at the end of 2022<sup>32</sup>.

When assessing the importance of TV-COM's local network, it must be taken into account that a copper connection network was also built in these two municipalities to provide telephony. This is because TV-COM (or its predecessor company Matt Antennentechnik AG until 2009) first emerged as a provider of cable TV connections, which then also offered internet connections via its network, but only began to market telephone connections in bundles on its coaxial cable TV network in 2016. In TV-COM's home network area, there has thus been a copper connection network for a long time, which has been replaced by a fibre-optic connection network since 2016 due to LKW's FTTB network construction project, i.e. there is long-standing infrastructure competition in TV-COM's home network area, whereby in the end-user market TV-COM faces all other service providers in the country who provide services via LKW's network infrastructure.

The question of whether the network infrastructure of the LKW makes market entry in the home network area of TV-COM technically and economically possible can best be examined, in the absence of municipality-specific market data, on the basis of the development of the coaxial cable-based TV connections of TV-COM. TV connection data according to different line types are requested in the statistical data collection of the country and, in the case of coaxial cable-based TV connections of TV-COM, are exclusively related to its home network area. The data in Table 3 show that TV-COM's home network lost 35% of coaxial cable-based TV connections from 2015 to 2021, and more than 50% by the end of 2022, with a slight increase in population. In contrast, nationwide demand for TV connections declined by only 1% in the period to 2021, with the population also increasing. Due to the stable demand at the overall national level and assuming that the demand behaviour of the population in the home

<sup>32</sup> Public market share statistics of the AK, available on website <https://www.lv.li/de/landesverwaltung/amt-fuer-kommunikation/elektronische-kommunikation/marktstatistik>

network area of TV-COM is not fundamentally different, the AK concludes that in the years studied, service providers based on the network infrastructure of the LKW were able to successfully penetrate the local market of the home network area of TV-COM. Thus, on the one hand, the wholesale infrastructure services of LKW in this area are to be assumed to be equivalent to those in the rest of the country from the point of view of the demanding service providers and, on the other hand, the home network of TV-COM is not to be treated as a special network to be taken into account in the present market analysis.

<b>TV connections</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>
Quantities as of 31 December								
<b>TV-COM</b>								
TV connections in coax home network	••••	••••	••••	••••	••••	••••	••••	••••
Development index	100	102	98	91	84	66	65	46
<b>All TV connections, whole country, all providers</b>								
TV connections	14'740	14'771	16'060	16'046	16'132	15'009	14'628	
Development index	100	100	109	109	109	102	99	
<b>Population</b>								
(TV-COM home network area: municipalities of Eschen-Nendeln and Mauren-Schaanwald)								
Population home network TV-COM	8'601	8'658	8'729	8'805	8'864	8'947	9'094	9'124
Development index	100	101	101	102	103	104	106	106
Population whole country	37'622	37'810	38'114	38'378	38'747	39'055	39'308	39'680
Development index	100	100	101	102	103	104	104	105

Table 3: Development of TV connections of TV-COM in the home network area, and whole country [Sources: TV connections: AK, Population: Office for Statistics].

Moreover, the market statistics contain only very few fibre optic subscriber lines that are offered by other providers on the basis of their own network infrastructure (Table 4).

<b>Access to ULL</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>
Quantities as of 31 December								
<b>Liechtensteinische Kraftwerke</b>								
ULL twisted pair copper wire	20'591	19'209	18'256	15'677	13'091	7'894	4'253	1'750
ULL coax (homes connected)	13'422	13'624	13'780	13'904	14'008	11'318	7'459	4'490
ULL fibre optic	3'866	3'930	3'981	5'019	7'712	12'775	17'488	20'384
<b>Other suppliers</b>								
ULL twisted pair copper wire	0	0	0	0	0	0	0	0
ULL coax	0	0	0	0	0	0	0	0
ULL fibre optic	8	11	23	8	8	8	6	6

Table 4: Development of the supply for access to subscriber lines (unbundled local loops, ULL) [Source: AK].

Due to the very few, selective offers from other providers, only LKW is relevant in the local loop market. **LKW holds a market share of - effectively - 100%**. According to the statistical data of the AK, this situation has existed for many years. The AK also has no indications that this could change in the coming years.

The technology change in the area of local loop networks from copper-wire pairs or coaxial connection networks to fibre-optic connection networks (cf. Figure 7) does not play a role with regard to the market situation and for the present market analysis, since by the end of 2023 all subscriber connections will have been realised with fibre and all copper-wire pairs and coax subscriber connections will also have been removed.

**The analysis of the market data from the statistical data collection shows that the LKW operates the only passive, nationwide network infrastructure in Liechtenstein. Subscribers lines (unbundled local loops) with complete nationwide coverage are only available from LKW.**

## 5. The Market under Investigation

### 5.1 Preliminary Remarks on Market Definition

According to the SMP guidelines, the definition of the relevant product market must be based on a test of substitutability of the product or service in question on the demand and supply side. All those products belong to the same market which are considered to be sufficiently substitutable from the consumer and supplier perspective. A generally recognised method for this is the so-called SSNIP test (small but significant non-transitory increase in price - SSNIP) or hypothetical monopolist test.

In its 2016 Market Recommendation, the ESA identified those relevant product and service markets in accordance with art. 15 of the Framework Directive that are eligible for ex ante regulation. For these markets it can be assumed, as the ESA has already checked the fulfilment of the relevant criteria in this respect, that they are also eligible for ex ante regulation in Liechtenstein. As the competent regulatory authority, the AK therefore does not have to carry out this examination again, unless it has justified doubts about their specific fulfilment in the national context or the definition of the relevant national product market deviates from the recommended one.

The service or product markets to be examined within the framework of the market analysis are to be defined by the regulatory authority in accordance with art. 21 para. 1 KomG, taking into account the market recommendation of the ESA.

## 5.2 Definition of the Relevant Product Market

### 5.2.1 Definition

In accordance with the ESA's Market Recommendation, the AK defines the relevant market for the present procedure in accordance with art. 21 para. 1 KomG as the "wholesale market for physical access to subscriber lines provided locally at fixed locations" (in short: "local loop market").

Subscriber connections are made available to providers in central offices. Access is offered locally, i.e. the location of the access is in the central office in whose access network the subscriber is located. Access to the local loop is provided to the provider exclusively and as physical access. A local loop provides a direct line to the subscriber's location.

### 5.2.2 Technology-indifferent regulatory approach

Subscriber lines are treated in a technology-neutral manner with regard to various technical implementations, as is already the case in the regulation in place since 2009.

While the past years showed substitution between the local loop types, first from copper twisted pair to coax and fibre, then also from coax to fibre (cf. Figure 7), due to the migration of the LKW network infrastructure to fibre (combined with the dismantling of the old copper twisted pair and coax access networks), providers - with the exception of TV-COM - will only use fibre-based local loops.

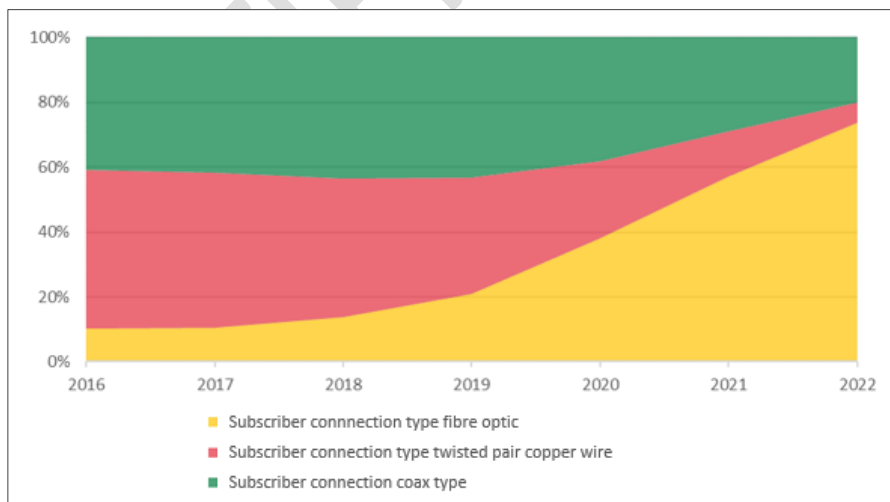


Figure 7: Shares of different types in the total number of fixed network subscriber lines for both network infrastructures of LKW and TV-COM, and substitution movements between the different types of subscriber lines [Source: AK].

Mobile-based connections for subscribers at fixed locations are not ascertainable in the Liechtenstein market as a substitute in the sense of the market definition. The broadband internet access service on a fixed network basis (sum of cable modem, DSL and fibre optic internet connections), is growing at the same rate as the number of households and workplaces. The statistical data collection revealed only zero reports<sup>33</sup> for the category of site-based mobile connections for exclusive internet access. With regard to non-site-based mobile connections for exclusive internet access, there has been no increase since the introduction of LTE (4G) in 2015. Based on this long-term market statistics data, the AK can therefore not recognise any fundamental substitution effects through mobile radio solutions (cf. Figure 8). In principle, pure mobile broadband packages are available, but this is only demanded to a small and slightly decreasing extent, which is a clear indication of the lack of so-called "fixed-mobile substitution".

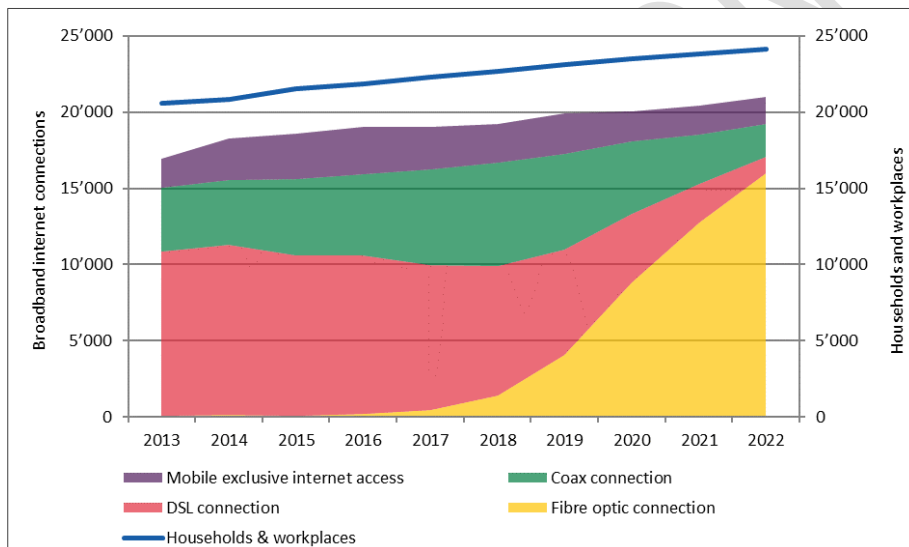


Figure 8: Development of broadband internet connections in the fixed network and of exclusive internet access in the mobile network compared to the development of households and workplaces [Source: AK]

Due to the fundamental and continuing lack of further network infrastructures that could serve as substitutes at present and in the foreseeable future, further clarification with regard to the factual market definition is not expedient and can be omitted.

Despite the technology-neutral approach, only access to unbundled fibre is relevant now and in the future, as it has completely replaced the other fixed network infrastructures.

<sup>33</sup> The indicator "Exclusive internet access, with Liechtenstein telephone number, with address in Liechtenstein and for fixed use" has been collected since 2017.



### 5.2.3 ESA market recommendation

The relevant product market for the present market analysis therefore corresponds to market no. 3a "Wholesale access to subscriber lines provided locally at a fixed location" of the Market Recommendation 2016. From the point of view of the AK, there are no indications that the relevant market does not fulfil the criteria for possible ex ante regulation in Liechtenstein or that its product dimension would have to be defined differently due to national circumstances.

### 5.2.4 Conclusion of the relevant product market

Based on the above, the relevant product market for the present analysis comprises physical access to local loops provided at fixed locations.

## 5.3 Definition of the Relevant Geographic Market

The relevant geographic or geographic market according to art. 21 para. 1 KomG is the geographic area in which subscriber connections are offered and demanded under sufficiently similar or homogeneous competitive conditions.

It follows from paragraphs 47-51 of the SMP Guidelines that the definition of the relevant geographic dimension of the market to be analysed must be based on an analysis of the demand and supply side substitution relationships.

Point 51 of the SMP Guidelines states:

"In the field of electronic communications, the relevant geographic market has so far been defined on the basis of two main criteria:

- a) the area covered by a network, and
- b) the existing legal and other administrative instruments."

Accordingly, the network and the existing legal and administrative instruments are the reference points for the geographic market definition.

With regard to the network, according to the SMP Guidelines this corresponds to the area in which an operator may operate. This is in line with the authorisation to provide and operate electronic communications networks and to offer electronic communications services on Liechtenstein territory after notification in accordance with art. 43 KomG.

The spatial definition also results from the actual geographical extent of LKW's network infrastructure, which is justified in art. 10 para. 2 let. a KomG on the minimum range of services of the universal service in combination with the vertical separation of the telecommunications market in Liechtenstein: "The provision of a local loop at any reasonable fixed location to enable the provision of electronic communications services in accordance with let. b and c".

### 5.3.1 Conclusion geographically relevant market

Therefore, for the purpose of this analysis, the relevant geographic market is defined as the entire national territory of Liechtenstein.

## 6. Market Power and Competition Problems

### 6.1 Companies with Significant Market Power

#### 6.1.1 Single dominant position

According to art. 3 para. 1 no. 3 KomG, an undertaking with significant market power is "an undertaking which, either individually or jointly with others, enjoys a position equivalent to dominance, that is to say, an economically strong position affording it the power to behave to an appreciable extent independently of competitors, customers and ultimately consumers".

When assessing whether a company has significant market power on its own, the regulatory authority must take into account the following criteria in particular, according to art. 31 para. 1 VKND:

- a) the size of the company, its size in relation to that of the relevant market, and changes in the relevant positions of market participants over time;
- b) the level of market entry barriers and the resulting extent of potential competition;
- c) the extent of demand-side countervailing power;
- d) the extent of demand and supply elasticity;
- e) the respective market phase;
- f) the technological lead;
- g) any advantages in the sales and distribution organisation;
- h) the existence of economies of scale, scope and density;
- i) the extent of vertical integration;
- k) the extent of product differentiation;
- l) access to finance;
- m) control over infrastructure that is not easily replaceable;
- n) market behaviour in general, such as pricing, marketing policy, bundling of products and services or erection of barriers.

#### 6.1.2 Assessment of market power

The LKW is active as the single supplier in the relevant market (Table 4) and thus have a market share of 100%. They control the only network infrastructure with complete coverage of the national territory of Liechtenstein (Table 2). The lack of alternative offers for access to local loops is the result of the - de facto - insurmountable level of the structural barrier to market entry, i.e. the sunk costs of network construction, especially in the cable ducts, are so high that the construction of a second infrastructure for the existing telecommunications market, which is already fully covered with a network infrastructure, does not represent a realistic business case. The network infrastructure represents a natural monopoly. This effectively excludes competition from (potential) competitors and ultimately the market counterparty (the demand side) is the only force that could still discipline the exercise of the market power that results from this de facto monopoly position of LKW.

A key element of demand-side countervailing power (as it significantly underlines credibility) is the existence of alternatives: By credibly threatening to obtain the product from another

supplier, to produce it oneself or to abstain from consumption, considerable pressure can be exerted on the supplier.

The only potential alternative would be TV-COM's coaxial cable network, which is geographically limited to the two municipalities of Eschen-Nendeln and Mauren-Schaanwald and covers approximately  $\frac{1}{4}$  of the country's population. However, TV-COM does not offer access to its coaxial cable network, but uses it exclusively for itself.

In the absence of the possibility to switch to an alternative provider or to provide the local loop service itself, and due to the basic need character of broadband internet connections in the fixed network - which also renders countervailing power through the threat of renunciation invalid - there is thus no demand-side countervailing power. Moreover, the LKW does not have to expect a demand-elastic reaction from the service providers, as the providers need the local loops to fulfil the end-customer demand and as the basis of their business model (dependent demand).

TV-COM also does not exercise countervailing power vis-à-vis the LKW, as TV-COM only relies on its own coaxial cable network in a geographically limited area (instead of using LKW's local loops) and does not give access to other providers, while in all other parts of the country TV-COM also uses LKW's network infrastructure without alternatives.

Ultimately, suppliers have no bargaining tools with sufficient disciplinary effect.

### 6.1.3 Conclusion market power

The assessment of whether LKW occupies a position equivalent to dominance according to the criteria of art. 31 para. 1 VKND shows that LKW has unrestricted market power due to its monopoly position, the practically insurmountably high barriers to market entry and the lack of countervailing power on the demand side. According to current estimates, it is not to be expected that the market position of LKW could change in the foreseeable future.

## 6.2 Competition Problems

### 6.2.1 Introduction

For the regulatory measures to be imposed, it is of central importance, in particular on the basis of art. 20 and art. 22 KomG, which specific market failures and competition problems (incl. welfare economic implications) would be expected in connection with an unregulated local loop market - according to the greenfield approach. The aim is to eliminate or reduce these negative consequences of the lack of competition through appropriate measures of special regulation. Subsequently, the terms market failure and lack of competition are used synonymously.

### 6.2.2 Potential Competition Problems

In general, it should be noted that LKW will - also in the future - be the only significant provider of passive infrastructure, i.e. fibre connections, in Liechtenstein and thus effectively have a

monopoly at the wholesale infrastructure level. The LKW is not active in the downstream wholesale or retail markets, e.g. broadband. Another key characteristic is that the fibre is rolled out by the LKW in point-to-point (P2P) technology, which makes it easy for any (downstream active) provider to provide customers with active services. This would not be possible with a "PON" technology (at the fibre level).

Due to this situation at the wholesale level, there is highly competitive pressure on the downstream (active) markets, where about 15 companies compete for end customers.

It is of course desirable - for the future - that this market dynamic is maintained.

Three (potential) competition problems in particular are to be examined more closely, which are to be expected in the case of non-regulation of the local loop charges and the access conditions:

- Allocative distortions due to excessive charges: Due to its market power, LKW could raise charges above costs without fear of being disciplined by the demand side.
- Discriminatory strategies against providers by applying different charges and access conditions or by refusing or delaying access. Discrimination strategies can be applied in connection with the local loop itself or also with cable ducts or ancillary services (including access to core network fibres and services in central offices), which are indispensable for the use of local loops. This competition problem could arise in particular with regard to the connection to Telecom Liechtenstein via the common owner.
- Entry of LKW into the retail market, directly or through shareholdings, and in this context the practice of a margin squeeze.

