
*Public consultation on the methodology for cost modeling*

# ***Methodological Document***

# Contents

1. Introduction ..... 1

1.1. Structure of the document ..... 4

2. The use of costing models in regulation ..... 5

2.1. Bottom-Up LRIC Costing Models ..... 5

2.2. Margin-Squeeze Model ..... 6

2.3. NCUS Model ..... 8

3. Bottom-Up LRIC Models ..... 10

3.1. Issues common to both BULRIC Models ..... 10

3.1.1. Cost standard ..... 10
3.1.2. Allocation of common costs ..... 12
3.1.3. Asset valuation ..... 13
3.1.4. WACC ..... 16
3.1.5. Depreciation method ..... 16
3.1.6. Period of time modelled ..... 17
3.1.7. Treatment of the information ..... 18
3.1.8. Demand ..... 19

3.2. Issues specific to each BULRIC Model ..... 20

3.2.1. BULRIC Model for mobile networks ..... 20
3.2.2. BULRIC Model for fixed networks ..... 26

4. Margin-Squeeze Model ..... 31

4.1.1. Reference Operator ..... 32
4.1.2. Aggregation Level ..... 33
4.1.3. Products ..... 34
4.1.4. Cost Standard ..... 35
4.1.5. Relevant downstream costs ..... 36
4.1.6. Reasonable Profit ..... 37
4.1.7. Time modelling for costs ..... 37

5. Ancillary Services Model ..... 39

5.1. Connection Services ..... 39

5.2. Carrier selection and preselection Reference Offer ..... 40
5.3. Interconnection Reference Offer ..... 40
5.4. LLU Reference Offer ..... 41
5.5. WLR Reference Offer ..... 42
5.6. Mobile Reference Offer ..... 43
5.7. Leased Lines Reference Offer ..... 45
5.8. Broadband Reference Offer ..... 46
5.9. Other services ..... 47

6. NCUS Model ..... 48

6.1. Uneconomic Areas ..... 48
6.1.1. Treatment of Costs - Accounting Standard ..... 49
6.1.2. Relevant geographical area of reference ..... 49
6.1.3. Distribution of costs and revenues to geographical areas ..... 50
6.1.4. Treatment of the incoming call effect ..... 52
6.1.5. Profitability assessment ..... 53
6.1.6. Net Cost calculation ..... 54
6.2. Enquiry services ..... 54
6.3. Discounts for People with Disabilities and in Social Exclusion ..... 54
6.4. Indirect benefits ..... 55
6.4.1. Brand Value ..... 56
6.4.2. Ubiquity ..... 57

Annex A. Glossary of terms ..... 58

Annex B. Overview on dimensioning algorithms for BULRIC models 59

**B.1. Mobile networks** ..... 59
**B.2. Fixed networks** ..... 62

# 1. Introduction

The Office of the Commissioner for Electronic Communications and Postal Regulations ('the OCECPR') is empowered under The Electronic Communications and Postal Regulation Law 112(I)/2004 as amended, to make decisions in relation to the regulatory remedies that may be required to address the risks that arise for consumers as a consequence of the lack of effective competition.

By virtue of the Decisions that have been issued regarding markets which are stated below OCECPR assesses and evaluates both retail and wholesale markets in the electronic communications sector.

1) ADP 315/2013 - Decision with regard to the definition of the relevant market, market analysis and imposition of regulatory obligations on the organization with SMP in the relevant market of wholesale (physical) access to network infrastructure (including shared and fully unbundled access to local sub/loop)in fixed position (Market 4)

2) ADP 314/2013 - Decision with regard to the definition of relevant market, analysis for effective competition and for designation of organization with SMP on the market and imposition of regulatory obligations on the organization with SMP in the relevant wholesale market of broadband access (Market 5)

3) ADP 317/2015 - Decision with regard to the definition of relevant market, analysis of regime of competition and the imposition of regulatory obligations on the organization with SMP in the wholesale market of terminating segments of leased lines.

4) ADP 316/2015 - Decision with regard to the definition of the relevant market, the analysis of the regime of competition and the imposition of regulatory obligations on the organization with SMP on the wholesale market for trunk segments of Leased lines.

5) ADP 597/2015 - Decision on the examination of the market for wholesale voice call termination on individual mobile networks and imposing regulatory obligations to the organization with Significant Market Power (CYTA).

6) ADP 598/2015 - Decision on the examination of the market for wholesale voice call termination on individual mobile networks and imposing regulatory obligations to the organization with Significant Market Power (MTN).

7) ADP 595/2015 - Decision on the examination of the market for wholesale voice call termination on individual mobile networks and imposing regulatory obligations to the organization with Significant Market Power (PRIMETEL).

8) ADP 596/2015 - Decision on the examination of the market for wholesale voice call termination on individual mobile networks and imposing regulatory obligations to the organization with Significant Market Power (CABLENET COMMUNICATIONS SYSTEMS LTD).

9) ADP 594/2015 - Decision on the examination of the market for Access and call origination on public mobile telephone networks and imposing regulatory obligations to the organization with Significant Market Power (CYTA).

10) ADP 768/15 -Decision in the examination of the market regarding the call termination on individual public telephone networks provided at a fixed location and the imposition of regulatory obligations to the Organization with Significant market Power (Callsat International Telecommunications Ltd)

11) ADP 769/15 - Decision in the examination of the market regarding the call termination on individual public telephone networks provided at a fixed location and the imposition of regulatory obligations to the Organization with Significant market Power (CYTA Ltd)

12) ADP 770/15 - Decision in the examination of the market regarding the call termination on individual public telephone networks provided at a fixed location and the imposition of regulatory obligations to the Organization with Significant market Power (MTN Cyprus Ltd)

13) ADP 771/15 - Decision in the examination of the market regarding the call termination on individual public telephone networks provided at a fixed location and the imposition of regulatory obligations to the Organization with Significant market Power (Primetel PLC)

14) ADP 772/15 - Decision in the examination of the market regarding the lifting of the regulatory measures which had imposed on Cyta regarding the Market of Local / National telephoned networks which provided at a fixed location to residential and non residential customers

15) ADP 773/15 - Decision in the examination of the market regarding the lifting of the regulatory measures which had imposed on Cyta regarding the transit services in the public telephone network provided at a fixed location

16) ADP 774/15 - Decision regarding the sharing of the costs related to the closures interface

17) ADP 775/15- Decision in the examination of the market regarding the call termination on individual public telephone networks provided at a fixed location and the imposition of regulatory obligations to the Organization with Significant market Power (Mytelco Ltd)

18) ADP 776/15 -Decision in the examination of the market regarding the lifting of the regulatory measures which had imposed on Cyta regarding the transit services in public telephone network at a fixed location for residential and non residential customers.