The competition problem of refusal of access per se seems unlikely, as the business model of the LKW consists exclusively of offering network infrastructure, because only by offering network infrastructure can the LKW generate revenues that cover the costs of the network infrastructure.

The competition problems of discrimination as well as entry into the end customer market and the associated margin squeeze problem are not to be assumed due to the provisions of the LKWG and the owner's strategy<sup>34</sup> from 2014.

The LKWG stipulates in art. 5 that the LKW, according to art. 1 an independent institution under public law, must grant access to all providers of electronic communications networks or services operating in Liechtenstein on a non-discriminatory basis and at fair and transparent prices. The overall supervision of LKW is assigned to the government in art. 17 LKWG. This article also regulates the determination and amendment of the owner's strategy as well as the transmission of the annual report and the annual accounts to the Landtag<sup>35</sup> for information. The Landtag as legislator decided on the vertical separation of the electronic communications market, thus the role of the LKW as the exclusive provider of network infrastructure (duct systems, unswitched lines in the cable network, central offices). Through the reporting obligation to the Landtag, the Landtag thus remains transparently informed about LKW's activities.

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<sup>34</sup> Available at <https://www.lkw.li/userdata/Alle-Download-Dokumente/Allgemeines-Unternehmen/Rechtsgrundlagen/lkw-eignerstrategie.pdf>

<sup>35</sup> Legislative body of the entirety of the state's citizens, parliament. The main task of the Landtag is legislation, see <https://landtag.li/funktion>.

The government, as the owner's representative, makes it clear in the owner's strategy that the LKW must comply with the strategic objective of making the communications infrastructure available to service providers without discrimination. Furthermore, the LKW is required not to participate directly or indirectly in companies that provide services in the field of telecommunications. Furthermore, the LKW is required to conduct all end-customer contacts via service providers and to direct its offers exclusively to providers of electronic communications.

However, the competition problems of denial of access, discrimination, entry into the retail market and the use of margin squeeze strategies cannot be completely ruled out, as on the one hand the owner's strategy can change and on the other hand compliance depends on supervision and influence by the government/owner, which at the same time also controls the largest service provider in the country, Telekom Liechtenstein.

According to the assessment of the AK, the occurrence of the above-mentioned potential competition problems, especially the theoretical scenario of a targeted action of the owner with regard to a concerted behaviour between these companies, weakening the other market participants through discrimination / margin squeeze - corresponding to the possibilities of a vertically integrated operator - is highly unlikely due to the high hurdles mentioned (LKWG, transparency towards the legislative Landtag). The AK has not made any observations in the sense of this scenario in the past years.

In any case, with regard to LKW, the danger remains that LKW will charge excessive prices due to the dominant position in a natural monopoly market.

### 6.2.3 Conclusion competition problems

In the opinion of the AK, the distortions of competition due to excessively high fees represent the potentially most significant competition problem.

The potential competition problems of refusal of access, discrimination and margin squeeze following direct or indirect entry into the retail market are less urgent, but should also be taken into account, following the principle of prudence and in view of the fact that the owner (the country of Liechtenstein) controls both the LKW and the largest service provider.

The problems mentioned are to be mitigated by suitable regulatory instruments, which are described and selected in Chap. 7.

## 6.3 Overall Assessment: No Effective Competition

Thus, from an economic point of view, there is no effective competition on the local loop market and LKW is consequently to be designated as the sole undertaking with market power within the meaning of art. 22 para. 1 let. B KomG.

- The local loop market is a natural monopoly market where the barriers to entry - from a commercial point of view - are insurmountable, potential competition is excluded and the market share of LKW is 100%.
- The analysis of potential competition problems in Chapter 6.2 shows that with free pricing, LKW has clear incentives to charge excessive prices, with the problem of excessive charges being the most significant problem to be addressed by special regulation measures.

- The analysis of the countervailing power of demanders at the wholesale level shows that demanders (service providers) do not have any countervailing power, as there is in fact no alternative to purchasing the local loop service of the LKW. Although it is possible to lay one's own fibre-optic lines in the cable ducts of the LKW, this is hardly ever used. Furthermore, there is of course also the possibility of burying one's own pipe systems, which - from a commercial point of view - would hardly be profitable.
- In the absence of regulation, the AK thus expects the results described in Chapter 6.2.
- According to the assessment of the AK, the situation will continue to be like this.

## 7. Regulatory Instruments

### 7.1 Regulatory Instruments according to KomG

According to art. 20 KomG, the regulatory authority must take the necessary measures to eliminate or reduce the negative consequences of the lack of effective competition in the electronic communications markets. It obliges operators with market power - in accordance with art. 23 KomG in conjunction with art. 34 to 42 VKND - to take one or more of the following measures of special regulation for this purpose:

- Equal treatment obligation (art. 34 VKND);
- Transparency obligation (art. 35 VKND);
- Separate accounting (art. 36 VKND);
- Access to network facilities and network functions (art. 37 VKND);
- Charge control and cost accounting for access (art. 38 VKND)

Pursuant to art. 20 KomG and art. 6 RKV, the regulatory authority is required to follow ESA recommendations as far as possible when conducting market analyses.

As regards the consideration of recommendations and communications of the European Commission not issued by ESA for the EFTA-EEA States, ESA<sup>36</sup> refers firstly to the objectives of the Framework Directive (i.e. the basis of the KomG), namely i) to contribute to the development of the internal market by promoting consistent regulatory approaches and the consistent application of the regulatory framework (art. 8(3)(d) and 8(5)(a) Framework Directive); and ii) to apply objective, transparent, non-discriminatory and proportionate regulatory principles (art. 8(5) Framework Directive). Second, ESA cites the principle of homogeneity enshrined in Article 1(1) of the EEA Agreement (i.e. the objective of "promoting a continuous and balanced strengthening of trade and economic relations between the Contracting Parties under equal conditions of competition and respect for the same rules, in order to establish a homogeneous European Economic Area").

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<sup>36</sup> According to e-mail communication from the ESA to the AK on 5 December 2022

The following recommendations and communications of the European Commission are particularly relevant for the present market analysis, as they specify the measures of the special regulation of the KomG in more detail:

- NGA recommendation
- Recommendation on consistent non-discrimination obligations and costing methodologies
- Commission Notice on the calculation of the WACC

## 7.2 Commission NGA Recommendation

The regulatory authority is required, according to art. 20 KomG, to carry out market analyses and in doing so to largely follow recommendations of the ESA and the European Commission (according to the Framework Directive and the EEA Agreement, cf. chap. 7.1 above). The Commission Recommendation on Regulated Access to Next Generation Access Networks<sup>37</sup> ("NGA Recommendation") provides for a series of measures to promote the deployment of next generation access networks ("NGA") based on fibre technology and is thus relevant to the present market analysis, as it specifies the measures of the special regulation of the KomG in more detail.

The Commission states that when NRAs consider imposing remedies in the context of market analyses under art. 16 of the Framework Directive, they should design such obligations effectively and in accordance with the said Directives and the approach set out in this Recommendation. The Recommendation is targeted at relevant markets 4 and 5 of the Commission's 2007 Market Recommendation<sup>38</sup>, corresponding to markets 3a and 3b of the 2016 Market Recommendation.

In the context of the present market analysis, the commitments should in particular comply with the principles set out in points 13-15 concerning access to civil engineering infrastructure (cable ducts) and points 22-25 concerning unbundled access to fibre in FTTH/B networks.

Point 13 states that NRAs should require the granting of access to civil engineering infrastructure where cable duct capacity is available. Access should be granted according to the principle of equivalence as set out in Annex II of the NGA Recommendation. Access should be granted at cost-oriented charges in accordance with point 14.

According to point 22, where an SMP operator deploys FTTH lines, NRAs should in principle impose unbundled access to the fibre connection. The imposition of unbundled access to the fibre connection should be accompanied by appropriate measures to ensure co-location and backhaul (core network). Access should be granted at the most appropriate point in the network, i.e. as a rule at the main distribution point (MPoP). When setting the charge for unbundled access to the fibre loop (point 25), NRAs should take due account of the additional and quantifiable risk incurred by the SMP operator.

Access to the civil engineering infrastructure, i.e. cable ducts, and access to the unbundled fibre optic connection should be presented in a reference offer or included in the existing

<sup>37</sup> Commission Recommendation of 20 September 2010 on regulated access to next generation access networks (NGA), (Text with EEA relevance), (2010/572/EU), available at <https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=celex%3A32010H0572>

<sup>38</sup> available at <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32007H0879>

reference offer for unbundled access to the subscriber's connection as soon as possible, in accordance with points 15 and 24 of the Recommendation.

The Commission specifies the criteria for setting the risk premium in Annex I of the NGA Recommendation. When assessing the investment risk, NRAs should take into account, inter alia, the following uncertainty factors:

- i) uncertainty regarding demand at the wholesale and retail level;
- ii) Uncertainty regarding the cost of network construction, civil works and project management;
- iii) Uncertainty about technological progress;
- iv) uncertainty regarding market dynamics and the evolving competitive situation, e.g. the strength of competition between infrastructures and/or cable networks; and
- v) macroeconomic uncertainty.

With regard to granting access to the civil engineering infrastructure, i.e. cable ducts, in accordance with NGA recommendation number 13, the economic viability of access in the sense of the "ladder of investment" concept is not generally fulfilled for Liechtenstein due to the building stock, which consists of around 55% single-family houses and has an average of only 2.4 usage units (i.e. flats and business premises) per building. The AK comes to this conclusion because the market statistics data only show a very small amount of demanded cable ducts, i.e. the providers have only pulled cables into offered cable ducts (of the LKW) on individual routes. In the access network area, the length of the inserted cables is 0.2% of the total cable length. The providers have not invested in the construction of a network with local, regional or national coverage in the sense of infrastructure competition. In the foresight, the AK is also not aware of any such plans. The AK attributes this to the fact that cable ducts can generally be characterised as a natural monopoly in Liechtenstein.

Therefore, access to the construction infrastructure is not to be prescribed as the sole access measure, but rather as a supplement to unbundled access to the fibre connection. As far as the setting of a risk premium according to recommendation number 25 is concerned, it should be noted for the present market analysis that there is no additional investment risk in the sense of recommendation number 25.

The LKW as operator with considerable market power has a monopoly position, i.e. there are no other providers of network infrastructure, and they are dismantling the old access networks (copper, coax) in the course of FTTB network construction. This results in a plannable and secure demand for local loop fibre of the FTTB network, corresponding to the demand for local loops of the old copper networks (cf. Figure 8). In addition, regulation is carried out after the FTTB network construction has been completed, which means that there is no uncertainty about network construction costs. By offering passive network elements (optical fibres), the LKW is also not exposed to the rapid risks of technical progress in the area of active equipment. Therefore, the LKW has not taken any additional and quantifiable investment risk in the sense of recommendation point 25.



### 7.3 Recommendation on Consistent Non-Discrimination Obligations and Costing Methodologies of the Commission

The objectives of the Commission Recommendation of 11. September 2013 on harmonised non-discrimination obligations and costing methodologies to promote competition and improve the environment for broadband investment ([2013/466/EU](#))<sup>39</sup> are i) to ensure a level playing field through the application of stricter non-discrimination rules, (ii) setting predictable and stable regulated wholesale access charges for the copper network; and (iii) providing greater certainty as to the circumstances in which regulated wholesale access charges for NGA services should not be imposed. The Recommendation is aligned with the relevant markets 4 and 5 of the Commission's 2007 Markets Recommendation, corresponding to markets 3a and 3b of the 2016 Markets Recommendation. The Commission adds in Recommendation point 5 that other markets susceptible to ex ante regulation identified by NRAs in the course of the market analysis are also subject to the Recommendation principles, provided that they replace the above markets and cover the same network levels. This includes, inter alia, access to civil engineering infrastructure (cable ducts) and unbundled access to copper and fibre local loops.

With regard to non-discrimination provisions, the Commission assumes in its considerations that there is a vertically integrated operator with market power which is directly or indirectly active in the retail market. This is not the case in the Liechtenstein market, as the LKW only offers network infrastructure. For the present market analysis, the non-discrimination provisions of the Commission's recommendation and the comments on the circumstances under which no regulated wholesale access charges should be imposed for NGA services therefore do not give rise to any further specific points that would need to be taken into account.

In recitals 25-48 and recommendation 30-47, the Commission specifies the recommended cost accounting method relevant to the market analysis at hand, with the aim that the method leads to access charges that replicate as far as possible the charges that can be expected on a market in which there is genuine competition.

Recommendation 30-32 specify that for the purposes of setting wholesale access charges for copper pair and NGA networks, NRAs should use a 'bottom-up long-run incremental costs plus' (BU-LRIC+) costing methodology, which includes bottom-up modelling using the LRIC cost model plus a mark-up for common cost recovery. NRAs should use a BU-LRIC+ cost accounting methodology to estimate the current costs that a hypothetical efficient operator would incur in deploying a modern, efficient NGA network consisting wholly or partly of optical components.

The Recommendation assumes that NGA networks will be deployed predominantly in existing built infrastructure. According to recommendation points 32-35, NRAs should value existing reusable civil engineering assets and their regulatory asset base (RAB), which corresponds to legacy reusable civil engineering assets, in the cost accounting using the indexation method. In particular, NRAs should measure the RAB of this type of asset at the regulatory book value less accumulated depreciation at the calculation date and indexed by an appropriate price index such as the retail price index. NRAs should examine the accounts of the SMP operator,

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<sup>39</sup> available at <https://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=CELEX:32013H0466>

where available, to determine whether they are sufficiently reliable as a basis for reconstructing the regulatory book value. In doing so, NRAs should determine the RAB for the existing reusable civil engineering assets once and then carry it forward from one regulatory period to the next. NRAs should set the life of the civil engineering assets in accordance with recommendation point 36 so that it corresponds to the expected useful life of the asset and the demand profile. This should normally be at least 40 years for cable ducts.

#### 7.4 Commission Notice on the Calculation of the WACC

In the Commission Notice on the calculation of the cost of capital for legacy infra structures in the context of the Commission's assessment of national notifications in the electronic communications sector in the EU, dated 6 November 2019 ([2019/C 375/01](#))<sup>40</sup> (the "Notice") the Commission sets out its methodology for estimating the weighted average cost of capital (WACC)<sup>41</sup>. These serve as a reference in the context of reviewing draft measures notified by NRA under art. 7 of the Framework Directive, which is part of the EU's regulatory framework<sup>42</sup> for electronic communications ("Framework").

The framework aims to ensure that NRAs contribute to the development of the internal market by cooperating with each other and with the Commission to ensure the development of consistent regulatory practice and the consistent application of the regulatory framework (8). In line with the objectives of the regulatory framework (Articles 7(2) and 8(3)(d)), this Notice aims to increase the consistency of WACC calculations across the Union.

This Notice aims to contribute to the achievement of these objectives and to a stable regulatory environment conducive to investment in electronic communications networks in the Union for the benefit of end-users. This is to prevent distortions of investment due to inconsistent approaches by NRAs over time and in different parts of the Union, which affects the functioning of the digital single market.

Based on the methodology set out in this Notice, the values for each WACC parameter are calculated and published annually by BEREC<sup>43</sup>. The Commission uses these values as a reference in its examination of the draft measures notified under art. of the Framework Directive.

<sup>40</sup> available at <https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=CELEX%3A52019XC1106%2801%29>

<sup>41</sup> Within the framework of the regulation of the telecommunications markets, the WACC is calculated by the competent national regulatory authority. The WACC value is a measure of the level of a company's cost of capital. According to economic theory, the cost of capital is the opportunity cost of a certain investment made instead of another investment with the same risks. The cost of capital thus represents the return that a company must earn in order to make a given investment. The cost of capital can be broken down into equity and debt costs depending on the source of financing.

<sup>42</sup> The current regulatory framework consists of the following legal acts as amended: i) Directive 2002/21/EC (Framework Directive), ii) Directive 2002/20/EC (Authorisation Directive), iii) Directive 2002/19/EC (Access Directive), iv) Directive 2002/22/EC (Universal Service Directive) and v) Regulation (EU) No 531/2012 on roaming on public mobile telephone networks.

<sup>43</sup> The BEREC Report on WACC parameter calculations is published annually in June. The current version dated 8 June 2023 is available at <https://www.berec.europa.eu/en/document-categories/berec/reports/berec-report-on-wacc-parameter-calculations-according-to-the-european-commissions-wacc-notice-of-6th-november-2019-wacc-parameters-report-2023>

This Notice only refers to the WACC calculation for legacy infrastructure. For the purposes of this Notice, 'legacy infrastructure' means network infrastructure of an SMP operator for which no NGA premium is granted. The Notice does not address the applicability or calculation of NGA risk premia.

The Commission Notice is also relevant to the present market analysis. It applies in relation to the market analysis procedure under the Framework Directive, which forms the basis of the KomG.

Regarding the review of draft measures of EEA-EFTA countries (thus also Liechtenstein) by ESA, ESA states as follows<sup>44</sup> :

- The Commission's Notice sets out a methodology to be used by the Commission when estimating WACCs in the context of reviews under art. 7 of the Framework Directive.
- The Notice is a non-binding legal instrument used by the Commission and the ESA to ensure compliance with certain regulatory principles and objectives set out in the Framework Directive (and the European Electronic Communications Code), i.e. the legislation incorporated into the EEA Agreement. In particular, the Notice makes explicit reference to the following objectives of the Framework Directive (cf. point 7 of the Notice):
  - Contributing to the development of the internal market by promoting consistent regulatory approaches and the consistent application of the Framework Directive (art. 8(3)(d) and art. 8(5)(a) of the Framework Directive); and
  - Application of objective, transparent, non-discriminatory and proportionate regulatory principles (art. 8(5) Framework Directive).
- The Notice provides a methodological framework for assessing compliance with certain binding legislation that also applies to the EEA/EFTA States (currently the 2002 regulatory framework and in the future the Code). The annual BEREC report complements the Commission's work by regularly updating the various WACC parameter values for the individual EU/EEA countries (cf. point 7 of the Notice).
- We also note that even before the adoption of the Notice, art. 8 Framework Directive in conjunction with art. 13 Access Directive (largely corresponding to art. 3 or art. 74 of the Code) formed the legal basis for the Commission's serious doubts in Phase II of the WACC investigations (cf. e.g. cases SI/2018/2050 and SK/2018/2051).
- As regards the application of the Notice by the ESAs, we refer to the principle of homogeneity enshrined in art. 1(1) of the EEA Agreement (i.e. the objective to "promote a continuous and balanced strengthening of trade and economic relations between the Contracting Parties under equal conditions of competition and in compliance with the same rules, in order to establish a homogeneous European Economic Area").

With regard to the determination of the Notice for the calculation of the cost of capital for legacy infrastructure, the Commission refers to the NGA recommendation in footnote 9 of the Notice. As explained in chap. 7.2 above, there are no exceptional investment risks of NGA network construction, which is why no NGA premiums are to be provided for. Thus, all network infrastructure of LKW is considered legacy infrastructure for which the Notice is relevant.

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<sup>44</sup> E-mail communication from the ESA to the AK of 5 December 2022

## 7.5 Principles for the Application of Regulatory Instruments

With regard to the imposition of regulatory instruments (measures of special regulation) in competition regulation, the regulatory authority must take into account the regulatory objectives according to art. 1 para. 2 KomG as well as the principles of art. 5 para. 2 KomG.

### Proportionality principle

art. 5 para. 2 let. b KomG explicitly refers to the principle of proportionality that must be observed. art. 33 VKND explicitly defines the general administrative principle of proportionality, stating that measures of special regulation must correspond to the nature of the problem that arises and must be appropriate and justified, taking into account the principles of regulation according to art. 5 para. 2 KomG.

The principle of proportionality states that the means used to achieve a specific purpose must not go beyond what is appropriate and necessary to achieve that purpose. Thus, for a measure taken by the regulatory authority to be compatible with the principle of proportionality, firstly a justified objective standardised in art. 1 KomG must be pursued. Secondly, the measure used to achieve this goal must be necessary to achieve the goal. Thirdly, it must not impose an unreasonable burden on the operator concerned. The measure taken should therefore be the minimum necessary to achieve the objective in question.

## 7.6 Selection and Evaluation of Regulatory Instruments

### 7.6.1 On the choice of regulatory instruments

The local loop market in Liechtenstein is a natural monopoly market, so that the primary objective of imposing regulatory instruments cannot be to promote (inefficient) infrastructure competition, but to eliminate the competition problems identified in the market analysis, with their adverse effects on competition in the downstream markets, but especially for end users.

The main (potential) competition problem identified in chapter 6.2 concerns excessive charges. A regulatory instrument is therefore primarily "effective" if it can sufficiently influence charges. Only if it can be ensured that the charges for local loop services are oriented towards the costs of efficient service provision will allocative distortions no longer occur and the competition problem can be considered eliminated.

In addition to charges, the dominant company also has a number of other instruments at its disposal to restrict competition and transfer market power. For example, it could provide downstream customers with a lower quality access service, deny access to certain necessary information, deny or delay access to the local loop, or set unreasonable contractual terms and conditions, thereby increasing the downstream customer's costs. In particular, when a cost-oriented access charge is set, a potential competition problem remains that the dominant company could try to apply discriminatory strategies in the terms of service provision ("non-price" behaviour). In the following, a differentiation is made in the assessment of the regulatory instruments between aspects relating to charges and aspects relating to conditions.

### 7.6.2 Transparency obligation

The basic purpose of a transparency obligation according to art. 35 VKND is to improve vertical market transparency (between suppliers and demanders) and thus to reduce transaction costs (e.g. search costs) or to intensify (price) competition. Only if the demanders of the (preliminary) service are sufficiently informed about alternative offers (prices) can competitive forces become effective. Economic theory shows that inefficient market outcomes cannot be ruled out in markets with imperfect information (e.g. information asymmetries). However, the pro-competitive effect of strengthening market transparency cannot be reduced to the parameter of price alone. In particular, if an access charge regulation exists and companies have an incentive to switch to "non-price" action parameters, the transparency obligation in connection with other obligations such as the equal treatment obligation (in the form of a reference offer) can be an effective instrument to make such "non-price" tactics more difficult.

Furthermore, the transparency obligation can be used to assist the regulator in monitoring (possible) anti-competitive behaviour.

In order to assess the effectiveness of this instrument, the question must be asked whether the transparency obligation (alone) has an influence on the behavioural parameters of a dominant company, but in particular on charges, and if so, which. The answer to the first question is no. A necessary prerequisite for this would be that a demander at the wholesale level can obtain the service from more than one provider: Only if at least one substitute exists can (price) competition develop - supported by improved market transparency. However, this is not the case with the monopoly service local loop, so that a transparency obligation (at the wholesale level) alone is not suitable to counter the identified competition problems (but especially the problem of excessive prices).

Against this background, the transparency obligation should primarily be seen as an auxiliary instrument for other obligations. Relevant for the present context is above all the support of the equal treatment obligation. In order to make such an obligation effective, it is necessary that customers are able to obtain sufficient information by simple means (e.g. via a website) about those factors that could potentially be used for discrimination. In the area of telecommunications regulation, the instrument of the obligation to publish a reference offer has become established.

A reference offer for services which are in repeated demand (such as access to the local loop) makes sense in particular because a large part of the transaction costs in the context of access negotiations can be eliminated. In addition, new operators entering the market can easily and quickly inform themselves about the current situation regarding access to the local loop. Possible delaying tactics by companies with considerable market power are thus prevented just as effectively as the possibility of completely preventing market entry.

The instrument of the obligation to publish a reference offer is standardised in art. 34 para. 3 VKND as a possible obligation in connection with the equal treatment obligation and is therefore also dealt with in the chapter on the equal treatment obligation (chapter 7.6.5).

### 7.6.2.1 Conclusion transparency obligation

The transparency obligation in the form of a reference offer is necessary to eliminate the identified competition problems. The instrument serves as an auxiliary tool in interaction with other obligations, such as the equal treatment obligation.

### 7.6.3 Separate accounting

The instrument of separate accounting (art. 36 VKND) serves to make internal expenses, costs and revenues between different areas of activity transparent for the regulatory authority, in order to make cross-subsidisation and discrimination between internal provision (internal transfer price) and external sales (for the regulatory authority) recognisable. Analogous to the transparency obligation, the question of whether the obligation to keep separate accounts alone (or in combination with a transparency obligation) has an influence on the behavioural parameters of a market-dominant company, in particular on the local loop charge, must be answered in the negative. The instrument of separate accounting should therefore primarily be used as a supplement to other instruments, such as the obligation to equal treatment (cf. chap. 7.6.5 below) or the remuneration control (cf. chap. 7.6.6 below). With regard to charge control, which only concerns the business area of LKW active in the electronic communications market, separate accounting is necessary for differentiation from the other business areas - including the main business areas of the electricity grid and the energy supply - in any case for determining the costs of the network infrastructure.

#### 7.6.3.1 Conclusion separate accounting

The obligation to keep separate accounts is necessary to eliminate the identified competition problems. The instrument serves mainly as an auxiliary tool in interaction with the charge control and the cost accounting model.

### 7.6.4 Access to network facilities and infrastructure

The basic purpose of an access obligation (art. 37 VKND) is to prevent refusal of access and to specify the conditions of access. To this end, art. 37 VKND contains detailed provisions on which obligations regarding access can be imposed on an undertaking (e.g. access to network, unbundled parts, collocation, cable routes, etc.). The access obligation is an effective instrument to remedy the (potential) competition problems of general refusal of access or non-price anti-competitive practices (in the form of delaying tactics, inferior quality of the wholesale product, refusal of access to information and upstream systems, etc.) and should therefore be imposed.

As far as the concrete design of the access obligation is concerned, according to the NGA recommendation, the obligation of access to the local loop should be imposed by the regulatory authority in FTTH and FTTB networks and flanked by appropriate measures to ensure collocation and return (core network). In addition - if cable duct capacities are available - the granting of access to the civil engineering infrastructure / cable ducts should be imposed.

#### 7.6.4.1 Conclusion access to network facilities and infrastructure

Against the background of the monopoly situation of the local loop, an access obligation to the subscriber line (FTTB fibre) is in any case to be regarded as proportionate. Access to services in central offices and to dark fibres of the core network infrastructure (cf. Figure 5), which connect central offices, is also to be included in the access obligation as ancillary services necessary for the use of the local loop.<sup>45</sup> Access to the civil engineering infrastructure (the cable ducts) is to be imposed as a further obligation within the framework of the available capacity, in continuation of the existing regulation, on the basis of which providers selectively laid their own cables in the cable ducts of the LKW. Access to the civil engineering infrastructure, i.e. cable ducts, enables greater added value, even if this is only used in individual cases, for example for services of the business customer area. However, it is not suitable as the sole access measure, because with only an average of approx. 2.4 usage units per building, the investment in own fibre optic connection cables is generally not economical for service providers (natural monopoly) and thus access is not granted.

Since the general obligation to grant access under art. 26 KomG for access to resources of the communications infrastructure basically affects every operator of a public communications network and the business model of the LKW communications sector is only geared towards offering network infrastructure, the further consideration of the proportionality of this obligation can take a back seat: It can be assumed that a general legal provision aimed at a wide range of addressees is in principle proportionate and in the public interest. Furthermore, the business processes are already set up for offering access.

#### 7.6.5 Non-discrimination obligation

The obligation of equal treatment according to art. 34 VKND serves to prevent discrimination between different purchasers of a service. In the present context, a distinction must be made between:

- Discrimination with regard to the parameter price (price discrimination);
- Discrimination in relation to parameters other than price (quality discrimination).

##### 7.6.5.1 Quality discrimination

As already mentioned in chapter 7.6.4 above on the access obligation, the dominant company - especially if there is access price regulation - has an (economic) incentive to engage in "non-price" anti-competitive (discrimination-) practices. An obligation that is suitable to counteract a number of such "non-price" competition problems, but in particular different forms of quality discrimination, is the equal treatment obligation. This obligation can ensure that the dominant company offers the wholesale product to all customers with the same quality. In addition, an obligation to publish a reference offer pursuant to art. 34 para. 3 VKND can be imposed in order to concretise or operationalise the access obligation. This is particularly useful in the case of relatively complex products, since without such a reference offer -

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<sup>45</sup> The total length of cables from service providers in the cable ducts of LKW is approx. 0.2%.

especially for smaller customers - significant transaction costs can arise in the context of access negotiations.

Against this background, a non-discrimination obligation supported by an obligation to publish a reference offer via a website (transparency obligation) should be imposed in principle to ensure the effectiveness of regulation. The advantage of such an obligation lies not only in the effective elimination of discriminatory practices but also in the reduction of transaction costs (especially for smaller customers).

#### **7.6.5.2 Price discrimination**

The non-discrimination obligation must also be assessed in relation to the parameter of price. However, the (price) non-discrimination obligation alone or in combination with the previously examined measures is not suitable for eliminating the allocative distortions, since such an obligation does not limit the price-setting scope of the dominant company. Such an obligation merely ensures that all customers purchase the service at the same (possibly excessive) price and thus guarantees equal opportunities for competition on the respective end customer markets.

#### **7.6.5.3 Conclusion non-discrimination obligation**

By means of a non-discrimination obligation it can be ensured that the (preliminary) service is offered to all customers at the same conditions. An obligation to equal treatment with regard to non-price parameters (quality discrimination) or an obligation to publish a reference offer is an instrument against "non-price" anti-competitive strategies of a market-dominant company, which are to be expected in particular if access price regulation is imposed on this company. Such an obligation is in any case necessary to eliminate possible "non-price" anti-competitive strategies.

As far as the concrete scope of the reference offer obligation is concerned, according to the NGA recommendation, the reference offer should include the local loop (FTTB) as well as the ancillary services in central offices and core network fibre access and, in addition, the structural infrastructure.

#### **7.6.6 Price control and cost accounting**

art. 38 VKND provides that the regulatory authority may impose obligations on operators with market power regarding cost recovery and charge control, including cost-oriented charges. The regulatory authority must take into account criteria such as efficiency, the investments made, the return on investment and the existing market risk when correctly determining the access charge. art. 38 para. 2 VKND furthermore contains provisions with regard to the burden of proof: it is incumbent on an operator obliged to cost orientation to prove that its charges are calculated on the basis of costs and a reasonable return on investment. The regulatory authority may impose on the operator a cost accounting system independent of its cost accounting system.



art. 13 of the Access Directive requires regulators to design cost accounting and price control measures in a way that promotes efficiency and sustainable competition and maximises the interests of end-users.

On the basis of this obligation - if applied correctly - the efficient access charge can be set. The measure is therefore fundamentally suitable for eliminating allocative inefficiencies (excessive prices); the efficient access charge ensures that no excess profits are generated with this service.

Cost-based pricing is most proportionate in situations where the dominant company can overcharge and the market power is not constrained by competitive forces in the longer term. LKW has sole control in the market over network infrastructure that is not easily substitutable and therefore have a high degree of market power.

The recommendation on consistent non-discrimination obligations and costing methodologies encourages NRAs to use a "BU-LRIC+" cost accounting methodology<sup>46</sup> for the purposes of setting cost-oriented wholesale charges for access to NGA networks (cf. chap. 7.3) to estimate the current costs that a hypothetical efficient operator would incur in deploying a modern, efficient NGA network consisting wholly or partly of optical components. The recommendation assumes that NGA networks are predominantly deployed in existing built infrastructure. NRAs should identify in the cost accounting existing reusable civil engineering assets and their regulatory asset base (RAB) corresponding to the legacy reusable civil engineering assets, where available and sufficiently reliable, based on the accounts of the SMP operator. In doing so, NRAs should determine the RAB for the existing reusable civil engineering assets once and then carry it over from one regulatory period to the next.

Although BU LRIC+-based cost accounting systems have a number of advantages, they also have numerous disadvantages. The greatest disadvantages are, in particular, the very high time, personnel and cost expenditure associated with the execution of such a cost accounting model, both for the operator concerned and for the regulatory authority. The disadvantages mentioned above are even more pronounced in the particular context of the smallness of the circumstances in Liechtenstein and, in the opinion of the AK, are clearly disproportionate to the size of the market, the operators and the regulatory authority. The AK is of the opinion that the resources required for the introduction of a BU LRIC+ cost accounting model are not available to the AK and the LKW at present and in the foreseeable future and that the application of the recommended method would therefore be objectively disproportionate.

In this context, it is necessary to examine which less costly cost accounting methods meet the requirements to set efficient and cost-oriented charges in line with a competitive market, in particular with regard to the already existing top-down cost accounting model based on historical full costs and separate accounting, which differentiates the area of electronic communication from the other areas of activity of LKW. This cost accounting model was approved by the AK in 2014 and formed the basis for the fee regulation of 15 January 2015.

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<sup>46</sup> This methodology models the incremental capital (including sunk costs) and operating costs to be borne by a hypothetical efficient operator in providing all access services plus a mark-up to cover common costs. Therefore, the BU-LRIC+ method allows the recovery of the total costs incurred by an efficient operator. In the BU-LRIC+ methodology, the current costs incurred today by an efficient network operator in building a modern network capable of providing all required services are calculated in a forward-looking manner (for example, based on modern technology and expected demand). Thus, the BU-LRIC+ method sends correct and effective signals for market entry.

A comparison of the basic purposes for a cost accounting model as set out in points 31 and 32 of the Recommendation on consistent non-discrimination obligations and costing methodologies, namely: "NRAs should use an i.) Bottom-up Long Run Incremental Cost plus (BU-LRIC+) cost accounting methodology to estimate the ii.) current costs that a iii.) hypothetical efficient operator would incur in deploying a iv.) modern, efficient NGA network that v.) meets the bandwidth, coverage and penetration objectives of the Digital Agenda for Europe and consists wholly or partly of optical components":

- i. Incremental costs: LKW operates exclusively a passive fibre-based network infrastructure, without any service increments built on top of it for the wholesale or end-user market level. LKW's other business areas, such as energy management and "electricity" network operations, are clearly demarcated by separate accounting. As a result, the total scope of activities / costs in the area of electronic communications represents the (BU-LR)IC+.
- ii. Current costs: The FTTB network construction as passive fibre infrastructure was carried out in a short period of time, with the majority of the total investment occurring within the last five years. The cost information can therefore be considered current.
- iii. Hypothetically efficient operator: The FTTB network was largely built into existing structural infrastructures, whereby the number of central offices - corresponding to the little distance-dependent optical signal transmission - was adjusted, i.e. reduced by 50%. The FTTB network construction was commissioned with tender procedures for the individual construction lots under market conditions to implementing companies. The costs of the civil engineering infrastructure (cable ducts) are only included in the cost calculation within the framework of the residual value not yet depreciated, whereby the service life of the structural systems meets the requirements of recommendation point 36 of at least 40 years. It can therefore be assumed that the FTTB network will be efficiently constructed.
- iv. Modern, efficient NGA network: The FTTB connection network of the LKW is realised according to an FTTH point-to-point architecture as a new building with modern optical components, whereby unbundled fibres are made available to the service providers for exclusive use, and thus corresponds to the current standards. This architecture enables - in contrast to a GPON network - the highest possible competitive intensity.
- v. The FTTB access network meets any Digital Agenda targets in terms of optical component design, coverage and penetration. The latter are complete by the end of 2023 due to the dismantling of the old copper access networks, i.e. all fixed network services are provided via fibre optic subscriber lines and every building or usage unit is connected to the fibre optic network. Regarding bandwidth targets of the Digital Agenda, the FTTB network gives an unrestricted basis for service providers to offer the required bandwidths at every residential and commercial building location in Liechtenstein.

In summary, the use of a BU LRIC+ model for cost modelling in the market analysis case at hand is disproportionate in terms of effort, as the LKW actually realised what would otherwise have to be modelled as a hypothetical case with BU LRIC+ cost accounting - namely estimating current costs. On this basis, an output can be expected from the top-down cost accounting model of the LKW that corresponds to that of a BU LRIC+ cost model. It should be explicitly emphasised here that all costs for the expansion of the fibre optic network were incurred in the recent past, i.e. since approximately 2016. Therefore, they can be regarded as current.

No other (lesser) instrument than the obligation of cost orientation is suitable to eliminate the price-related aspects of the identified potential competition problems (excessive prices). In

the light of the identified competition problems, the setting of cost-oriented access charges is therefore an appropriate and necessary measure.