19) ADP 777/15 - Decision in the examination of the market regarding the lifting of the regulatory measures which had imposed on Cyta regarding the call origination on the public telephone network at a fixed location.

20) ADP 778/15 - Decision in the examination of the market regarding the call termination on individual public telephone networks provided at a fixed location and the imposition of regulatory obligations to the Organization with Significant market Power (Cablenet Communications Systems Ltd).

The initial result of these works was materialised in the publication on February 17th, 2016 of a Consultation Document outlining OCECPR's preliminary views on a number of key issues for for the implementation of the following costing tools:

- Bottom-Up Long Run Incremental Costs (BULRIC) model for fixed networks
- Bottom-Up Long Run Incremental Costs (BULRIC) model for mobile networks
- Margin-Squeeze (MS) model
- Net Cost of Universal Service (NCUS) model
- Ancillary Services model

Stakeholders were encouraged to provide their views and comments to the methodological approaches proposed for the implementation of these models.

After the publication of this document, five Operators (i.e. Cyta, MTN, Primetel, Cablenet and Callsat) provided their contributions, outlining their position in each of the questions listed by the OCECPR[1]. OCECPR appreciates the time and efforts dedicated by the operators, and believes these contributions are essential to improve the robustness of the present document.

[1] The Operators' contributions and OCECPR's responses are described in the Position Statement.

This methodological document lays out the main methodological approaches that will be implemented in the above listed Models, considering the Public Consultation document and the contributions provided by the Operators.

## 1.1. Structure of the document

The remainder of this document is laid out as follows:

- Section 2: The use of costing models in regulation
- Section 3: Bottom-Up LRIC Models
- Section 4: Margin-Squeeze Model
- Section 5: Ancillary Services Model
- Section 6: NCUS Model
- Glossary of terms
- Overview on dimensioning algorithms for BULRIC models

# 2. The use of costing models in regulation

## 2.1. Bottom-Up LRIC Costing Models

The use of Bottom-Up Long Run Incremental Costing (BULRIC) models is extensive across the globe, mainly in Europe, after the issue of the "*European Commission ('EC') Recommendation on the Regulatory Treatment of Fixed and Mobile Termination Rates of 7 May 2009*"[2] ('EC Recommendation'). The following paragraphs summarise some of the most important recommendations that may be extracted from this document:

- Use of Bottom-Up Models for the calculation of MTRs/FTRs:
  "It is recommended that the evaluation of efficient costs is based on current cost and the use of a bottom-up modelling approach using long-run incremental costs (LRIC) as the relevant cost methodology"
- Definition of symmetric termination rates:
  "NRAs should set termination rates based on the costs incurred by an efficient operator. This implies that they would also be symmetric"
- Consideration of Modern Equivalent Assets
  "The cost model should be based on efficient technologies available in the time frame considered by the model. Therefore the core part of both fixed and mobile networks could in principle be Next-Generation-Network (NGN)-based. The access part of mobile networks should also be based on a combination of 2G, and 3G telephony, reflecting the anticipated situation[3]"
- Definition of increments for the calculation of termination rates
  "Within the LRIC model, the relevant increment should be defined as the wholesale voice call termination service provided to third parties"
- Depreciation methodology
  "The recommended approach for asset depreciation is economic depreciation wherever feasible"

As it is presented in the exhibit below, most of the EU countries have already developed Bottom-Up LRIC models in accordance to the EC Recommendation:

[2] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009H0396&from=EN
[3] The anticipated market situation shall include also 4G

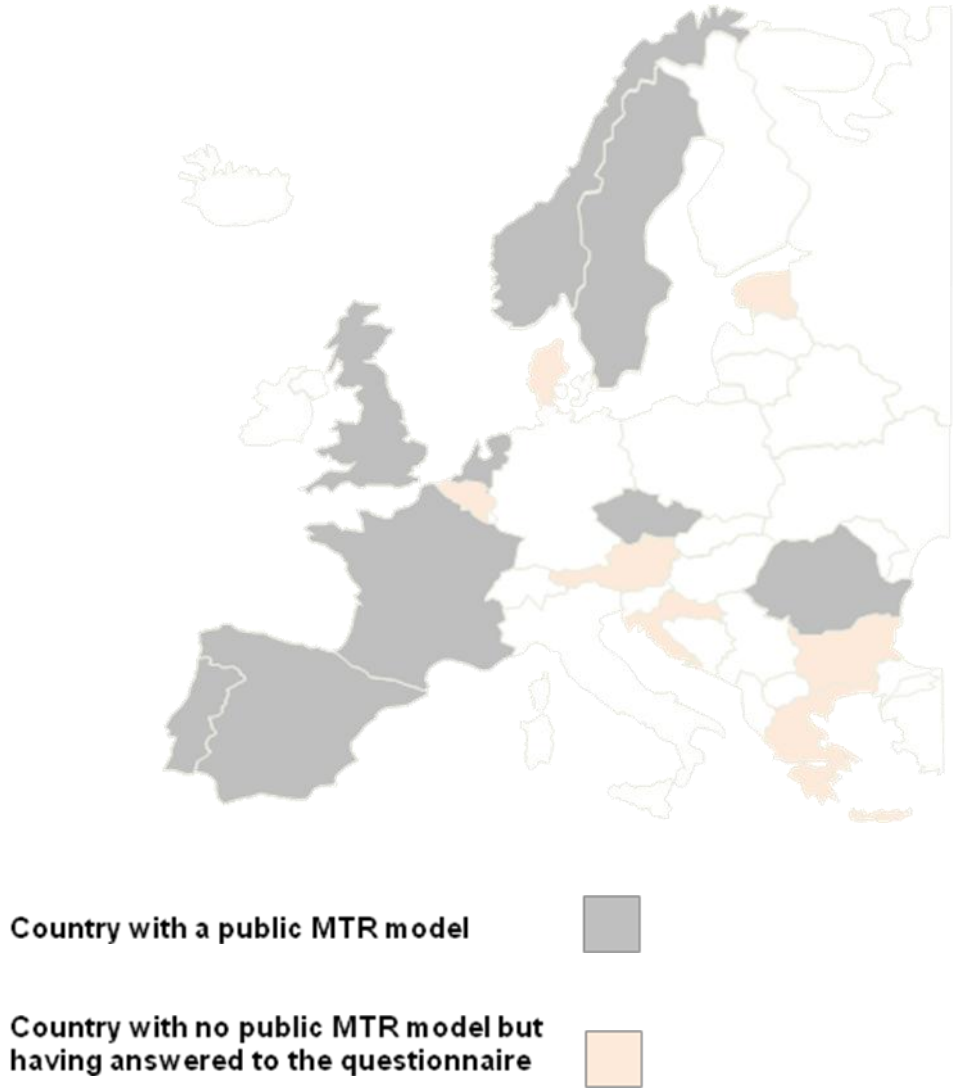


**Exhibit 2.1: Overview of the European countries that have implemented Bottom-Up LRIC models for mobile networks**

## 2.2. **Margin-Squeeze Model**

The use of Price Squeeze Models is common in several European countries (e.g. Austria, Belgium, Greece, Italy, Norway, Spain. See Exhibit 2.2 for further detail), especially after the recent publication of EC's Recommendation on non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment[4].