#### **7.6.6.1 Conclusion price control and cost accounting**

In view of the concrete situation of LKW as the exclusive operator and provider of a passive network infrastructure without further service increments and in view of the fact that the entire FTTB network was built efficiently within the framework of a compact construction project, using the existing construction infrastructure, the cost-oriented, efficient charges are determined with a cost accounting model based on historical full costs. In addition, a benchmark is consulted by the AK to validate the cost efficiency. This procedure corresponds to the purposes that can generally be fulfilled with the application of a BU-LRIC+ model according to the recommendation on consistent non-discrimination obligations and costing methodologies and is size-compatible and efficient with regard to the available resources at LKW and AK.

### **7.7 Conclusion - Regulatory Instruments**

In order to remedy the competition problems identified in the local loop market, it is necessary and appropriate to impose special regulation measures based on art. 23 para. 1 KomG.

The persistent monopoly character of LKW was also explained in chap. 6. The AK is also aware that the charges for wholesale services are - necessarily - also reflected in the retail prices. It is therefore essential that the wholesale charges reflect a competitive - cost-oriented - price and therefore do not contain any elements of monopoly pricing.

The envisaged measures of the special regulation are therefore as follows:

- Obligation to grant physical access to subscriber lines provided locally at fixed locations as well as access to central office services, core network optical fibres and cable ducts in accordance with art. 23 para. 1 let. d KomG and art. 37 para. 1 VKND;
- Based on art. 23 para. 1 let. d KomG and art. 38 VKND, the obligation of LKW to base the charges on the costs of an efficient operator, based on an approved top-down cost accounting model;
- Based on art. 23 para. 1 let. d KomG and art. 36 VKND, to keep separate records for regulated and unregulated areas or products in accordance with the specifications of the Office for Communications.
- Obligation of equal treatment with regard to charges and quality of access services in accordance with art. 23 para. 1 let. d KomG and art. 34 VKND;
- Transparency obligation pursuant to art. 23 para. 1 let. d KomG and art. 35 VKND: Obligation to provide the Office for Communications with all information required for cost control and monitoring of the non-discrimination obligation in a transparent manner; and in conjunction with art. 34 VKND obligation to publish and update an approved reference offer on the operator's website which includes the necessary technical, operational and pricing elements.

In the present proceedings, therefore, no obligations other than those mentioned in the KomG will be examined, since, in the assessment of the AK, there are neither exceptional

circumstances that would justify the use of other obligations, nor are other instruments available that are suitable to eliminate the identified competition problems and that would be more appropriate.

The measures imposed are the least intrusive necessary to solve the competition problems identified and thus comply with the principle of proportionality. The measures are complementary and not alternative instruments. Each in itself serves - as explained above - to address certain sub-problems in connection with the identified competition problems. From the point of view of the AK, only the use of all instruments ensures that the identified competition problems are prevented.

The AK is aware that the so-called "Code" (Directive (EU) 2018/1972) will enter into force shortly, but that these regulatory measures are still being enacted under the current Communications Act and will therefore apply for the near future under a revised legal framework. From a foresight perspective, the regulatory measures are also justified, especially when considering art. 80(1)a of the Code in conjunction with the fact that both the LKW and the incumbent and largest provider Telecom Liechtenstein with more than 50% market share of the fixed network market are 100% state-owned. Therefore, the lighter regulatory regime cannot be applicable.

## Appendix 1 Draft Decision

### DECISION

#### Consultation Version of July 18

Note
In order to inform the ESA as comprehensively as possible, the AK encloses a skeleton of the decision with the main points. The decision is only elaborated in the ruling and shows the draft regulatory measures that Liechtensteinische Kraftwerke (party to the proceedings) will be obliged to take. The contents of the chapters on the facts and the reasons for the decision will be inserted accordingly according to the contents in the present market analysis document.

The Office for Communications, by virtue of its administrative proceedings concerning

**Liechtensteinische Kraftwerke**  
**Im alten Riet 17**  
**9494 Schaan**  
(party to the proceedings)

regarding measures of special regulation on the wholesale market for access to local loops provided at fixed locations

on DD. Month 20YY

has decided as follows:

#### RULING

##### 1. Market definition

The relevant product and geographic market for the present procedure is defined on the basis of art. 21 para. 1 of the Communications Act ("KomG") as the wholesale market for physical access to subscriber lines provided locally at fixed locations. The market comprises the entire national territory of Liechtenstein.

2. Single significant market power

Based on the market analysis carried out, it is established in accordance with art. 22 para. 1 KomG that there is no effective competition on the wholesale market for physical access to subscriber lines at fixed locations and that the party to the procedure has single significant market power in accordance with art. 22 para. 1 let. b KomG.

3. Measures of special regulation

In order to eliminate the competition problems identified, the following specific obligations (measures of special regulation) are imposed on the party to the procedure with regard to the wholesale market in question on the basis of art. 23 para. 1 KomG:

- a Pursuant to art. 23 para. 1 let. d KomG and art. 37 para. 1 VKND, the party to the procedure must grant any other operator physical access to subscriber lines and access to cable ducts and to ancillary services, in particular physical access to core network fibre optic and services in central offices, upon reasonable request.
- b According to art. 34 VKND, the party to the proceedings must grant any requesting provider the same conditions for all services as it grants itself or affiliated or other undertakings.
- c In accordance with art. 34 para. 3 and art. 35 VKND, the party to the procedure shall immediately publish the reference offer approved by the Office for Communications, in the version Vx.x of DD. month 2023, for physical access to subscriber lines, as well as access to cable ducts and to ancillary services, in particular physical access to core network glass fibre and services in central offices, on the company's website and keep it up to date. Planned changes to the reference offer must be submitted to the Office for Communications for approval with a lead time of at least six weeks prior to their application. The party to the procedure must inform its wholesale customers of the new regulation of the reference offer within 14 days of notification of this order. The party to the procedure shall be obliged to apply the services, regulations and time limits provided for in the reference offer uniformly from the 1st month of 2024 to all wholesale customers who purchase or order a service regulated in the reference offer.
- d The party to the procedure must provide the Office for Communications with all information required for cost control and monitoring of the non-discrimination obligation in a transparent manner in accordance with art. 35 VKND.
- e According to art. 36 VKND, the party to the procedure must keep separate records for regulated and unregulated areas or products in accordance with the specifications of the Office for Communications.
- f Pursuant to art. 23 para. 1 let. d KomG and art. 38 para. 1 VKND, the party to the procedure must charge cost-oriented fees for the provision of physical access to subscriber lines and for the provision of access to cable ducts and to ancillary services, in particular physical access to core network glass fibres and services in

central offices. The cost-oriented charges shall be calculated on the basis of a cost accounting model to be approved. In assessing the cost orientation and efficient provision of services, the Office for Communications shall take into account international comparative values (benchmarking) on the basis of art. 38 para. 2 VKND. The Office for Communications will calculate, or approve respectively, the corresponding charges on the basis of the cost accounting model submitted in accordance with ruling no. 4.

4. Cost accounting model

The cost accounting model submitted by the party to the proceedings, consisting of the Excel document "XXXX" in the version of DD. Month 2023 and the document "Description of Cost Accounting" in the version of DD. Month 2023, which is attached to the present decision, is approved as follows.

- a The structure and systematics of the reviewed cost accounting model are approved, which, in accordance with the obligations set out in ruling 3.f and complies with the specification of the Office for Communications of 9 June 2022.
- b The volume and cost data of the cost accounting model based on the 2021 and 2022 business closing figures, the 2023 budget figures, and the projected values for 2024-2034 are approved.
- c The following useful life values are approved for the assets:
 

• Subscriber line glass fibre	(asset groups 500-011, 500-004):	35 years
• Backhaul glass fibres	(asset group 500-005):	35 years
• Cable ducts local loop	(asset group 500-006):	45 years
• Cable ducts backhaul	(asset group 500-007):	45 years
• Twisted Pair Copper Wire	(asset groups 500-008, 500-001):	20 years
• Coax Access	(asset groups 500-009, 500-003):	20 years
• Active components - electrical equipment rooms:		10 years
	(asset groups 510-001)	
• Active components - electrical equipment networks:		10 years
	(asset group 510-002)	
• Technical facilities/equipment:	(asset group 510-003)	20 years
- d Depreciation costs are calculated on a straight-line basis from the acquisition value over the intended useful life. Depreciation ends as soon as the accumulated depreciation reaches the acquisition value of the asset.
- e The weighted average cost of capital rate for the calculation of the imputed cost of capital ("WACC") is 2.84%.
- f Allocation keys of the cost accounting model apply as follows:
  - i. The cost of the cost centre 3555 Cable Ducts Access is allocated in the following proportions:

Cost centre 3570 FTTH Layer1	98.35%,
Cost centre 3530 LWL Core	1.37%,
Cost unit 350175 Cable Ducts Access	0.28%

(Average values for the period 2024-2034)

- ii. The cost of the cost centre 3560 Cable Ducts Backhaul is allocated in the following proportions:

Cost centre 3530 LWL core	97.87%,
Cost unit 350176 Cable Ducts Backhaul	2.13%

(Average values for the period 2024-2034)

- iii. The cost of the cost centre 3550 Central Offices is allocated to cost units in the following proportions:

Cost unit 350150 Collocations	82.72%,
Cost unit 350170 FTTH	11.39%,
Cost unit 350120 Dark Fibre Backhaul	5.89%

(Average values for the period 2024-2034)

- g Building connection fees are recognized as liabilities and released on a straight-line basis over the useful lives of the Copper pairs Access, Coax Access and ULL-fibre asset groups in cost unit 350170 FTTB.

- h The incremental asset costs and the operational costs for building fibres have been removed from the asset, cost centre and cost unit of local loop / ULL fibre, thus reducing the ULL fibre costs.

- i The party to the procedure shall be obliged to review and, if necessary, revise its cost accounting model in the event of a significant change both in terms of structure and systematics as well as in terms of quantities, calculation methods and procedures and to resubmit it to the Office for Communications for approval. Significant changes include, in particular, changes in network structures, relevant changes in sector-specific law, the introduction of new services or technologies, changes in useful lives, book values or other parameters in accounting or any other change which appears likely to have a significant influence on the result of cost accounting.

#### 5. Charges

The charges submitted by the party to the procedure on **DD. Month 2023 on the** basis of the cost accounting model for all regulated products are approved subject to the following points.



## a Approved charges:

(Charges as presented in the public consultation from July 18 to August 28)

## 1. Central Office

Product	one-off CHF	Unit	recurring monthly CHF
<b>Rackspace Shared Room</b>			
1/1 Rack (Rackspace)	1'250.00	Pcs.	500.00
1/2 Rack (Rackspace)	1'250.00	Pcs.	250.00
1/3 Rack (Rackspace)	1'250.00	Pcs.	167.00
1 height unit	500.00	Pcs.	11.00
Energy up to 1 kW band load included <sup>47</sup>	(-)	kWh	(-)
Energy higher than 1 kW Band load	(-)	kWh	0.30 <sup>48</sup>
<b>Private Room</b>			
Area (gross area)	(-)	m <sup>2</sup>	25.00
Energy	(-)	kWh	According to tariff contract Supplier with LKW (electricity)
Access means/key (1x included)	100.00	Pcs.	(-)

## 2. Cable Ducts

Product	Unit	Fee
<b>recurring</b>		
Access network	CHF/m/month <sup>49</sup>	0.107
Backhaul network	CHF/m/month <sup>49</sup>	0.128
<b>one-off</b>		
Feasibility study incl. cost estimate for project planning order (for connection network and core network)	CHF/order	280.00
Project planning of the cable laying project	CHF/hour	150.00

## 3. Fibre Backhaul

Product	one-off CHF	recurring CHF/m/year		
		SLA 1	SLA 2	SLA 3
1 fibre	(-)	0.48	0.54	0.73
1 fibre pair	(-)	0.96	1.02	1.21
Provision incl. 2 patchings				
1 fibre	1'700.00			
n* fibre pair	1'700.00			
Further patching per fibre	200.00			
Further patching per fibre pair	275.00			

<sup>47</sup> Equivalent to approx. 720 kWh per month.

<sup>48</sup> Incl. grid feed-through and statutory charges; tariff is reviewed annually and adjusted according to price developments.

<sup>49</sup> The invoiced length of the cable ducts corresponds to the effective course of the cable ducts.

Product	one-off CHF	recurring CHF/m/year		
		SLA 1	SLA 2	SLA 3
Prioritised troubleshooting per fibre from SLA 1 to SLA 3	2'000.00	(-)		
Transfer cable to the optical distribution frame				
1 x 6 fibres	1'000.00			
1 x 12 fibres	2'000.00			
1 x 24 fibres	3'600.00			

#### 4. Fibre Local Loop (ULL)

Product	one-off CHF		recurring monthly		
			SLA 1 CHF	SLA 2 CHF	SLA 3 CHF
1 fibre	(-)		21.95	47.50	301.30
2 fibres	(-)		43.90	95.00	602.60
Patching/pre-patching: 1 - 5 fibres	Basic charge per central office	additional per fibre	(-)		
from 6 fibres for all fibres	30.00	18.00			
Saturdays and bridging days	30.00	11.00			
	60.00	36.00			
Prioritised troubleshooting per fibre from SLA 1 to SLA 3	2'000.00 per fault repair				
Laying whip cable	according to expenditure, 126.00 CHF/h				

#### 5. NeDocS

Product	one-off CHF	recurring annually CHF
Setup client and access NeDocS, HW platform and Oracle licences (excl. application training, one-off amount to be determined annually, depending on Oracle and Nedocs licences)	12'100.00	1'200.00

- b The party to the proceedings shall be obliged to include the charges for the regulated products in the respective approved version of its reference offer as a price cap.
- c The party to the procedure shall be obliged to apply the charges published in its reference offer uniformly to all wholesale customers as of **1st month 2024**.
6. Building fibres  
The use of the building fibres by the party to the procedure is only permitted in connection with the operation of its smart meters for meter reading and consumer control of the basic suppliers for electricity, heat, gas and water. Any other use of the building fibre, such as for building automation, building security, smart home, video surveillance, medical applications (alarm button) or other electronic communication services, is excluded.

7. Period of validity and important circumstances

This ordinance shall be effective from **Month 1, 2024** for at least five years. If there are important circumstances, the party to the procedure - as well as other market participants - can request a revision or a new market analysis by submitting a request to the Office for Communications, stating reasons which are supported by evidence.

8. Ordinances from the preceding market analysis round

The present ordinance replaces all orders from the preceding market analysis round, in particular:

- Ordinances of 16 December 2009 concerning special regulation measures in the wholesale market for physical access to network infrastructures at fixed locations,
- Ordinances of 22 May 2014 concerning special regulation measures on the wholesale market for physical access to network infrastructures for high-capacity transmission paths in the core network,
- Ordinances of 7 October 2014 regarding the approval of a cost accounting model,
- Ordinances of 15 January 2015 regarding the approval of the fees of the regulated products,
- Ordinances of 15 January 2015 regarding the approval of the "Reference offer subscriber line copper",
- Ordinances of 15 January 2015 regarding the approval of the "Reference offer Collocation".
- Ordinance of 4 January 2020 regarding the approval of "TBB".

9. Fees

The costs of this decision remain with the Land.

**Facts**

...

**Reasons for the decision**

...

**Information on Legal Remedies**

...

An appeal against this order/decision may be lodged with (name of the issuing authority) or with the (name of the appellate authority: government or one of the special appeal commissions) within 14 days of notification.

The complaint must contain:

- The name of the contested decision,
- the statement whether the decision is contested in its entirety or only in individual parts,
- and in the latter case the exact designation of the contested part,
- the grounds of appeal,
- the motions,

- the evidence by which the grounds for challenge are to be supported and proved,
- the signature of the complainant.

Vaduz, **TT. Month 20YY**

File number 731.3 / 2020-1136

OFFICE FOR COMMUNICATIONS

Dr. Rainer Schnepfleitner

Director

Attachments:

- Document "Analysis of the wholesale market for locally provided physical access to subscriber lines at fixed locations".
- Document «Beschreibung Kostenrechnung» (Description of costing model)
- Document «Beschreibung der Berechnung des gewichteten durchschnittlichen Kapitalkosten-Zinssatzes (Weighted Average Cost of Capital - WACC)» (Calculation of WACC)
- Document «Standardangebot für den Zugang zur passiven Infrastruktur des Kommunikationsnetzes der LKW» (reference offer)

## Appendix 2 Benchmarking

The purpose of this benchmarking is to assess whether the prices determined using the full cost model are within a reasonable range of the regulated cost-based prices set by other regulators for similar access products.

At the outset, it must also be clearly stated that the legal framework provides for charges to be determined on the basis of costs and that benchmarks can only serve as a plausibility check.

The AK follows three approaches for benchmarking:

1. CAPEX of fibre optic connection networks: Is the investment sum for the FTTB network per connection in a plausible range, compared to other network construction projects with as similar network architecture as possible?
2. Charge benchmark for local loop fibre: Is the cost-oriented charge calculated with the cost accounting model in a plausible range compared to other local loop fibre regulations? The benchmarking should be based on regulated cost-oriented wholesale fibre prices for networks that are as similar as possible to the LKW network.
3. Charge benchmark for cable ducts: Is the cost-oriented charge calculated with the cost accounting model in a plausible range, compared to other cable duct regulations that were created under construction and environmental conditions that are as similar as possible?

The first approach focuses on the investment (CAPEX), which, due to the high asset values, leads to a significant cost input into the cost accounting model in the form of the imputed costs (depreciation, interest on capital).

In the latter two approaches, the comparison starts on the output side of the cost accounting model, i.e. charges are examined that depend on the incoming operating costs, the imputed costs, the quantity structures and the allocation keys.

For the provision of the international benchmark data, the AK commissioned the consultancy firm GOS Consulting Limited<sup>50</sup>, which has the relevant expertise in regulatory cost accounting, to provide meaningful benchmarking to contribute to the AK's work on setting cost-based regulated access prices for the LKW FTTB -point-to-point fibre access network and for access to ducts used for this network.

In addition, the AK draws on already known points of comparison from the Swiss area.

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<sup>50</sup> GOS Consulting Limited - The Laithe House, Woods Lane, Cliddesden, RG25 2JF, Hampshire, UK, [www.gos-consulting.com](http://www.gos-consulting.com)

## 1. Construction method for fibre optic connection networks

For a benchmark it is essential that access networks with corresponding network architecture are compared. A distinction must be made between point-to-point and PON on the one hand and between FTTP/H and FTTB on the other.

### Point-to-point fibre optic network architecture

Point-to-point (P2P) fibre networks lay dedicated fibres between the connection centre and the end customer location. Typically, operators provide the fibres in pairs and one or two fibre pairs are deployed at the end customer site.

P2P fibre networks require a high number of fibres in the network and therefore larger routes or manholes to lay these fibre cables. However, P2P networks offer a dedicated (not shared) connection for each end customer and are therefore considered the networks with the highest quality and availability.

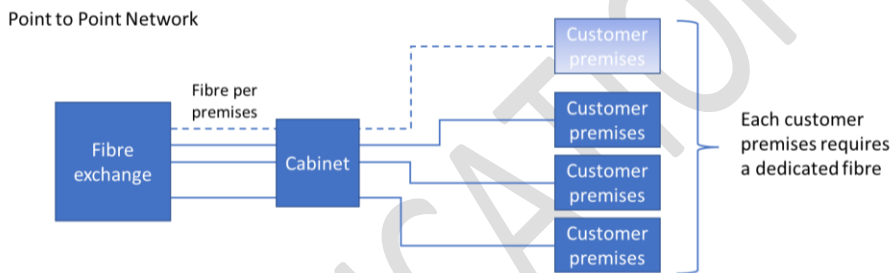


Figure 9: Point-to-point network architecture with dedicated fibre connection from the connection centre to the end-user site. [Source: GOS]

### Passive optical networks (PONs)

PONs use a shared fibre architecture, so a smaller number of fibres are required in the core area of the network. This results in lower deployment costs.

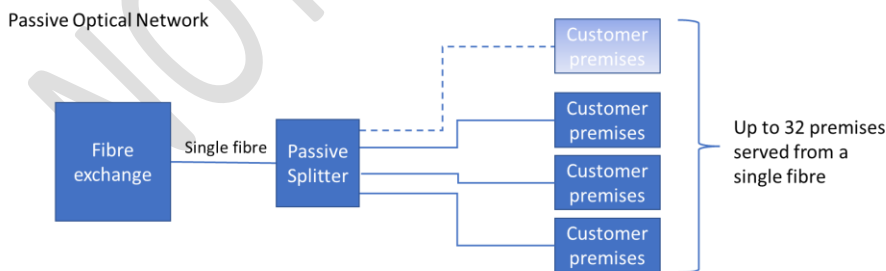


Figure 10: PON network architecture with shared fibres between the connection centre and the passive splitter. [Source: GOS]

Both P2P and PON-based fibre access networks can be provided in two different network architectures, namely up to the end customer's premises (known as Fibre to the Premises (FTTP) or Fibre to the Home (FTTH)) or up to the boundary or basement of the building where

the end customer is located (known as Fibre to the Building (FTTB)). They are briefly described below.

### FTTP/FTTH

The terms FTTP and FTTH are synonymous. In this form of fibre roll-out, the fibre connection is laid into the building and (for end customers in apartment buildings) into the individual flats within the building. The costs for FTTP/H expansion therefore also include the not inconsiderable costs for these end connections.

### FTTB

FTTB networks are effectively "shorter" than FTTP/H networks, as the final connection to the end customer is not included. Therefore, FTTB costs will generally be lower than those for FTTP/H networks.

The two options are presented below:

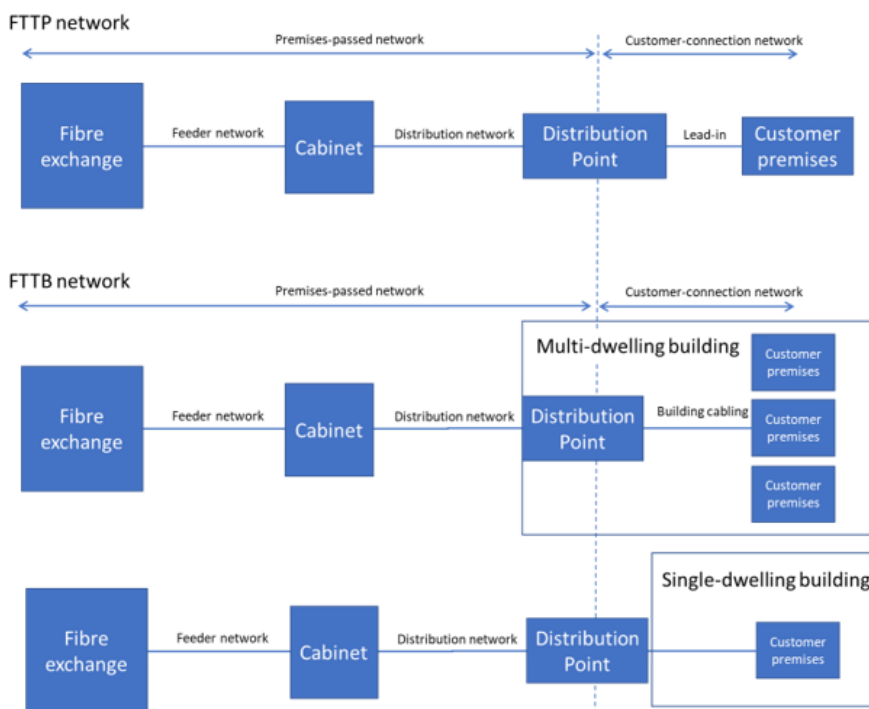


Figure 11: Comparison of FTTP/FTTH network design with FTTB design [Source: GOS].

The LKW network is a P2P FTTB network. Thus, the benchmarking should be based on regulated, cost-oriented fibre access on networks that are as similar as possible to the LKW network.

## 2. FTTB investment benchmark - CAPEX per unit of use

The construction costs (investment, CAPEX) of the fibre optic access network significantly determine the costs of the local loop via the imputed costs for interest on capital and depreciation. An inefficient network construction would mean too high a cost input into the cost accounting model with a correspondingly too high calculation result for the costs of the local loop. Benchmarking the investment costs per connection thus addresses the question of how efficient the construction of the LKW FTTB access network is compared to other such network construction projects.

A benchmark of the investment per connection should include comparable point-to-point FTTB architectures (i.e. one optical fibre per unit of use from the connection centre to the network termination point at the user's location), with optical fibre laid in duct systems that are largely installed in the road body in built-up areas. When making comparisons with network construction projects outside the CHF currency area, it is also important that the comparison is made taking into account purchasing power parity, as a very high proportion of network construction costs are attributable to construction activities that are subject to national economic conditions.

### International benchmark

The consultancy GOS states in the benchmark report that the predominant PON construction method makes it impossible to build a meaningful benchmark for point-to-point FTTB.

The data collected by GOS for PON construction represents the Cost per Premises Passed (CPP) costs. The cost categories usually included in CPP are: Civil engineering (digging trenches, erecting poles, etc.), conduits, fibre cables, connectors and other equipment required for the network (but not the house connection). GOS explains the very wide range of values in Table 5 with different network characteristics such as new construction or use of existing conduit systems, cable routing through conduit systems or over poles, building mix (single vs. multi-family), and construction techniques. All these characteristics are mostly unavailable for secondary source data.

As the data available to GOS come from secondary sources, a comparison taking into account purchasing power parity also encounters conceptual obstacles, which is why GOS converted the investment amounts into CHF using the exchange rate of 25.4.2023.

PON networks - Cost per Premises Passed (CPP)				
Country	Currency	Exchange rate 25.4.2023 <sup>51</sup>	Average investment per building	
			Local currency	CHF
Australia	AUD	0.5911	2'522	1'491
Austria	EUR	0.9788	2'500	2'447
Europe	EUR	0.9788	475	465

<sup>51</sup> Spot rates as of 25.4.2023, retrieved from <https://www.xe.com/currencyconverter/>



PON networks - Cost per Premises Passed (CPP)				
Country	Currency	Exchange rate 25.4.2023 <sup>51</sup>	Average investment per building	
			Local currency	CHF
Germany	EUR	0.9788	1'149	1'125
Italy	EUR	0.9788	331	324
United Kingdom	GBP	1.1057	373	413
USA	USD	0.8868	1'183	1'049

Table 5 : Benchmark of CPP cost per premises passed for PON networks [Source: GOS].

GOS writes:

*PON-based networks are generally cheaper than point-to-point networks and FTTB networks are cheaper than FTTP/H networks (once the premises are connected), as the FTTP/H network includes the cost of connecting the premises, whereas the FTTB network terminates at the property line.*

*As the LKW network uses a P2P architecture, the cost per connected building is expected to be higher than when using PON.*

Due to the many deviations from the requirements of the benchmark needed, the data in Table 5 can only be used as a very limited comparison for the LKW network.

### Points of comparison in the Swiss area

The following table compiles data for point-to-point network construction projects determined by the AK in the Swiss, i.e. CHF area. The total CAPEX amounts of the network construction projects in Table 6 refer to the expansion of the point-to-point fibre optic connection network using existing duct facilities.

Land, Operator	Data source	Connection density Use units per km <sup>2</sup> Settlement area	Network architecture	Fibre model (NE: fibres per unit of use, G: fibres for buildings)	Capex in FTTB/H fibre network (without duct installations) per unit of use in CHF
Liechtenstein LKW	LKW <sup>52</sup>	1'400	P2P FTTB	2 NE + 2 G	2'200
Switzerland Operator (confidential)	Information of the operator to AK	3'000	P2P-FTTB / P2P-FTTH	4 NE	2'200
Switzerland, St.Moritz	Voting documents concerning the project "Realisation of a FTTH	2'500	P2P FTTH	2 NE + 1 G	2'400

<sup>52</sup> FTTB investment according to post-calculation LKW for the years 2017-2021 and values of the cost accounting model for the years 2022 and 2023. 25,000 usage units will be connected in these years.

Land, Operator	Data source	Connection density Use units per km <sup>2</sup> Settlement area	Network architecture	Fibre model (NE: fibres per unit of use, G: fibres for buildings)	Capex in FTTB/H fibre network (without duct installations) per unit of use in CHF
	glass fibre infrastructure <sup>53</sup>				
Switzerland	Study for Swiss OFCOM, WIK <sup>54</sup>	Cluster 1 >7'000	P2P FTTH	1 NE	1'434
		Cluster 2 4'000-7'000			1'801
		Cluster 3 2'500-4'000			2'173
		Cluster 4 1'600-2'500			2'429
		Cluster 5 1'150-1'600			2'941
		Cluster 6 800-1'150			3'008

Table 6: Investment per grid connection for P2P FTTH design

### Comparison with Capex of the LKW

LKW's network construction costs for the FTTB fibre network, excluding investments in duct installations, are in a plausible range at CHF 2,200 per connected unit of use, both in comparison with the network construction projects of two Swiss municipalities, and in relation to the study by WIK for the attention of Swiss OFCOM on modelling the costs of a nationwide high-bandwidth network in Switzerland.

### 3. Charge benchmark for local loops for fibre optics

The consultancy GOS has not been able to fulfil the AK's mandate to provide a benchmark for cost-oriented regulated access prices to unbundled local loop fibre due to the lack of comparable regulations, in terms of the cost approach (orientation to the costs of network construction vs. orientation to price differences between wholesale and retail or to anchor products based on copper access lines) and in terms of the network architecture (point-to-point FTTH with individual fibres for each usage unit vs. PON with shared, branching fibre networks).

GOS explains:

*While the LKW network is a P2P FTTH network and benchmarks should ideally include the cost of regulated access to directly comparable networks, changes in regulatory policies and practices mean that very few regulators set cost-based prices for access to fibre networks using detailed costing models, instead using other tools that explicitly*

<sup>53</sup> [https://www.gemeinde-stmoritz.ch/fileadmin/user\\_upload/dokumente/pdf/botschaften/2021\\_01\\_31\\_Botschaft\\_Kredit\\_10.5\\_Mio\\_Realisierung\\_FTTH\\_Glasfaserinfrastruktur.pdf](https://www.gemeinde-stmoritz.ch/fileadmin/user_upload/dokumente/pdf/botschaften/2021_01_31_Botschaft_Kredit_10.5_Mio_Realisierung_FTTH_Glasfaserinfrastruktur.pdf)

<sup>54</sup> Study for the Federal Office of Communications, modelling the costs of a nationwide high-speed broadband network in Switzerland  
Values from Table 4-7, Figure 2-4: 79% share of the investment for FTTH.  
[https://www.bakom.admin.ch/dam/bakom/de/dokumente/bakom/das\\_bakom/rechtliche\\_grundlagen/Bundesgesetz/KVF-NR%2012.02.2018/wik-bericht%20hochbreitband.pdf.download.pdf/WIK-Bericht%20Hochbreitband\\_final.pdf](https://www.bakom.admin.ch/dam/bakom/de/dokumente/bakom/das_bakom/rechtliche_grundlagen/Bundesgesetz/KVF-NR%2012.02.2018/wik-bericht%20hochbreitband.pdf.download.pdf/WIK-Bericht%20Hochbreitband_final.pdf)

*incentivise incumbents and new entrants to invest in new fibre networks. We therefore found that it was not possible to find a meaningful sample of fibre network access prices set on the basis of cost calculation models.*

*Furthermore, most fibre networks currently being built are not P2P FTTB networks, but PON (Passive Optical Network) FTTP or FTTH networks.*

*These differences between the AK approach to setting regulated prices for access to fibre networks and the approach used by most other regulators, as well as between the technology used by LKW and the network design used by other providers, have meant that it is not possible to find directly comparable prices for fibre access.*

GOS was therefore unable to produce a meaningful benchmark for the LKWs' ULL fibre.

Two individual points of comparison for the LKW local loop fibre charge are provided by the offers from Post Luxembourg<sup>55</sup> and Swisscom. In Table 7 shows the fibre-optic access prices converted into CHF in local currency and taking into account purchasing power parity. LKW's charge is lower than Swisscom's non-regulated price of CHF 24.00 and also lower than Post Luxembourg's regulated price of CHF 30.84 converted to purchasing power. The other prices for the various services in connection with local loop fibre are shown below in extracts for Post Luxembourg and Swisscom.

Country, operator	Product	Offer	Regulation	Monthly fee	
				local currency	CHF PPP <sup>56</sup>
Luxembourg, Post Luxembourg	Local Loop Fibre P2P FTTB	Reference Unbundling Offer (RUO) Copper & Fiber, version 2.1.1, valid from 1.4.2022	Yes ERT <sup>57</sup>	EUR 19.95	CHF 30.84 <sup>58</sup>
Switzerland, Swisscom	Local Loop Fibre P2P FTTH	Access Line Optical (ALO) Version 2-5, valid from 1.10.2022	No	CHF 24.00	CHF 24.00
Liechtenstein, LKW	Local Loop Fibre P2P FTTB	Standard offer for access to the passive infrastructure of the LKW communication network, version 1.0, consultation version	Yes Cost orientation	CHF 21.95	CHF 21.95

Table 7: Local loop fibre prices in local currency and purchasing power adjusted in CHF [Source: AK].

<sup>55</sup> GOS identified the Luxembourg regulator as one of the few that set ERT-regulated prices for fibre access using specific cost accounting models for fibre.

<sup>56</sup> PPP Eurostat 2021 purchasing power parities, weighted purchasing power parity: 90% Category A050203 Building and civil engineering, 10% Category A050102 Electrical and optical equipment

<sup>57</sup> Economic Replicability Test: The price difference between the retail product and the regulated company's fibre access must enable demanders of fibre access to enter the retail market.

<sup>58</sup> LUX Purchasing Power Parity to Purchasing Power Standard EU27\_2020, Eurostat 2021: CAT A050203, Building and Civil Engineering: 1.092, CAT A050102 Electrical and Optical Equipment: 1.078, MIX weighting 90% Construction / 10% Electr.Opt.: 1.091. Thus, LUX in Purchasing Power Standard EU27: 18.29. Purchasing Power Parity of Switzerland: CAT A050203: 1.745, CAT A050102: 1.156, MIX weighting 90% Construction / 10% Electr.Opt.: 1.687. Thus, LUX in Purchasing Power CHF: 18.288 \* 1.687 = 30.84.

## Post Luxembourg RUO - Tariffs

Website:

<https://www.posttechnologies.lu/documents/194199/2697755/RUOv2.1.1.pdf/bccd05c2-580c-4910-9496-c0fb78874e75>

### Schedule 9. Tariffs

This schedule presents the specific tariffs applicable to RUO Services.

These tariffs are only applicable to all services with a minimum contract duration of 6 months.

#### 9.1. FTTH Fibre Access Service

Item	Euro
Connection charge for a new or modified FTTH Fibre Access connection not requiring any intervention at end customer's premises	75,09
Connection charge for a new or modified FTTH Fibre Access connection and measurement, intervention at ODF and end customer's premises, including travel costs	118,79
Migration of an existing FTTH Fibre Access from Donor to Recipient Operator not requiring any intervention at end customer's premises	82,64
Conversion of an existing VULA or fibre-based Bitstream Service to a FTTH Fibre Access Service not requiring any intervention at end customer's premises	75,09
Conversion of an existing VULA or fibre-based Bitstream Service to a FTTH Fibre Access Service requiring an intervention at end customer's premises, including travel costs	118,79
Monthly rental for a FTTH Fibre Access Service	19,95
Training course for the fibre management and installation works at the FO-NTP	300 <sup>1</sup> , -
Negative answer to an FTTH order* or cancellation of an order before activation	16,21
FTTH Fibre Access Hand-back charge	14,93

\*Only applicable in case POST Technologies' search engine showed clearly that the specific address is not yet served by POST Technologies' FTTH network.

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### 9.3. FTTO Fibre Access Service

Item	Euro
Connection charge FTTO - connection and measurement at ODF and at End User's premises including travelling	703,99
Monthly rental for a FTTO service	48,- per km Up to a maximum of 288,-€ per FTTO service *)
Training course for the fibre management and installation works at the FO-NTP	300,-
Request for quote and reservation of fibre for a duration of 3 months (per fibre)	154,34
Site survey	164,58
FTTO Hand-back charge	29,86

\*) Sites connected by the FTTO network are mostly connected to more than one Local Exchange in order to allow for redundant setups. The price cap as mentioned before, which equals to a maximum billed length of 6 km (6km\*48€/km =288€), is only valid if the FTTO Fibre Access Service terminates within the nearest Local Exchange or within a Local Exchange proposed by POST Technologies. If the Operator for some reason chooses a different Local Exchange (e.g. diverse routing, no colocation presence), the entire fibre length will be billed if it exceeds the length of 6 km. Please also note that a minimum length of 1 km will be invoiced even if the actual fiber length is only a fraction of one km.