[4] C(2013) 5761 final, of 11.9.2013

The following paragraphs summarise some of the most important recommendations that may be extracted from this document:

- Monitoring of potential margin-squeeze practices:
  "NRAs should ensure that the margin between the retail price of the SMP operator and the price of the NGA wholesale input covers the incremental downstream costs and a reasonable percentage of common costs. Where wholesale price regulation for NGA wholesale inputs should not be imposed on the SMP operator when additional safeguards are implemented in accordance with this Recommendation, a lack of economic replicability can be demonstrated by showing that the SMP operator's own downstream retail arm could not trade profitably on the basis of the upstream price charged to its competitors by the upstream operating arm of the SMP operator"
- Relevant cost standard:
  "The incremental cost of providing the relevant downstream service is the appropriate standard. A LRIC+ model should be used to calculate the incremental cost (including sunk costs) and to add a mark-up for common costs related to the downstream activities"
- Relevant retail products
  "NRAs should assess the most relevant retail products including broadband services ('flagship products') offered by the SMP operator on the basis of the identified NGA-based wholesale access layer. […] In addition, NRAs should consider whether a particular retail product, which may not be among the most relevant retail products of the SMP operator, is particularly attractive to alternative operators"

As it is presented in the exhibit below, the development of Price Squeeze Models is not as extensive as for BULRIC models, though several countries have already implemented them:

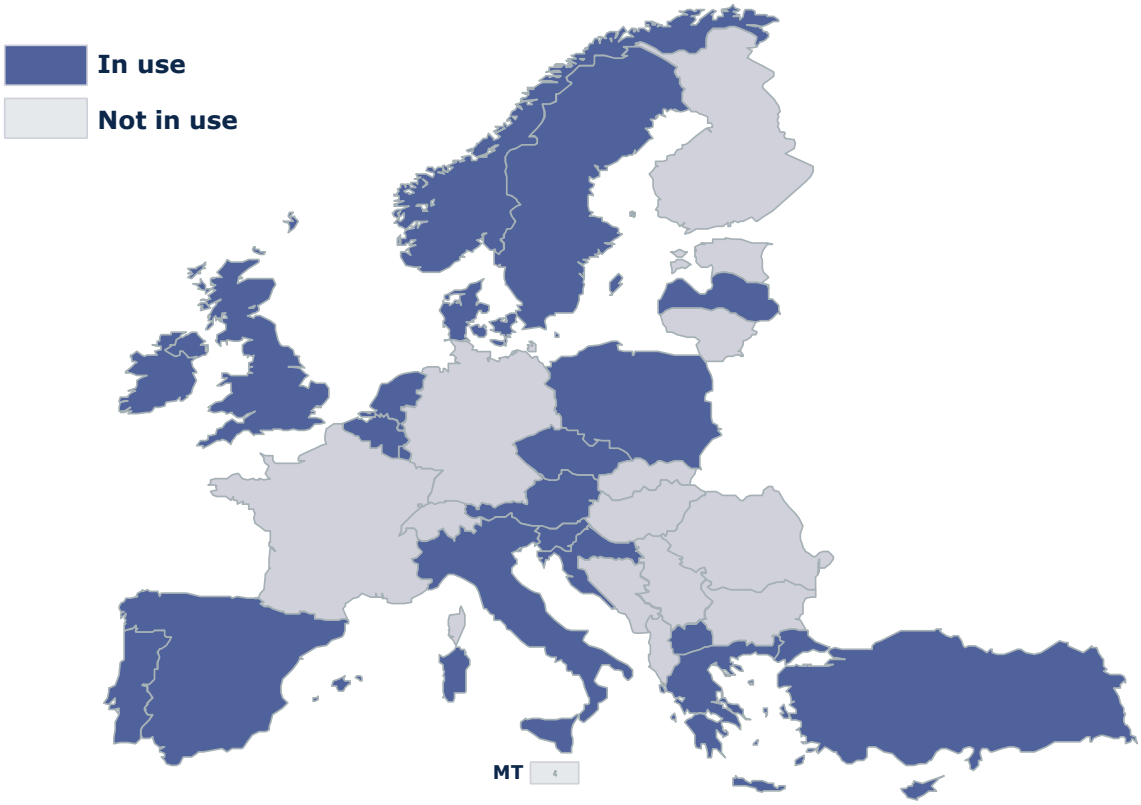


**Exhibit 2.2: Overview of the European countries that have implemented Margin-Squeeze models [Source: Axon Consulting]**

## 2.3. **NCUS Model**

The Directive 2002/22/EC of the European Parliament, dated on 7th March 2002, and its amendments (hereinafter 'Universal Service Directive') address universal service obligations and users' rights relating to electronic communications networks and services. The Universal Service Directive states, in its Article 12, that the NRAs are required to calculate the Net Cost of Universal Service Obligations ('USO') when they consider it may represent an unfair burden on the designated USO provider.

Annex IV, part A of the Directive states that the Net Cost calculation should assess the benefits, including intangible benefits, to the US provider. Recital 20 specifies that the intangible benefits derived by the USO provider should be deducted from the direct Net Cost.