### 9.5. Rush Order Fees for MPF, FTTH, FTTO and VULA Services

Item	Euro
Rush Order type 1 (within 2 Business Days)	1.000,-
Rush Order type 2 (within 5 Business Days)	750,-
Rush Order type 3 (within 10 Business Days)	500,-

### 9.6. Fault Repair Fees for MPF, FTTH, FTTO and VULA Services

Item	Euro
During Business Hours (8:00 – 17:00), fault in POST Technologies' Network	Free of charge
During Business Hours (8:00 – 17:00), fault in the Operator's Network	Invoiced per hour
Priority intervention Monday to Friday 7:00 – 19:00, Saturday 8:00 – 12:00, fault in POST Technologies' or the Operator's Network	Invoiced per hour Min. 250,- EUR per intervention <sup>*)</sup>
Priority intervention Monday to Friday 19:00 – 7:00, Saturday 0:00 – 8:00 and 12:00 – 24:00, Sundays and public holidays, fault in POST Technologies' Network or the Operator's Network	Invoiced per hour Min. 500,- EUR per intervention <sup>*)</sup>

\*) Minimum charge will not apply if the Operator has chosen the Business Service Level for its MPF, FTTH, FTTO or VULA Service

## Swisscom contract regarding Access Line Optical (ALO) - Prices

Website:

<https://www.swisscom.ch/de/business/wholesale/angebot/anschluesse/access-line-optical.html>

### 2 Wiederkehrende Preise

#### 2.1 Teilnehmeranschlussleitung

Beschreibung	Pro Leitung und Monat (CHF)
Überlassung einer ALO	24.00

### 3 Einmalige Preise

#### 3.1 Bereitstellung

##### 3.1.1 Neuschaltungen

Beschreibung	Pro Neuschaltung einer Leitung inkl. Kündigung (CHF)
Neuschaltung einer ALO	107.00
Faserstecken am OHDF bei Anbindungsvariante 1 (Optionale Leistung, falls von FDA gewünscht. Pro Neuschaltung)	15.50
Anpassung an einer aktiven ALO (z.B. ein von der FDA gewünschter Wechsel des Breakoutkabels)	127.80
Zuschlag für Expressschaltung einer ALO	500.00

##### 3.2.1 Störungsbehebung ALO

Beschreibung	Pro Störungsbehebungsauftrag (CHF)
Störungsbehebung einer ALO	391.10
Zuschlag für priorisierte Störungsbehebung einer ALO	1600.00

## 4. Charge benchmark for cable ducts

The prices for cable duct rental determined by GOS for the benchmark are taken from published standard offers found on the websites of operators or regulators. All prices used refer to access to cable ducts in the access network.

There are different price structures in the standard offers:

- The prices are based exclusively on the length of the empty conduit used;
- Prices vary depending on the number of pipes in the route
- Pricing is based on the cross-sectional area of the occupied empty pipe
- Prices vary depending on the type of surface (e.g. carriageway, footpath or grass verge).

The following Table 8 contains cost-oriented regulated prices and price bases for the use of cable ducts from 11 countries.

Country	Company / Organisation	Year	Comment	Rental prices											Source	
				Rental per metre per month	Rental per km per month	Rental per quarter cable duct per metre per month	Rental per @2 bores per metre per year	Rental per @3+ bores per metre per year	Rental per carriageway duct per metre per year	Rental per footway duct per metre per year	Rental per verge duct per metre per year	Rental per sq cm per metre per month	Space in sub-duct per sq cm per month	Space in duct per sq cm per month		
Luxembourg	POST	2018		€ 0.11												<a href="#">59</a>
Ireland	open eir	2022	Dublin						€ 2.84	€ 2.12	€ 1.22					<a href="#">60</a>
Ireland	open eir	2022	Provincial						€ 1.92	€ 1.45	€ 1.00					<a href="#">61</a>
Finland	Elisa	2020	Zone 1	€ 0.30												<a href="#">62</a>
Finland	Elisa	2020	Zone 2	€ 0.20												<a href="#">63</a>
France	Orange	2023										€ 0.03				<a href="#">64</a>
Portugal	PT	2022	Lisboa & Porto										€ 6.89	€ 6.37		<a href="#">65</a>
Portugal	PT	2022	Outside Lisboa & Porto										€ 5.40	€ 4.88		<a href="#">66</a>
Spain	CNMC	2022	For Ø40mm subduct		€ 46.50											<a href="#">67</a>
Spain	CNMC	2022	For space within												€ 3.70	<a href="#">68</a>

<sup>59</sup> [https://www.posttechnologies.lu/documents/194199/2697755/RUO\\_2018.pdf](https://www.posttechnologies.lu/documents/194199/2697755/RUO_2018.pdf)

<sup>60</sup> [https://www.openeir.ie/wp-content/uploads/2022/09/ARO-Price-List-V23\\_0-Marked-01102022.pdf](https://www.openeir.ie/wp-content/uploads/2022/09/ARO-Price-List-V23_0-Marked-01102022.pdf)

<sup>61</sup> [https://www.openeir.ie/wp-content/uploads/2022/09/ARO-Price-List-V23\\_0-Marked-01102022.pdf](https://www.openeir.ie/wp-content/uploads/2022/09/ARO-Price-List-V23_0-Marked-01102022.pdf)

<sup>62</sup> [https://static.elisa.com/v2/image/2tqybbhjs47b/70SPO0SrfR9Yb92dFi0aQX/Lease\\_of\\_Cable\\_Placement\\_Right\\_Price\\_01062020.pdf?w=800](https://static.elisa.com/v2/image/2tqybbhjs47b/70SPO0SrfR9Yb92dFi0aQX/Lease_of_Cable_Placement_Right_Price_01062020.pdf?w=800)

<sup>63</sup> [https://static.elisa.com/v2/image/2tqybbhjs47b/70SPO0SrfR9Yb92dFi0aQX/Lease\\_of\\_Cable\\_Placement\\_Right\\_Price\\_01062020.pdf?w=800](https://static.elisa.com/v2/image/2tqybbhjs47b/70SPO0SrfR9Yb92dFi0aQX/Lease_of_Cable_Placement_Right_Price_01062020.pdf?w=800)

<sup>64</sup> <https://gallery.orange.com/h/5bMV3a>

<sup>65</sup> <https://ptwholesale.pt/en/servicos-nacionais/infraestruturas/Pages/orac.aspx>

<sup>66</sup> <https://ptwholesale.pt/en/servicos-nacionais/infraestruturas/Pages/orac.aspx>

<sup>67</sup> <https://www.cnmc.es/sites/default/files/4004719.zip>

<sup>68</sup> <https://www.cnmc.es/sites/default/files/4004719.zip>

Country	Company / Organisation	Year	Comment	Rental prices											Source		
				Rental per metre per month	Rental per km per month	Rental per quarter cable duct per metre per month	Rental per @2 bores per metre per year	Rental per @3+ bores per metre per year	Rental per carriageway duct per metre per year	Rental per footway duct per metre per year	Rental per verge duct per metre per year	Rental per sq cm per metre per month	Space in sub-duct per sq cm per km per month	Space in duct per sq cm per km per month			
			Ø110mm duct														
Spain	CNMC	2022	For Ø63mm subduct		€ 130.70												<a href="#">69</a>
Spain	CNMC	2022	For space within Ø63mm duct												€ 10.24		<a href="#">70</a>
Switzerland	Swisscom	2022	Per cable	CHF 0.21													<a href="#">71</a>
Greece	EETT	2018	Per pipeline	€ 0.07													<a href="#">72</a>
Norway	Telenor	2023	Per cable installed	NOK 4.43													<a href="#">73</a>
Germany	BNetzA	2022	Per quarter duct			€ 0.06											<a href="#">74</a>
UK	Openreach	2023	For Ø25mm subduct				£ 0.24	£ 0.16									<a href="#">75</a>

Table 8: Baseline data and price basis obtained from reference offers [Source: GOS].

<sup>69</sup> <https://www.cnmc.es/sites/default/files/4004719.zip>

<sup>70</sup> <https://www.cnmc.es/sites/default/files/4004719.zip>

<sup>71</sup> [https://www.swisscom.ch/content/dam/swisscom/de/ws/documents/D\\_FMG-Dokumente/KK-FMG/d\\_kk-fmg\\_handbuch-preisev3-12.pdf.dl.res/d\\_kk-fmg\\_handbuch-preisev3-12.pdf](https://www.swisscom.ch/content/dam/swisscom/de/ws/documents/D_FMG-Dokumente/KK-FMG/d_kk-fmg_handbuch-preisev3-12.pdf.dl.res/d_kk-fmg_handbuch-preisev3-12.pdf)

<sup>72</sup> [https://www.eett.gr/opencms/export/sites/default/admin/downloads/telec/apofaseis\\_eett/kanonistikes\\_apofaseis\\_eett/AP875-002.pdf](https://www.eett.gr/opencms/export/sites/default/admin/downloads/telec/apofaseis_eett/kanonistikes_apofaseis_eett/AP875-002.pdf)

<sup>73</sup> <https://www.telenorinfra.no/wp-content/uploads/2023/03/2023-03-01-Standardvilkar-Telelosji-fastnett-Bilag-2-Priser-og-prisforutsetninger.pdf>

<sup>74</sup> [https://www.bundesnetzagentur.de/DE/Beschlusskammern/1\\_GZ/BK3-GZ/2022/BK3-22-0003/BK3-22-0003\\_Entgelte\\_Download\\_BF.pdf](https://www.bundesnetzagentur.de/DE/Beschlusskammern/1_GZ/BK3-GZ/2022/BK3-22-0003/BK3-22-0003_Entgelte_Download_BF.pdf)

<sup>75</sup> <https://www.openreach.co.uk/orpg/home/products/pricing/loadProductPriceDetails.do?data=z75T9D0yFKL0UorCMMA7OVmB8c5ofXzFv23yZvBj9Z6rNZuinCs99NbkJZPD9hXYmiiixH6wrCQm97GZMyQ%3D%3D>



GOS has derived from the baseline data of the Table 8 GOS has "normalised" the type of cable duct and the price unit in order to obtain the most comparable cable duct access prices possible, adjusted for purchasing power and based on CHF-per-metre-per-month values.

Normalisation was carried out with the following adjustments:

- Ireland: Prices are available for two regions, Dublin and elsewhere; the Dublin price was used to better reflect Liechtenstein conditions. In addition, an average of the prices for carriageway, pavement and verge surfacing was taken.
- Finland: Prices are available for Zone 1 (urban areas/cities) and Zone 2 (other areas); Zone 1 prices have been used to better reflect conditions in Liechtenstein.
- France: The price is given per cm<sup>2</sup> of occupied cross-sectional area; this price has been adapted to a cross-section of 25 mm diameter to bring it into line with other countries.
- Portugal: The price is given per cm<sup>2</sup> of occupied cross-sectional area; this price has been adjusted to a cross-section of 25 mm diameter to align with other countries. Furthermore, the prices for Lisbon/Porto are listed separately from the rest of the country: The Lisbon/Porto price has been used.
- Spain: The price is given for a down tube of 40 mm diameter; this price has been adjusted to a cross-section of 25 mm to bring it into line with other countries.
- United Kingdom: Prices are given separately for the rental of pipes in train paths with 2 pipes and those with 3 or more pipes. An average value was formed from these prices in order to achieve alignment with other countries where no such distinction is made.

It should be noted that not all countries specify the diameter of the occupied space, but may specify "per cable", "per pipe", "per partial duct" or "per ¼ duct". As these are the only rental units available, GOS has assumed that they are broadly equivalent to the 25-30 mm diameters given in other countries.

## Benchmark prices for cable ducts in the access network

The benchmark data are shown below in Table 9.

Country	Year Price publication	Price per m per year	Local currency	PPP factor civil engineering <sup>76</sup>	PPP-adjusted price per m per month [CHF].	Duct diameter (mm)	Comment
Ireland	2022	2.06	EUR	1.1160	0.27	per sub-KK	Average of roadway / pavement / edge area for Dublin area
Finland	2020	3.60	EUR	1.5063	0.35	per cable	Zone 1 in urban areas
Luxembourg	2018	1.32	EUR	1.0959	0.18	30	

<sup>76</sup> PPP: Purchasing power parity based on category A050203 (civil engineering works). The latest available index was used; this is 2021 for all countries except the UK, where the index is 2020.  
[https://ec.europa.eu/eurostat/databrowser/view/PRC\\_PPP\\_IND\\_\\_custom\\_5305086/default/table?lang=en](https://ec.europa.eu/eurostat/databrowser/view/PRC_PPP_IND__custom_5305086/default/table?lang=en)

Country	Year Price publication	Price per m per year	Local currency	PPP factor civil engineering <sup>76</sup>	PPP-adjusted price per m per month [CHF].	Duct diameter (mm)	Comment
France	2023	2.00	EUR	1.1900	0.25	25	Price per cm <sup>2</sup> converted to 25mm diameter
Portugal	2022	0.41	EUR	0.8336	0.07	25	Price per cm <sup>2</sup> converted to 25mm diameter
Spain	2022	0.22	EUR	0.8171	0.04	25	Price per 40 mm diameter converted to 25mm diameter
Greece	2018	0.84	EUR	0.6819	0.18	per CC	
Switzerland	2022	2.57	CHF	1.7604	0.21	per cable	
UK	2023	0.20	GBP	1.0187	0.03	25	Average of 2-pipe and 3+pipe prices
Norway	2023	53.16	NOK	13.6592	0.57	per cable	
Germany	2022	0.72	EUR	1.3355	0.08	1/4 KK	

Table 9: Cost-oriented regulated benchmark prices for cable ducts in the access network, normalised to price-per-metre and adjusted for purchasing power [Source: GOS].

### Comparison with cost-based charges for cable ducting of LKW

The cost-oriented fee for cable ducts in the access network of the LKW is 0.107 CHF/m/month and is thus within the benchmark value range, below the median of 0.181 CHF/m/month.

Country	PPP-adjusted price per m per month [CHF].
United Kingdom	0.029
Spain	0.039
Portugal	0.072
Germany	0.079
<b>Liechtenstein</b>	<b>0.107</b>
Luxembourg	0.177
Greece	0.181
Median	0.181
Mean value	0.203
Switzerland	0.214
France	0.247
Ireland	0.271
Finland	0.351
Norway	0.571

Table 10: Comparison of cable ducting access network charges on a purchasing power adjusted CHF basis [Source: AK].

## Appendix 3 Regulatory approaches and concrete procedures for market analysis

### 1. Guidelines on market analysis and the designation of significant market power

The ESA's Guidelines on Market Analysis and the Determination of Significant Market Power<sup>77</sup> (hereinafter referred to as the "SMP Guidelines"), which were renewed in 2022, summarise the regulatory approach to market analysis (cf. Chap. 2) and go into the definition of the relevant market (cf. Chap. 3) and on the assessment of significant market power (cf. Chap. 8)<sup>78</sup>. The SMP Guidelines describe the principles that national regulatory authorities (hereinafter referred to as "NRAs") should follow when analysing markets susceptible to ex ante regulation and when assessing SMP. The SMP Guidelines reflect the latest developments in the case law of the Court of Justice of the European Union, economic thinking and rapidly evolving markets.

### 2. Regulatory approach for the market analysis in question

In the following, the regulatory approach is summarised from the SMP guidelines, in particular from points 13 - 23, which deal comprehensively with the way in which market analyses are carried out. Corresponding points can also be found in the recitals of the 2016 Market Recommendation.

In conducting the market analysis, NRAs shall assess the relevant market on a forward-looking and structural basis over the relevant period. The relevant period (the next review period) is the time between the end of the current review and the end of the next market review where NRAs are required to assess specific market characteristics and market developments.

The starting point for determining which wholesale markets are susceptible to ex ante regulation should always be the analysis of the relevant retail markets. In doing so, NRAs must determine whether the underlying retail markets are potentially competitive in the absence of wholesale regulation based on a finding of sole or joint SMP, and thus whether the absence of effective competition is a lasting phenomenon.

To this end, NRAs should take into account existing market conditions as well as market developments that can be expected or foreseen over the next review period in the absence

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<sup>77</sup> EFTA Surveillance Authority Guidelines of 16 November 2022 on market analysis and the assessment of significant market power under the Community regulatory framework for electronic communications networks and services pursuant to Annex XI of the Agreement on the European Economic Area, available at <https://www.eftasurv.int/cms/sites/default/files/documents/gopro/ESA%20New%20Guidelines%20on%20market%20analysis%20and%20SMP%20assessment.pdf>

<sup>78</sup> Topic "Regulatory approach to market analysis" in chapter 1.3, "Definition of the market" in chapter 2, "Assessment of significant market power" in chapter 3 of the SMP Guidelines

of SMP regulation. This approach is referred to as the "modified greenfield approach"<sup>79</sup>. In addition, the analysis shall also take into account the effects of other types of (sector-specific) regulation as well as decisions or regulations applicable to the relevant retail and related wholesale markets in the relevant period.

If the underlying retail markets are found to be potentially competitive under the modified "greenfield approach" - i.e. without wholesale regulation - NRAs should conclude that regulation is no longer necessary at the wholesale level. If this is not the case, the wholesale markets upstream of the retail market should be analysed.

For their analysis, NRAs should use past data and current data where relevant to developments in that market in the next review period. In this respect, it should be stressed that existing evidence of past practice does not automatically indicate that this practice is likely to continue in the next review period. Nevertheless, past practice is relevant if the characteristics of the market have not changed significantly or are unlikely to change significantly in the next review period.

Accordingly, NRAs should take into account both static and dynamic considerations in the market analysis in order to address market failures identified at the retail level, and impose appropriate obligations at the wholesale level designed, inter alia, to promote competition and contribute to the development of the internal market. These obligations should be based on the regulatory principles set out in art. 8 of the Framework Directive 2002/21/EC, i.e. promoting regulatory predictability, efficient investment, innovation and infrastructure competition.

The analysis should be based on a functional consideration of the links between the relevant wholesale markets and the underlying retail markets and other relevant markets, where NRAs consider this appropriate. The Commission has indicated in its previous decision-making practice that, while conditions on retail markets may provide NRAs with information on the structure of wholesale markets, they do not in themselves indicate the existence of SMP at the wholesale level. As the Commission has already explained in several decisions under Article 7 of Directive 2002/21/EC, it is not necessary to demonstrate single or collective SMP at the retail level in order to conclude that one or more undertakings have single or collective SMP on the relevant wholesale market. In line with recital 23 of the 2016 Market Recommendation, ex ante regulation at the wholesale level should be sufficient to remedy competition problems in the relevant downstream markets.