As it is presented in the exhibit below, the USO Net Cost is calculated across several European countries:

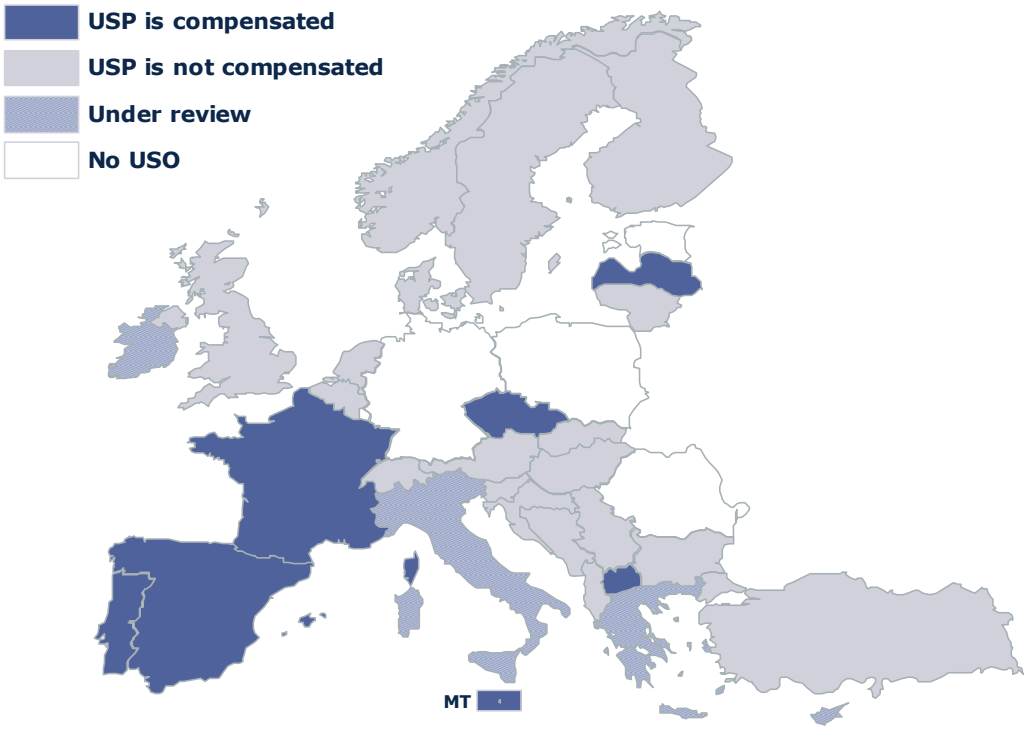


**Exhibit 2.3: Overview of the European countries where the USO net cost is compensated [Source: Axon Consulting]**

# 3. Bottom-Up LRIC Models

As it has been presented in Section 1, the OCECPR intends to develop two Bottom-Up LRIC Models:

- Bottom-Up Long Run Incremental Costs (BULRIC) model for fixed networks
- Bottom-Up Long Run Incremental Costs (BULRIC) model for mobile networks

The following paragraphs present OCECPR's approach towards their implementation, structured in the following sections:

- Issues common to both BULRIC Models
- Issues specific to each BULRIC Model

## 3.1. Issues common to both BULRIC Models

When defining the methodology for the development of BULRIC models there are a number of general issues that are important for the determination of the results and the implementation of the calculations within the models. This section contains the issues related to the implementation of the BULRIC Model, namely:

- Cost standard
- Allocation of common costs
- Asset valuation
- WACC
- Depreciation method
- Period of time modelled
- Treatment of the information
- Demand including Traffic Forecast Methodology for each service to be modeled

The following sections describe the possible options and the suggested solution for each one of these aspects.

### 3.1.1. Cost standard

OCECPR will develop bottom-up models under the LRIC approach which is defined by the ERG as the "*methodology [that] calculates the cost of providing a defined increment of output, on the basis of forward looking costs incurred by an efficient*

*operator."*[5] At the same time, this is the approach recommended by the EC, which states that "*It is recommended that the evaluation of efficient costs is based on current cost and the use of a bottom-up modelling approach using long-run incremental costs (LRIC) as the relevant cost methodology"*[6]. Moreover in the case of broadband the Commission specifies that: "*The bottom-up long-run incremental costs plus (BU LRIC+) costing methodology best meets these objectives for setting prices of the regulated wholesale access services."*[7]

For instance, in the case of voice termination, two LRIC approaches can be considered depending on how they treat joint and common costs, as it has been graphically illustrated below:

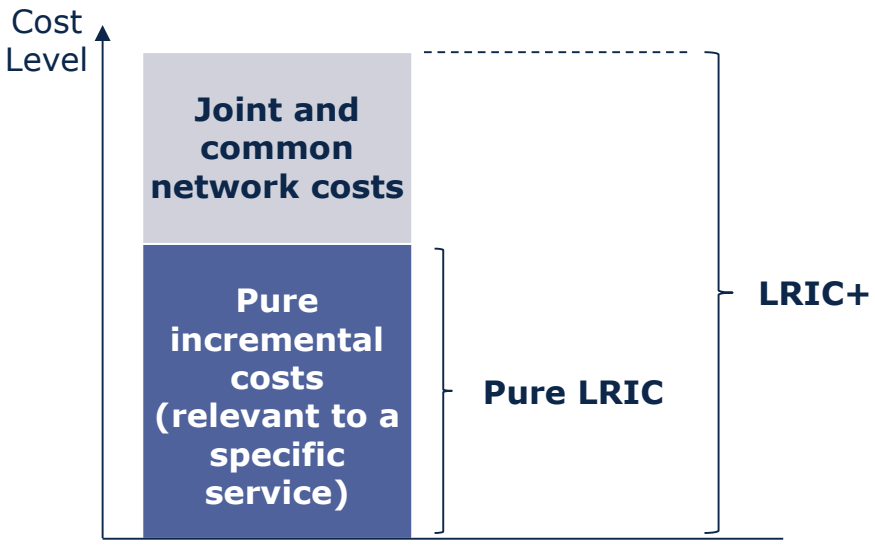


**Exhibit 3.1: Example of relevant costs under both pure LRIC and LRIC+ standards [Source: Axon Consulting]**

As it can be inferred from the exhibit above, voice termination costs would gather different subsets of costs depending on whether a Pure LRIC or a LRIC+ approach is followed:

- *Pure LRIC*: Only incremental costs directly associated to the provision of voice termination services would be considered (e.g. variable costs related to BTSs).
- *LRIC+*: Under this standard, joint and common costs (e.g. license costs) would be added on top of incremental costs.

[5] ERG 2005 Guidelines on accounting separation.
[6] EC-2009-Explanatory note on the regulation of MTR/FTR
[7] EC(2013) 5761 COMMISSION RECOMMENDATION on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment

According to the EC's recommendation on the regulation of MTRs/FTRs "*it is justified to apply a pure LRIC approach whereby the relevant increment is the wholesale call termination service and which includes only avoidable costs*". Hence, OCECPR will calculate the cost of voice termination services based on a Pure LRIC approach.