In defining the market and analysing market power in a given relevant wholesale market with a view to determining whether it is effectively competitive, direct and indirect competitive pressure should be taken into account, irrespective of whether the competitive pressure comes from electronic communications networks, electronic communications services or other types of services or applications that are comparable from an end-user perspective.

According to recital 27 of the Framework Directive, inappropriate ex ante regulatory obligations should not be imposed in emerging markets where the market leader is likely to

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<sup>79</sup> See Commission Staff Working Document of 27 April 2018, SWD(2018) 124 final, Commission Staff Working Document accompanying the document Communication from the Commission Guidelines on market analysis and the assessment of significant market power, available at: [https://ec.europa.eu/transparency/documents-register/detail?ref=SWD\(2018\)124&lang=en](https://ec.europa.eu/transparency/documents-register/detail?ref=SWD(2018)124&lang=en)

have a significant de facto market share. Indeed, premature ex ante regulation could disproportionately affect the conditions of competition in an emerging market. At the same time, however, foreclosure of such emerging markets by the leading company should be prevented.

### 3. Market definition

Pursuant to art. 21 para. 1 KomG, the regulatory authority shall determine the relevant communications markets in terms of subject matter and geography with market definition (market delineation) in accordance with competition law and art. 15 para. 3 of the Framework Directive and taking the utmost account of the 2016 Market Recommendation.

Article 15 of the Framework Directive refers in para. 2 to the EC Guidelines on Market Analysis and the Assessment of Significant Market Power, which provide further details on market definition (cf. also Chap. 1 above). For the AK, the SMP guidelines issued by ESA in 2022, which correspond to the current EC guidelines from 2018, are authoritative.

In the following, this chapter mainly refers to the chapter "Market Definition" of the SMP Guidelines<sup>80</sup> and in particular to page 14 of the Commission Staff Working Document of 27 April 2018 on the EC Guidelines<sup>81</sup>, which correspond to the SMP Guidelines, and to Chap. 2.1 of the Commission Staff Working Document of 9 October 2014 on the Commission Recommendation on Relevant Product and Service Markets<sup>82</sup>, which in turn corresponds to the ESA Markets Recommendation.

Market definition is the prerequisite for assessing whether a given market is characterised by effective competition or should be subject to ex ante regulation. The market definition sets the boundaries in terms of products/services and geographic scope within which the competitive dynamics are to be analysed in order to systematically identify the direct and indirect competitive constraints faced by undertakings in the market concerned.

As ex ante regulation is aimed at the absence of effective competition that is likely to exist for a certain period of time, markets need to be defined in a forward-looking manner.

There are two main competitive forces to be considered in market definition: (i) demand-side substitutability and (ii) supply-side switching flexibility.

Demand-side substitutability is a factor used to determine the extent to which customers are willing to substitute the product or service in question with other products or services, while supply-side substitutability provides an indication of whether suppliers other than those of the product or service in question would switch their production or offer the relevant products

<sup>80</sup> SMP Guidelines No. 26-30, 39, 46, 48, 51

<sup>81</sup> Commission Staff Working Document of 27 April 2018, SWD(2018) 124 final, on the EC Guidelines on market analysis and the assessment of significant market power (2018/C 159/01), available at [https://ec.europa.eu/transparency/documents-register/detail?ref=SWD\(2018\)124&lang=en](https://ec.europa.eu/transparency/documents-register/detail?ref=SWD(2018)124&lang=en)

<sup>82</sup> Commission Staff Working Document of 9 October 2014, SWD(2014) 298, Explanatory Note Accompanying the document Commission Recommendation on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services, available at <https://www.pts.se/globalassets/startpage/dokument/legala-dokument/eu-regler/explanatorynote-201410091.pdf>

or services immediately or in the short term without incurring significant additional costs for them. For network industries - such as electronic communications - supply-side substitutability is particularly important because the same network can be used to provide different services. The difference between potential competition and supply-side substitutability is that the latter can react quickly to a price increase, whereas potential entrants may need more time to bring their offer to the market. Supply-side substitution does not imply significant incremental costs, whereas potential entry may imply significant sunk costs and is therefore not considered in the market definition.

The starting point of the market definition activity is the definition of end-user markets over a certain time horizon, taking into account demand-side and supply-side substitutability from the end-user's perspective.

The corresponding wholesale markets are then defined, taking into account the demand-side and supply-side substitutability of products from the point of view of an operator wishing to compete in the supply of end-users.

NRAs should start by identifying and analysing the wholesale market that is furthest upstream from the retail market where the competition problems have been identified.

It should be noted that this may be a market consisting of or including more general, cross-market wholesale products such as passive infrastructure access (e.g. access to cable ducts) or passive access measures. Only thereafter, if measures in the furthest upstream market alone are not sufficient to solve the competition problem in the retail market, can NRAs move on to define and analyse wholesale markets further down the supply chain, again using a modified greenfield approach if regulation is in place at the time of the assessment.

Whether demand-side substitutability or supply-side substitutability exists can be determined using the "SSNIP" test<sup>83</sup>. In this test, the NRA should ask what would happen if a small but significant and sustained price increase were to occur in a particular product or service and the prices of all other products or services were to remain constant ("relative price increase"). While whether a relative price increase is significant will depend on each individual case, NRAs should expect customer (consumer and business) reactions to a small but persistent price increase to be in the range of 5% to 10%. The reaction of customers will indicate whether substitutable products exist and, if so, how the relevant product market should be defined.

As a starting point, the NRA should first identify an electronic communications product or service that is offered in a particular geographic area and that may be susceptible to the imposition of obligations. Subsequently, the NRA may include additional products or areas, depending on whether there is a competitive constraint from these products or areas that affects the price of the product or service initially examined. The NRA should apply this test up to the point where it can demonstrate that a relative price increase would be profitable within the defined relevant geographic and product markets, i.e. where there would no longer be a critical loss of revenue from switching to other readily available substitutes or to suppliers in other geographic areas.

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<sup>83</sup> "Small but significant non-transitory increase in price, also called hypothetical monopolist test.

However, customers' ability to substitute a product for an alternative because of a small but significant and persistent relative price increase may be affected by, among other things, significant switching costs. Customers who have invested in certain technology or made other necessary investments to obtain a service or use a product may be unwilling to incur the additional costs of switching to a service or product that is actually substitutable, or may find the switching costs prohibitively high. In addition, customers may be locked into long-term contracts with their current provider. Therefore, in a situation where customers incur significant costs to substitute product A for product B, these two products may not be allocated to the same relevant market.

Once the relevant product market has been defined, the next step is to determine its geographic scope. Only when the geographic scope of the product or service market is known can an NRA properly assess the conditions of competition in that market.

According to settled case-law, the relevant geographic market comprises an area in which undertakings are involved in the supply and demand of the relevant products or services and in which the conditions of competition are sufficiently homogeneous and can be distinguished from neighbouring areas where the conditions of competition are appreciably different.

In the field of electronic communications, the relevant geographic market has so far been determined on the basis of two main criteria: a) the area covered by a network and b) the existing legal and other administrative instruments.

With regard to relevant markets in the Market Recommendation, the NRA's task in practice will usually be to determine the geographic scope (geographic definition) of the relevant markets.

#### **4. Competitive conditions in retail markets and ex ante regulation of wholesale markets**

This chapter largely refers to contents of the 2016 Markets Recommendation and the 2018 Commission Staff Working Paper<sup>84</sup> on ex ante regulation, which ultimately serves to ensure sustainable effective competition in retail markets in the interest of end-users.

The starting point of the analysis is the retail markets. If there is no effective competition in the retail markets without wholesale regulation, an analysis of the wholesale markets is required. However, if an NRA concludes that there is sustainable competition in the defined retail market without wholesale regulation, it should also conclude that wholesale ex ante regulation is no longer necessary. In such a case, the relevant wholesale market in question should be examined with a view to removing ex ante regulation.

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<sup>84</sup> Recitals 7 - 26 of the Markets Recommendation and chapters on "Regulatory principles" and "Relationship between relevant retail and wholesale markets" of the Commission Staff Working Document of 27 April 2018, SWD(2018) 124 final, on the EC Guidelines on market analysis and the assessment of significant market power (2018/C 159/01), available at [https://ec.europa.eu/transparency/documents-register/detail?ref=SWD\(2018\)124&lang=en](https://ec.europa.eu/transparency/documents-register/detail?ref=SWD(2018)124&lang=en)

NRAs do not need to find SMP at the retail level to justify further defining related wholesale markets. It is sufficient to find a competition problem at the retail level in the absence of wholesale regulation.

Ex ante obligations are only imposed in markets where there is not yet effective competition. The investigation of the actual competitive situation should also include a clarification of whether the market is potentially competitive and thus whether the absence of effective competition is a lasting phenomenon.

The analysis of the corresponding retail markets is the starting point for the determination of the wholesale markets which are eligible for ex ante regulation. This analysis of the retail markets is carried out in a forward-looking manner, taking into account demand-side and, if applicable, supply-side substitutability over a certain period of time.

It should be assessed whether retail markets are effectively competitive in the absence of regulation based on a finding of SMP in the foresight period. In addition, the analysis should take into account the impact of other regulations applicable to the relevant retail and related wholesale markets throughout the period in question.

The analysis should determine, taking into account likely or foreseeable market developments, whether the market in the foreseeable future is competitive or otherwise, i.e. whether the lack of competition will be permanent.

Where, in the absence of ex ante regulation, there is no effective competition in the retail market in question, the relevant wholesale market susceptible to ex ante regulation under art. 16 of the Framework Directive should be analysed. The market definition and the analysis of market power in a given relevant wholesale market to determine whether it is effectively competitive should take into account direct and indirect competitive constraints.

Where wholesale markets are vertically interconnected in the value chain, the wholesale market at the top of the upstream value chain in relation to the retail market in question should be assessed first. An NRA should progressively assess markets that are downstream in relation to a regulated upstream input, up to the retail market, to determine whether they would be effectively competitive if regulated upstream.

## 5. Market recommendation: Markets eligible for ex ante regulation

In its annex, the Market Recommendation 2016 specifies electronic communications markets that may have characteristics that justify ex ante regulation because they meet the three-criteria test (cf. Annex 3). Appendix 2 Chap. 7). This means that the NRA should start from the assumption that the three criteria are fulfilled in these markets<sup>85</sup>. Before defining markets that deviate from the market recommendation, the NRA must ensure that they meet the three-criteria test (art. 21 para. 1 let. a-c KomG). If one of the three criteria is not met, this indicates that the market should not be defined as a market for which ex ante regulation can be

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<sup>85</sup> Recitals 16 and 24 of the 2016 Markets Recommendation



considered<sup>86</sup>. It is assumed that regulation of the relevant wholesale markets included in the market recommendation can remedy a lack of effective competition at the wholesale level, which in turn is the cause of identified market failures in the retail markets<sup>87</sup>. However, if an NRA concludes that there is sustainable competition in the defined retail market without wholesale regulation, it should also conclude that ex ante wholesale regulation is no longer necessary<sup>88</sup>.

## 6. Analysis of markets no longer included in the recommendation

Among the markets listed in the Annex to the Market Recommendation 2016, two markets which were included in the predecessor Market Recommendation of 2008 are no longer listed as they no longer meet the three-criteria test for ex ante regulation. These are market 1 at the retail level, access of residential and business customers to the public telephone network at a fixed location, and market 2 at the wholesale level, call origination in the public telephone network at a fixed location, i.e. the fixed network origination market in question.

The Commission Staff Working Document of 9 October 2014 on the Commission's Market Recommendation on Relevant Product and Service Markets<sup>89</sup> states with regard to Market 1 of the 2008 Market Recommendation on pages 23 and 24 that alternative operators without their own fixed network infrastructure can relatively easily enter the market by using regulated wholesale inputs, namely unbundled local loop and bitstream. An alternative operator seeking access to the unbundled local loop or bitstream for the provision of retail broadband services could relatively easily extend its offering to telephony services (both access and calls) by using IP technology. Finally, the working paper summarises that the market for fixed narrowband access to the public telephone network at Union level is no longer characterised by high and insurmountable barriers to entry. Given the wide availability of bundles and the ease of switching (number portability), it was unlikely that an operator, even an incumbent with a relatively high market share, could behave independently of its competitors and consumers. It is therefore concluded that the market for fixed narrowband access tends to be effectively competitive at Union level.

The ESA states, in relation to the discontinuation or continuation of ex ante regulation in these lapsed markets<sup>90</sup>, that specific national circumstances may justify an NRA finding that market 1 of the 2008 Market Recommendation, or other retail markets related to market 2 of the 2008 Market Recommendation, are not yet effectively competitive at the wholesale level in the foresight period without appropriate and proportionate special regulatory measures. NRAs could thus justify maintaining wholesale ex ante regulation provided that the three-criteria test is met for the subsequent review period.

If, within the framework of the market analysis pursuant to art. 32 VKND, the NRA determines that the prerequisites for special regulation pursuant to art. 22 KomG do not exist with regard

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<sup>86</sup> Recital 22 of the 2016 Market Recommendation

<sup>87</sup> Recital 23 of the 2016 Market Recommendation

<sup>88</sup> Recital 24 of the Markets Recommendation

<sup>89</sup> available at <https://www.pts.se/globalassets/startpage/dokument/legala-dokument/eu-regler/explanatorynote-201410091.pdf>

<sup>90</sup> Recitals 27 and 30 of the Markets Recommendation

to a relevant market and that special regulation measures still exist for undertakings on this market, these are to be lifted subject to a transitional period of no more than six months.

## 7. Three-criteria test

In accordance with the 2016 Market Recommendation, art. 21 para. 1 let. a-c KomG specifies the three criteria that must be cumulatively fulfilled in order for a market to be subject to ex ante regulation. The following comments use recitals 16-21 of the 2016 Market Recommendation.

### **First criterion: There are significant and persistent barriers to access.**

The first criterion is to consider whether there are significant and persistent barriers to entry. However, given the dynamic nature and functioning of electronic communications markets, it is necessary to take into account that barriers to entry may be removed in a relevant period of time when making a forward-looking analysis to define the relevant markets susceptible to ex ante regulation.

Two types of entry barriers are relevant: structural entry barriers and legal or regulatory entry barriers. Structural barriers to entry result from the initial cost or demand situation leading to an imbalance between incumbents and entrants, whose market entry is thus hindered or prevented. Significant structural barriers exist, for example, when absolute cost advantages, significant volume and/or size advantages, capacity constraints and high sunk costs are characteristic of the market in the past. A corresponding structural barrier may also exist if the provision of a service requires a network component that cannot be technically replicated or can only be replicated at high cost, so that the service becomes unprofitable for competitors.

Legal and regulatory barriers to entry arise from legislative, administrative or other measures that directly affect the conditions of entry and/or the position of operators in the relevant market. An example of legal or regulatory barriers to entry that impede or prevent entry into the market is a limited number of undertakings having access to spectrum for the provision of basic services.

Barriers to entry can become less relevant in innovative markets characterised by constant technological progress. Here, competitive pressure often arises from imminent innovations of possible competitors that are not yet present on the market. In deciding whether barriers to entry are likely to continue in the absence of regulation, it is important to consider whether market entry is frequent and successful in the industry and whether sufficiently rapid and sustained entry can limit market power or is likely to do so in the future. The importance of entry barriers depends, among other things, on the minimum efficient scale of output and sunk costs.

### **Second criterion: The market structure does not tend towards effective competition.**

The second criterion examines whether a market structure tends to be effectively competitive within a certain period of time. In applying this criterion, the state of infrastructure competition and other competition behind the barriers to entry must be examined.

A trend towards effective competition based on the second criterion means that the market will either reach the status of effectively competitive within the review period without ex ante

regulation or will reach this status after this period, provided that there is evidence of positive dynamics for this period. Market dynamics may arise, for example, due to technological developments or convergence of products and markets, which may result in operators active in different product markets exerting competitive pressure on each other. This may also be the case in markets with a limited - but sufficient - number of companies with different cost structures facing price elastic demand. Furthermore, there may be excess capacity in a market that would normally allow competing firms to increase output very rapidly in response to a price increase. In such markets, market shares may change over time and/or prices may fall.

The main indicators to be taken into account when assessing the first and second criteria are comparable to those used in a forward-looking market analysis to determine the existence of significant market power. These are, in particular, barriers to entry in the absence of regulation (including the extent of sunk costs), market structure, market outcome and market dynamics, including market shares and trends, market prices and market price developments, and the size and coverage of competing networks or infrastructure.

**Third criterion: Competition law measures alone are not sufficient to adequately counteract the identified market failure.**

The third criterion is met if the market failure in question cannot be adequately addressed by competition law means alone.

The third criterion is designed to assess the adequacy of remedies that may be imposed under competition law to address an identified persistent market failure, in particular in view of the fact that ex ante commitments may be effective in preventing competition law infringements. Competition law intervention is unlikely to be sufficient where, for example, there are extensive requirements to be met as part of a measure to address a persistent market failure or where intervention is required frequently and/or quickly. Ex ante regulation should therefore be considered as an appropriate complement to competition law where competition law remedies alone would not be sufficient to adequately address an identified persistent market failure.

## 8. Market power

An "undertaking with significant market power" is, according to the definitions of art. 3 KomG

*"an undertaking which, either individually or jointly with others, enjoys a position equivalent to control, that is to say, an economically strong position affording it the power to behave to an appreciable extent independently of competitors, customers and ultimately consumers".*

From an economic perspective, SMP refers to the power of a company to raise prices significantly above the competitive level (i.e. the efficient costs of providing services) on a permanent basis without having to suffer significant losses in sales.

In the market analysis, the existence of economic market power is examined, whereby in particular the criteria of art. 31 para. 1-3 VKND are taken into account according to their relevance for the market under examination. More details on the assessment of significant market power can be found in Chapter 3 of the SMP Guidelines, from which the AK lists the essential contents of numbers 54 - 63 below.

When assessing the market power of an undertaking, it is important to take into account the market shares of the undertaking and its competitors, as well as the competitive pressure exerted by potential competitors in the medium term. Market shares can provide NRAs with an initial insight into the market structure and relative importance of the firms active in the market. However, market shares should be interpreted in the light of the prevailing market conditions, in particular the dynamics of the market and the degree of product differentiation.