However, for the rest of services, in order to allow the recovery of common costs, these will be calculated based on a LRIC+ approach, which allows the recovery of common and joint costs that are not incremental to any given service. Under this approach, fixed and common costs will be recovered in the following manner:

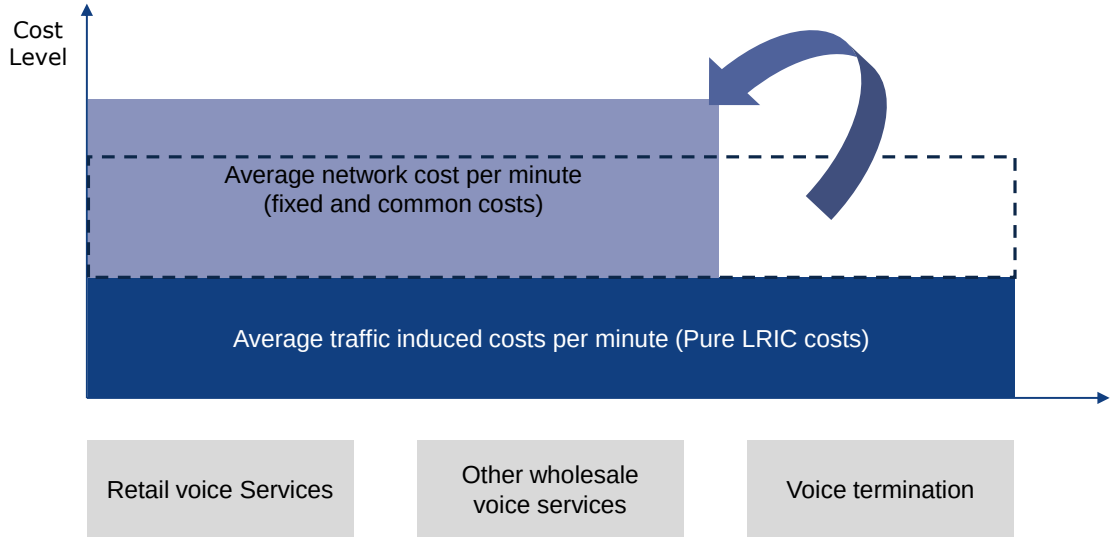


**Exhibit 3.2: Overview of the approach that will be followed to recover fixed and common costs under the proposed costing standards [Source: Axon Consulting]**

## 3.1.2. Allocation of common costs

As indicated previously, the LRIC+ cost standard incorporates a fair share of common and joint costs. Thus, a methodology needs to be defined to establish the criteria that shall be employed for common costs allocation to services. In other words, to define what 'fair share' of these costs each specific service should bear.

The OCECPR has identified a number of potential methodologies to be used for the allocation of common costs:

- **Equi-Proportional Mark-Up (EPMU)**, allocating common and joint costs to services in proportion to their incremental costs. This method is very commonly used and it is simple to implement.

- **Effective capacity,** allocates common and joint costs based on the capacity used by each service at the busy hour, using the same routing table defined for the allocation of pure incremental costs.

Even though the EPMU approach is commonly employed as a considerably more workable solution, it may also present severe limitations, particularly in cases where common and joint costs represent a significant amount of the cost base.

A main difficulty using the EPMU approach may arise when there are common and joint costs that may be common to several increments, but may not necessarily be relevant for all services. For instance, under this approach, common costs associated to an SMS-C platform would be allocated to all network services based on their share of pure incremental costs when, in fact, these should only be allocated to SMS services.

It would be inaccurate, in such cases, to allocate all common and joint costs indistinctly based on a simple mark-up of purely incremental costs.

Based on the above, OCECPR believes the effective capacity approach to be the option that more accurately represents how network-related common costs should be shared among services, as it would attribute common costs based on same routing table employed for the allocation of pure incremental costs. OCECPR also considers that the use of this approach would allow a better recognition of the common costs that should be assigned to services provided over early stage networks, such as 4G and FTTH services.

Unlike network-related common and joint costs, common costs related to G&A are normally not relevant only to a particular set of services. Establishing a measure of 'efficient capacity' for such costs is often not obvious. The OCECPR thus will employ an EPMU approach to allocate G&A common costs to services.

### 3.1.3. Asset valuation

The OCECPR identifies two main potential approaches to be used for asset valuation:

- **Historical Cost Accounting (HCA)** is the average price paid historically by the company to acquire an asset, based on the operator's book
- **Current Cost Accounting (CCA)** reflects the current and expected market value of the assets

In its 2009 Recommendation on the regulation of MTRs/FTRs, the European Commission stated that "*It is recommended that the evaluation of efficient costs is based on current cost and the use of a bottom-up modelling approach using long-run incremental costs (LRIC) as the relevant cost methodology*". Additionally, it provides further background to its recommendation stating that "*In a competitive environment, operators would compete on the basis of current costs and would not be compensated for costs which have been incurred through inefficiencies. Historic cost figures therefore need to be adjusted into current cost figures to reflect the costs of an efficient operator employing modern technology*".

Although this methodology has been broadly accepted by most NRAs in the development of Bottom-Up models for mobile networks, there have been several discussions among regulators on the suitability of valuating fixed operators' civil infrastructure (for instance copper access network, civil works and ducts) according to Current Cost Accounting, as it may lead to an overestimation of access services' costs.

In this sense, in its 2005 Copper Statement[8], Ofcom concluded, referring to civil infrastructure assets, that "*The value of the RAV (Regulatory Asset Value) is set to equal the closing HCA value for the pre 1 August 1997 assets for the 2004/5 financial year*" whereas it approved the "*use of current cost accounting as at present for assets deployed from 1 August 1997 onwards*".

In similar fashion, the EC Recommendation of 2013 'on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment' establishes clear guidelines in order to avoid such over-recovery of civil engineering related costs. Particularly, the EC Recommendation of 2013 states the following points:

> *(34) Unlike assets such as the technical equipment and the transmission medium (for example fibre), civil engineering assets (for example ducts, trenches and poles) are assets that are unlikely to be replicated. Technological change and the level of competition and retail demand are not expected to allow alternative operators to deploy a parallel civil engineering infrastructure, at least where the legacy civil engineering infrastructure assets can be reused for deploying an NGA network.*
>
> *(35) In the recommended costing methodology the Regulatory Asset Base (RAB) corresponding to the reusable legacy civil engineering assets is valued*

[8] http://stakeholders.ofcom.org.uk/binaries/consultations/copper/statement/statement.pdf

*at current costs, taking account of the assets' elapsed economic life and thus of the costs already recovered by the regulated SMP operator. This approach sends efficient market entry signals for build or buy decisions and avoids the risk of a cost over-recovery for reusable legacy civil infrastructure. An over-recovery of costs would not be justified to ensure efficient entry and preserve the incentives to invest because the build option is not economically feasible for this asset category.*

*(36) The indexation method would be applied to calculate current costs for the RAB corresponding to the reusable legacy civil engineering assets. This method is preferred due to its practicability, robustness and transparency. It would rely on historical data on expenditure, accumulated depreciation and asset disposal, to the extent that these are available from the regulated SMP operator's statutory and regulatory accounts and financial reports and on a publically available price index such as the retail price index.*

*(37) Therefore, the initial RAB corresponding to the reusable legacy civil engineering assets would be set at the regulatory accounting value, net of the accumulated depreciation at the time of calculation and indexed by an appropriate price index, such as the retail price index.*

*(38) The initial RAB would then be locked-in and rolled forward from one regulatory period to the next. The locking-in of the RAB ensures that once a non-replicable reusable legacy civil engineering asset is fully depreciated, this asset is no longer part of the RAB and therefore no longer represents a cost for the access seeker, in the same way as it is no longer a cost for the SMP operator. Such an approach would further ensure adequate remuneration for the SMP operator and at the same time provide regulatory certainty for both the SMP operator and access seekers over time."*

Based on the above, OCECPR understands the most appropriate approach for the valuation of assets is:

- *Bottom-Up model for mobile networks*: All assets will be valued at their current cost
- *Bottom-Up model for fixed networks:*
  - Assets purchased after 1/1/2011: All assets valued at their current cost.
  - Assets purchased before 1/1/2011: Civil infrastructure assets related to Cyta's copper network will be valued at their historical cost. The rest of the assets will be valued at their current cost.

### 3.1.4. WACC

Costing of services needs to take into account a reasonable amount of return on the invested capital an operator would be able to earn in a truly competitive market. In order to estimate this reasonable amount of return, the OCECPR proposes the use of a Weighted Average Cost of Capital (WACC), which is defined as the sum of the weighted cost of equity and debt. These weights are based on the market value of debt and equity, respectively.

The use of the WACC is the overwhelmingly preferred mechanism to reflect a reasonable regulated profit level in the telecommunications industry and is a de-facto international standard in the implementation of BULRIC models. In particular, the WACC figures to be applied will be extracted as follows:

- *Fixed networks*: OCECPR will request this figure from the SMP, given that the model will reflect its operations.
- *Mobile networks*: OCECPR will request the WACC figures employed by the three MNOs currently operating in the Cypriot mobile market. The value that will be considered in the model will be obtained as a weighted average (in terms of subscribers) of the values provided by the MNOs.

OCECPR may eventually adjust the figures provided by the operators if it considers that they are not representative of the market realities in Cyprus, or the figures provided have not been sufficiently justified by the operators.

### 3.1.5. Depreciation method

The pattern of cost recovery over time is critically dependent on the depreciation methodology assumed. The OCECPR is of the opinion that, when estimating the annualised costs for assets, the Financial Capital Maintenance (FCM) principle should be respected. The concern of the FCM is to maintain the financial capital of the company. This maintenance is achieved when the value of shareholder funds is the same in real terms at the start and at the end of the period. In practical terms, the FCM principle ensures that the costs incurred for the provision of services are recovered, including an appropriate level of profit.

A number of depreciation methods may be used, which are compatible with the FCM principle, such as:

- Straight line depreciation
- Standard Annuity
- Tilted Annuity

- Economic depreciation

OCECPR considers the tilted annuity approach as the preferred annualisation methodology, as it offers the best equilibrium between economic accuracy and ease of implementation. The tilted annuity allows the consideration of the evolution of network prices, while avoiding potential deviations due to traffic forecasts uncertainty which can affect the calculations in the case that an economic depreciation/adjusted tilted annuity method is used.

With this approach the profile of the costs recovery is adapted with the objective of recognising variations in asset prices. For example, in case prices of assets decrease, a new entry in the market could have a great advantage over existing operators because it will benefit from best prices and therefore lower depreciation costs.

This depreciation mechanism will be calculated in the models based on the following formula:

$$d_i = I \cdot \frac{p_i}{\sum_{n=i_0}^{i_0+UL-1}(p_n \cdot \alpha_n)}$$

Where:

- $d_i$ is the annualised costs at year $i$ (within the useful life)
- $I$ is the investment associated to the asset
- $p_i$ is the reference price of the asset for the year $i$
- $UL$ is the useful life of the asset
- $i_0$ is the year when the asset was purchased
- $\boldsymbol{\alpha_i}$represents the cost of capital factor and responds to the following formula:

$$\alpha_i = (1 + WACC)^{-(i-i_0+1)}$$

### 3.1.6. Period of time modelled

Given that the unit costs of services are calculated depending on the demand at a specific point in time, the period of time modelled will be crucial in the scope of the possible analyses of the models' results.

Fixed and mobile networks have been well-established in the Republic of Cyprus for many years, covering the vast majority of the population. In order to take into consideration the historical roll-out of fixed and mobile networks, obtain a precise valuation of civil infrastructure assets, and to be able to calibrate the models, it is

deemed necessary that the time frame considered shall begin in the past. Nevertheless, the OCECPR does not consider it essential to go back to the take-up stages of mobile and fixed networks, as it would add complexity to the modelling process.

In order to implement the asset valuation mechanisms outlined in section 3.1.3, OCECPR considers that a time frame starting in the year 2010 would be needed. This time frame will allow adequately to value civil infrastructure assets appropriately while allowing the model to be reconciled against operators historical data.

With regards to the final year of the time frame, a reasonable extent of the period of time modelled should be considered so as to understand the likely evolution of network costs towards the medium-term. Accordingly, the model will include a look-forward period that goes until 2025, so that the time-frame considered will encompass the period ranging from 2010 until 2025.

### 3.1.7. Treatment of the information

BULRIC models require a significant amount of inputs to be able to model the network accurately and to reliably represent the specificities of the Cypriot market. Data required includes, inter alia, information about traffic volumes, traffic statistics and patterns, network coverage, number of network elements, location of network sites, network dimensioning rules or CapEx and OpEx unit costs.