According to the established case law of the Court of Justice of the EU, a particularly high market share held by an undertaking over a certain period of time (more than 50%) - apart from exceptional circumstances - in itself provides evidence of the existence of a dominant position. Experience has shown that the higher the market share and the longer it is held, the more likely it is to be a first important indication of the existence of significant market power.

But even companies with high market shares cannot proceed largely independently of customers who have sufficient bargaining power. Moreover, the fact that an undertaking with a strong position in the market gradually loses market share may well indicate increasing competition in that market, but does not exclude a finding of significant market power. Market shares that fluctuate significantly over time may be an indication of a lack of market power in the relevant market. The fact that an entrant is able to increase its market share rapidly may also indicate that there is more competition in the relevant market and that barriers to entry can be overcome within a reasonable time frame.

Where the market share is high but remains below the 50% threshold, NRAs should base their assessment of SMP on other relevant structural market characteristics. They should then carry out an in-depth structural assessment of the economic characteristics of the market concerned before drawing conclusions as to the existence of SMP.

The finding of SMP depends on how easy it is to enter the market. In the electronic communications sector, barriers to entry are often high because of technical constraints such as spectrum scarcity, which can limit the amount of spectrum available, or because entry into the relevant market requires substantial infrastructure investment and capacity planning over long periods of time for reasons of profitability.

However, high barriers to entry may become less important in markets characterised by continuous technological innovation, in particular because new technology allows new entrants to offer qualitatively different services with which they can challenge the operator with significant market power. In electronic communications markets, competitive pressure can also come from upcoming innovations by potential competitors who are not yet present in the market.

NRAs should therefore take into account the likelihood that undertakings not currently active in the relevant product market may be able to enter the market in the medium term. Undertakings which, in the event of a price increase, would be able to switch or expand their range of products or services in order to enter the relevant market should be treated by NRAs as potential entrants, even if they do not yet produce the product or provide the service in question at the time of the investigation.

Market entries are more likely if potential entrants are already present in neighbouring markets or provide services relevant to the provision of or competition for the relevant retail services. In determining whether entry is likely and viable, the key factor is whether the minimum volume required for cost-effective operation can be achieved.

NRAs should also carefully consider economies of scale and scope, network effects, the importance of access to scarce resources and sunk costs associated with network expansion.

Based on the determination of market-powerful providers and the identification of the relevant competition problems in the investigated markets, the necessary measures of special regulation are then to be determined, which are suitable to eliminate or reduce the identified competition problems.

NOTIFICATION

## Appendix 4 EC / ESA Directives, Recommendations, Guidelines, Communications and Working Documents

### ESA: EFTA Surveillance Authority Recommendations and Guidelines

The ESA publishes its recommendations and guidelines for the electronic communications sector on its eCom website<sup>91</sup>.

- [Recommendation on Relevant Product and Service Markets:](#)  
EFTA Surveillance Authority Decision No 93/16/COL of 11. May 2016: The EFTA Surveillance Authority's Recommendation on Relevant Product and Service Markets within the electronic communications sector susceptible to ex ante regulation in accordance with the Act referred to at point 5cl of Annex XI to the EEA Agreement (Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services), as adapted to the EEA Agreement by Protocol 1 thereto and by the sectoral adaptations contained in Annex XI to that Agreement [2017/608]<sup>92</sup> (referred to in the market analysis text as "Market Recommendation 2016").
- [Guidelines on market analysis and the designation of significant market power:](#)  
EFTA Surveillance Authority Guidelines of 16 November 2022 on market analysis and the assessment of significant market power under the common regulatory framework for electronic communications networks and services, as set out in Annex XI to the Agreement on the European Economic Area<sup>93</sup> (referred to in the market analysis text as "SMP Guidelines")
- [Recommendation on notifications, time limits and hearings](#)  
EFTA Surveillance Authority Recommendation of 2 December 2009 on notifications, time limits and hearings pursuant to Article 7 of the Agreement on the European Economic Area, as referred to at point 5cl of Annex XI (Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services), as amended by Protocol 1 to the EEA Agreement<sup>94</sup>, (referred to in the market analysis text as the "Notification Recommendation")

<sup>91</sup> available at <https://www.eftasurv.int/internal-market/notifications-and-applications/ecom-notifications>

<sup>92</sup> available at <https://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=OJ:L:2017:084:FULL&from=FR>.

<sup>93</sup> available at

<https://www.eftasurv.int/cms/sites/default/files/documents/gopro/ESA%20New%20Guidelines%20on%20market%20analysis%20and%20SMP%20assessment.pdf>

<sup>94</sup> available at <https://op.europa.eu/de/publication-detail/-/publication/d5da7711-0c21-495f-b929-50b72cfed46b/language-de/format-PDF/source-107590473>

- EFTA Surveillance Authority Recommendation of 13 April 2011 on the regulation of fixed and mobile termination rates in the EFTA States.<sup>95</sup>

#### **EEA: Liechtenstein's regulatory framework for electronic communications networks and services**

The following directives were transposed in the KomG and the ordinances based on it:

- "[Framework Directive](#)": Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services (EEA Supplementary Act: Annex XI - 5cl.01).<sup>96</sup>
- "[Access Directive](#)": Directive 2002/19/EC of the European Parliament and of the Council of 7 March 2002 on access to, and interconnection of, electronic communications networks and associated facilities (EEA Supplementary Act: Annex XI - 5cj.01).<sup>97</sup>
- "Authorisation Directive": Directive 2002/20/EC of the European Parliament and of the Council of 7 March 2002 on the authorisation of electronic communications networks and services (EEA Supplementary Act: Annex XI - 5ck.01).<sup>98</sup>
- "Universal Service Directive": Directive 2002/22/EC of the European Parliament and of the Council of 7 March 2002 on universal service and users' rights relating to electronic communications networks and services (EEA Supplementary Act: Annex XI - 5cm.01).<sup>99</sup>
- "Roaming Regulation" means Regulation (EU) No 531/2012 of the European Parliament and of the Council of 13 June 2012 on roaming on public mobile telephone networks within the Union (OJ L 172, 30.6.2012, p. 10), as amended by Regulation (EU) 2015/2120 of the European Parliament and of the Council of 25 November 2015 (OJ L 310, 26.11.2015, p. 1) and Regulation (EU) 2017/920 of the European Parliament and of the Council of 17 May 2017 (OJ L 147, 9.6.2017, p. 1).<sup>100</sup>
- "Net Neutrality Regulation": Regulation (EU) 2015/2120 of the European Parliament and of the Council of 25 November 2015 on measures regarding access to the open internet and amending Directive 2002/22/EC on universal service and users' rights relating to electronic communications networks and services and Regulation (EU) No 531/2012 on roaming on public mobile telephone networks within the Union (Text with EEA relevance).

<sup>95</sup> abrufbar unter <https://op.europa.eu/en/publication-detail/-/publication/08101044-29a1-11e2-9209-01aa75ed71a1>

<sup>96</sup> available at <https://eur-lex.europa.eu/legal-content/DE/ALL/?uri=CELEX%3A32002L0021>.

<sup>97</sup> available at <https://eur-lex.europa.eu/legal-content/DE/ALL/?uri=CELEX%3A32002L0019>.

<sup>98</sup> available at <https://eur-lex.europa.eu/legal-content/DE/ALL/?uri=CELEX%3A32002L0020>.

<sup>99</sup> available at <https://eur-lex.europa.eu/legal-content/de/ALL/?uri=CELEX:32002L0022>.

<sup>100</sup> available at <https://eur-lex.europa.eu/legal-content/DE/TEXT/?uri=celex%3A32012R0531>

### EC: Recommendations, guidelines and communications of the European Commission and working documents of the Commission services

- Commission Notice on the calculation of the cost of capital for legacy infrastructure in the context of the Commission's review of national notifications in the EU electronic communications sector, dated 6 November 2019 (Text with EEA relevance) ([2019/C 375/01](#))<sup>101</sup>  
(referred to in the market analysis text as the "Notice").
- Commission Staff Working Document of 5 November 2019, SWD(2019) 397 final, Commission Staff Working Document accompanying the document Communication from the Commission, Commission Notice on the calculation of the cost of capital for legacy infrastructure in the context of the Commission's review of national notifications in the EU electronic communications sector (Text with EEA relevance) {C(2019) 7858 final}
- Communication from the European Commission of 7 May 2018, Guidelines on market analysis and the assessment of significant market power under the EU regulatory framework for electronic communications networks and services (Text with EEA relevance) (2018/C 159/01).<sup>102</sup>  
(referred to in the market analysis text as "EC Guidelines").
- Commission Staff Working Document of 27 April 2018, SWD(2018) 124 final, Commission Staff Working Document accompanying the document Communication from the Commission Guidelines on market analysis and the assessment of significant market power under the EU regulatory framework for electronic communications networks and services (Text with EEA relevance) {C(2018) 2374 final}.<sup>103</sup>
- Commission Recommendation 2014/710/EU of 9 October 2014 on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services (Text with EEA relevance)<sup>104</sup>
- Commission Staff Working Document of 9 October 2014, SWD(2014) 298, Explanatory Note Accompanying the document Commission Recommendation on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services.<sup>105</sup>

<sup>101</sup> available at <https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=CELEX%3A52019XC1106%2801%29>

<sup>102</sup> available at [https://eur-lex.europa.eu/legal-content/DE/TXT/HTML/?uri=CELEX:52018XC0507\(01\)&from=DE](https://eur-lex.europa.eu/legal-content/DE/TXT/HTML/?uri=CELEX:52018XC0507(01)&from=DE)

<sup>103</sup> available at [https://ec.europa.eu/transparency/documents-register/detail?ref=SWD\(2018\)124&lang=en](https://ec.europa.eu/transparency/documents-register/detail?ref=SWD(2018)124&lang=en)

<sup>104</sup> available at <https://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=CELEX:32014H0710&from=DE>

<sup>105</sup> available at [https://ec.europa.eu/transparency/documents-register/detail?ref=SWD\(2014\)298&lang=en](https://ec.europa.eu/transparency/documents-register/detail?ref=SWD(2014)298&lang=en)



- Commission Recommendation of 11 September 2013 on consistent non-discrimination obligations and costing methodologies to promote competition and improve the environment for broadband investment ([2013/466/EU](#))<sup>106</sup>
- Commission Recommendation of 20 September 2010 on regulated access to next generation access networks (NGA) (Text with EEA relevance) ([2010/572/EU](#))<sup>107</sup> (referred to as the 'NGA Recommendation' in the market analysis text).
- Commission Recommendation of 19 September 2005 on accounting separation and cost accounting systems in line with the regulatory framework for electronic communications (2005/698/EC)<sup>108</sup>

#### **BEREC: Reports of the Body of European Regulators for Electronic Communications**

- BEREC Report on WACC parameter calculations according to the European Commission's WACC Notice of 6th November 2019, BoR (23) 90, 8 June 2023 (WACC parameters Report)<sup>109</sup>

#### **EEA: Liechtenstein's future legal framework**

- Directive 2018/1972 of the European Parliament and of the Council of 11 December 2018 on the European Electronic Communications Code, Text with EEA relevance.<sup>110</sup>
- Commission Recommendation (EU) 2020/2245 of 18 December 2020 on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive (EU) 2018/1972 of the European Parliament and of the Council on the European Electronic Communications Code (Text with EEA relevance, notified under document number C(2020) 8750).<sup>111</sup>
- Commission Staff Working Document of 18 December 2020, SWD(2020) 337, Explanatory note accompanying the document Commission Recommendation on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code {C(2020) 8750 final}<sup>112</sup>

<sup>106</sup> available at <https://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=CELEX:32013H0466>

<sup>107</sup> available at <https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=celex%3A32010H0572>

<sup>108</sup> available at <https://eur-lex.europa.eu/legal-content/DE/ALL/?uri=CELEX%3A32005H0698>

<sup>109</sup> available at <https://www.berec.europa.eu/en/document-categories/berec/reports/berec-report-on-wacc-parameter-calculations-according-to-the-european-commissions-wacc-notice-of-6th-november-2019-wacc-parameters-report-2023>

<sup>110</sup> available at <https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=CELEX%3A32018L1972>

<sup>111</sup> available at <https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=CELEX%3A32020H2245>

<sup>112</sup> available at [https://ec.europa.eu/newsroom/dae/document.cfm?doc\\_id=72442](https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=72442)

## Appendix 5 Abbreviations and short terms

The AK uses the following abbreviations in the text, each of which is introduced on first appearance with the reference "(hereinafter "abbreviation)".

Short form	Long form / explanation
AK	Office for Communications, Amt für Kommunikation
Ancillary services	Further services required for access to the local loop by providers, which are also only offered by the regulated provider of access to local loops. Ancillary services include in particular one-off and recurring services in the central offices (rack space, areas, set-up services) and core network fibres connecting the central offices.
BEREC	Body of European Regulators for Electronic Communications (BEREC)
EC Guidelines	Communication from the European Commission of 7.5.2018 on Guidelines on market analysis and the assessment of significant market power under the EU regulatory framework for electronic communications networks and services (Text with EEA relevance) (2018/C 159/01 <a href="https://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=CELEX:52018XC0507(01)&amp;from=DE">https://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=CELEX:52018XC0507(01)&amp;from=DE</a>
CUDA	Copper twisted pair, transmission medium for the subscriber line (ULL) in the connection area.
ESA	EFTA Surveillance Authority, EFTA Surveillance Authority
SMP guidelines	EFTA Surveillance Authority Guidelines of 16 November 2022 on market analysis and the assessment of significant market power (SMP) under the common regulatory framework for electronic communications networks and services, as set out in Annex XI to the Agreement on the European Economic Area (Case No: 82094) <a href="https://www.eftasurv.int/cms/sites/default/files/documents/gopro/ESA%20New%20Guidelines%20on%20market%20analysis%20and%20SMP%20assessment.pdf">https://www.eftasurv.int/cms/sites/default/files/documents/gopro/ESA%20New%20Guidelines%20on%20market%20analysis%20and%20SMP%20assessment.pdf</a>
FTTB	Fibre to the Building, glass fibre to the building
Authorisation Directive	Directive 2002/20/EC of the European Parliament and of the Council of 7 March 2002 on the authorisation of electronic communications networks and services ("Authorisation Directive"; EEA Supplementary Act: Annex XI - 5ck.01). <a href="https://eur-lex.europa.eu/legal-content/DE/ALL/?uri=CELEX%3A32002L0020">https://eur-lex.europa.eu/legal-content/DE/ALL/?uri=CELEX%3A32002L0020</a>
HFC	Hybrid fibre coax, line-bound transmission of signals with a large bandwidth. Regional distribution takes place via fibre optic lines to a node, where the optical signals are converted into electrical signals, which are then routed to the individual households via coaxial cables.
KomG	Electronic Communications Act (Communications Act) <a href="https://www.gesetze.li/konso/2006091000">https://www.gesetze.li/konso/2006091000</a>
LKW	Liechtenstein power plants (Liechtensteinische Kraftwerke), operator of the nationwide passive network infrastructure for electronic communications, provider of passive infrastructure without offering active electronic communications services at the retail or wholesale level. <a href="https://www.lkw.li/angebot-und-leistungen/kommunikation.html">https://www.lkw.li/angebot-und-leistungen/kommunikation.html</a>
Market recommendation 2016	EFTA Surveillance Authority Decision No 93/16/COL of 11 May 2016: Recommendation of the EFTA Surveillance Authority on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation <a href="https://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=OJ:L:2017:084:FULL&amp;from=FR">https://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=OJ:L:2017:084:FULL&amp;from=FR</a>
NGA recommendation	Commission Recommendation of 20 September 2010 on regulated access to Next Generation Access (NGA) networks, (Text with EEA relevance), (2010/572/EU), available at <a href="https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=celex%3A32010H0572">https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=celex%3A32010H0572</a>
NGA network	Access networks, in the European Commission's terminology 'next generation access networks' ('NGA networks'), are circuit-based access networks that consist wholly or partly of optical components and therefore enable broadband access services with enhanced performance characteristics (e.g. higher throughput) beyond what can be offered with already existing copper cable networks. In most cases, NGA networks are the result of upgrading existing copper or coaxial cable access networks

Short form	Long form / explanation
Notification recommendation	EFTA Surveillance Authority Recommendation of 2 December 2009 on notifications, time limits and hearings provided for in Article 7 of the Act referred to at point 5cl of Annex XI to the Agreement on the European Economic Area (Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services), as amended by Protocol 1 to the EEA Agreement <a href="https://op.europa.eu/de/publication-detail/-/publication/d5da7711-0c21-495f-b929-50b72cfed46b/language-de/format-PDF/source-107590473">https://op.europa.eu/de/publication-detail/-/publication/d5da7711-0c21-495f-b929-50b72cfed46b/language-de/format-PDF/source-107590473</a>
NRA Framework Directive	National regulatory authority(ies) Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services ("Framework Directive"; EEA Supplementary Act: Anh. XI - 5cl.01) <a href="https://eur-lex.europa.eu/legal-content/DE/ALL/?uri=CELEX%3A32002L0021">https://eur-lex.europa.eu/legal-content/DE/ALL/?uri=CELEX%3A32002L0021</a>
RKV	Ordinance of 3 April 2007 on the Tasks and Powers of the Regulatory Authority in the Field of Electronic Communications (RKV), LGBl. 2007 No. 68. <a href="https://www.gesetze.li/konso/2007068000">https://www.gesetze.li/konso/2007068000</a>
ULL VKND	Unbundled local loop, subscriber line connecting to central office Ordinance of 3 April 2007 on Electronic Communications Networks and Services (VKND), LGBl. 2007 No. 67, <a href="https://www.gesetze.li/konso/pdf/2007067000">https://www.gesetze.li/konso/pdf/2007067000</a>
(WACC) Notice	Commission Notice on the calculation of the cost of capital for legacy infrastructure in the context of the Commission's review of national notifications in the EU electronic communications sector, of 6 November 2019 (Text with EEA relevance) (2019/C 375/01). <a href="https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=CELEX%3A52019XC1106%2801%29">https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=CELEX%3A52019XC1106%2801%29</a>
Access Directive	Directive 2002/19/EC of the European Parliament and of the Council of 7 March 2002 on access to, and interconnection of, electronic communications networks and associated facilities ("Access Directive"; EEA Supplementary Act: Annex XI - 5cj.01). <a href="https://eur-lex.europa.eu/legal-content/DE/ALL/?uri=CELEX%3A32002L0019">https://eur-lex.europa.eu/legal-content/DE/ALL/?uri=CELEX%3A32002L0019</a>

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