OCECPR will use the information provided by the operators as a primary and preferential source to populate and calibrate the BULRIC Models. To do so, OCECPR has already issued a data request template to the operators, in order to facilitate the exchange of information. Data provided by operators in this process will be treated as confidential, except when this is already available in the public domain.

In the case that a piece of information is not available, or is not provided by the operators, the OCECPR shall resort to the use of international benchmarks as preferred alternative data source.

In the case that a particular piece of data provided by the operators is not considered to be sufficiently reliable by the OCECPR (for instance, in the case of a material deviation versus the international norm), it will convene the operator to justify the value provided with supporting evidence. In the event that such justification is not deemed acceptable, and thus the provided data is not considered to be sufficiently reliable, the OCECRP may resort to the use of international benchmarks as preferred alternative data source.

The illustration below shows the decision tree that the OCECPR will apply in determining the appropriate data sources for the implementation of the BULRIC models:

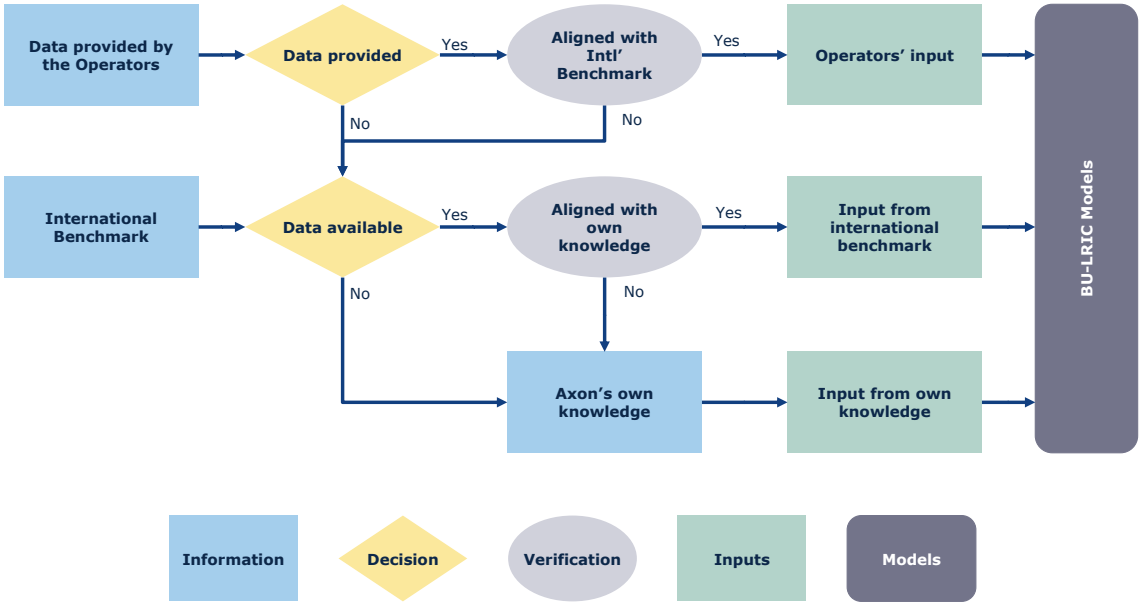


**Exhibit 3.3: Diagram of OCECPR's data revision process. [Source: Axon Consulting]**

## 3.1.8. Demand

Demand is a key input for the implementation of a BULRIC model, given that the dimensioning algorithms are designed based on a bottom-up approach. In this context, the OCECPR considers that this input should be calculated based on the following information:

- **Historic traffic demand,** for the historical period, in terms of users, access lines, data traffic, voice traffic and others.
- **Traffic demand forecasts,** expected for the future period, and expressed as inter-annual growth percentage of the total traffic (or average subscribers) per year compared with the previous year.

In order ensure the alignment of traffic demands that need to be included in the BULRIC models with the Cypriot market realities, this information will be requested to the operators.

However, OCECPR may eventually adjust the figures provided by the operators if it considers that they are not representative of the market realities in Cyprus, or the figures provided have not been sufficiently justified by the operators. Operators' data will be assessed taking into consideration:

- Demand evolution observed in the historical period and, in particular, the monthly consumption per subscriber (e.g. voice minutes)
- The evolution experienced in other European countries with similar characteristics and where the deployment of the NGN networks presents a more developed situation.

In case no forecasts are provided by the Operators, OCECPR will determine traffic forecasts based on the historical traffic trends registered in the Cypriot market as well as other European markets. These projections would typically be made over the monthly traffic consumption per subscriber, in order to ensure the underlying projections are aligned with the realities of the market.

## 3.2. **Issues specific to each BULRIC Model**

This section deals with those issues that need to be defined separately for each BULRIC Model. Specifically, the following key methodological aspects are treated in the paragraphs below for each type of model:

- Operator definition
- List of modelled services
- Definition of the increments

### 3.2.1. BULRIC Model for mobile networks

#### *Operator definition*

The type of operator to be modelled is a highly relevant conceptual issue, which determines the subsequent structure and parameters of the model. Likewise, the selection of the modelled operator in the case of mobile networks must take into consideration the regulatory approach that is expected to be followed in the upcoming decisions.

The full range of operator choices are:

1. *Actual operators* – in which the costs of all actual market players are calculated.
2. *Average operator* – in which the players are averaged together to define a 'typical' operator.
3. *Hypothetical new entrant* – in which a hypothetical new entrant to the market is defined as an operator entering recently with today's modern network architecture, which acquires a specified target share of the market.

4. *Hypothetical existing operator* – in which the hypothetical existing operator is modelled as an operator launching services in the market four or five years in the past after having previously rolled out a network with a modern network architecture, allowing the operator to attain its hypothetical scale in 2015.

From the options presented above, option 1 would automatically be removed, as it would not comply with EC's guidelines against considering actual operators. At the same time, this approach would only be useful in case asymmetric termination rates are pursued, which is not the case in Cyprus. From the remaining options, OCECPR believes a hypothetical existing operator would provide the most suitable option for cost modelling in the country, as it would enable the determination of costs in consistency with the existing suppliers of mobile termination in Cyprus, at the same time it removes the existing inefficiencies that would exist under option 2.

On the other hand, regarding the scale of the modelled operator, we acknowledge that the EC recommends to "*set that scale at 20 % market share. […] In case an NRA can prove that the market conditions in the territory of that Member State would imply a different minimum efficient scale, it could deviate from the recommended approach*"[9]. However, after the review of the European practices, it becomes clear that most NRAs have adopted a different approach, setting the scale of the reference operator at the average of the existing MNOs:

[9] Source: "*Commission recommendation of 7 May 2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU*" (2009/396/EC).

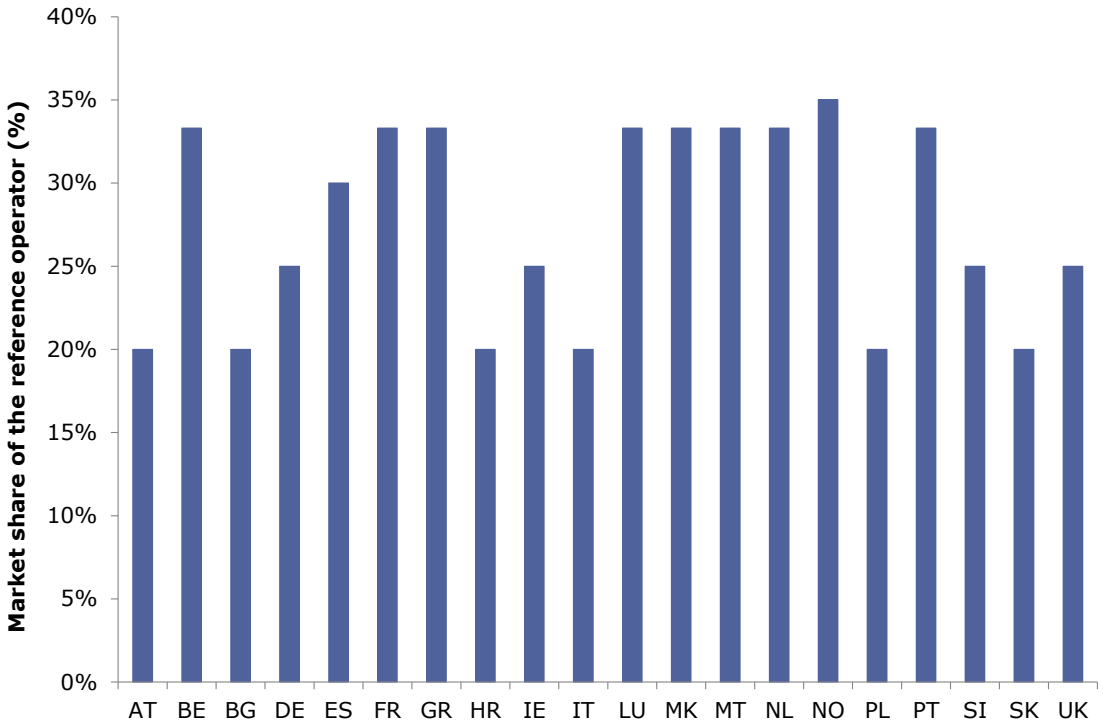


**Exhibit 3.4: Market share of the reference operator that has been considered in different European countries [Source: Axon Consulting]**

That is, the resulting market shares tend to move between 33,3% (the average market share of a market with 3 players) or 25% (the average of a market with 4 players). Following a similar approach as that taken into account by most European NRAs, and given the fact that 2 of the 3 Cypriot MNOs have a market share above 30%, OCECPR is of the opinion that the scale of the reference operator should be set to 33,3%.

More specifically, the characteristics of the proposed reference operator to be considered in the Bottom-Up model for mobile networks are summarised below:

- Type of operator: Hypothetical existing operator
- Market Share: 33,3%
- Coverage: Weighted average (in terms of subscribers) of the coverage levels achieved, under each technology, by the three existing MNOs.
- Spectrum: Average of the spectrum bandwidths available by the three existing MNOs
- Network architecture and topology: Mix of the three existing MNOs in the market

***List of modelled services***

The OCECPR considers that the lists of modelled services in the case of the BULRIC Model for mobile networks should include the services presented below for all possible technologies GSM, UMTS, LTE at a retail and wholesale level:

- Access services
  - Subscription fee
- Data services
  - Data per MB
- Voice services
  - On-net voice calls
  - Off-net voice calls
  - Call origination
  - Call Termination
- SMS services
  - On-net SMS
  - Off-net SMS
  - SMS origination
  - SMS Termination
- MMS Services
  - On-net MMS
  - Off-net MMS
  - MMS origination
  - MMS Termination
- National Roaming
  - Data traffic
  - Voice
  - SMS
  - MMS
- International Roaming (Foreign visitors in Cyprus)
  - Data traffic
  - Voice
  - SMS
  - MMS

- MVNO Services
- Data services
  - Data traffic
- Voice services
  - On-net voice calls

- Off-net voice calls
- Call origination
- Call Termination

- SMS services
  - On-net SMS
  - Off-net SMS
  - SMS origination
  - SMS Termination
- MMS Services
  - On-net MMS
  - Off-net MMS
  - MMS origination
  - MMS Termination

Additionally, for modelling purposes, the traffic carried out on each radio access technology will be differentiated in the model.

***Definition of the increments***

The European Commission recommendation on termination rates stated that "*it is justified to apply a pure LRIC approach whereby the relevant increment is the wholesale call termination service and which includes only avoidable costs*".

However, no other indications were given in regards to how the other services should be grouped into increments. More specifically, this grouping is generally performed based on one of the following approaches:

- *Based on technology*: services are grouped into increments according to their technology (i.e. GSM, UMTS, LTE). This approach is more commonly used by operators for supporting profitability systems and pricing (estimation of variable costs)
- *Based on services type*: increments are defined for the main services group (for example subscription, voice, data and other services). This alternative is more common among NRAs, as the main concern is to identify those costs that are directly attributable to certain service classes. For example, the SMS-Centre will be only associated with SMS services, regardless of technology

OCECPR recognises some merit in the distinction by technology, given that it may resemble the investment process of mobile operators, by which subsequent decisions are made on whether, and at what pace, successive technologies are deployed in the market. However, OCECPR also believes that, for regulatory purposes, mobile wholesale services should not be regulated on the basis of the

underlying technology. Based on the above, OCECPR will group the remaining services based on their type. That is, the following increments will be defined in the Bottom-Up model for mobile networks:

- Termination (voice and messaging services)
- Other voice and messaging services
- Data

***Technology and network considerations***

**Mobile Access Network**

Typically, the characteristics of each technology (as well as their dimensioning) are considered separately (in terms of coverage, demand and spectrum). The potential technologies to be modelled in the access network are as follows:

- 2G (GSM)
- 3G (UMTS)
- 4G (LTE)

The EC Recommendation states that *"The cost model should be based on efficient technologies available in the time frame considered by the model"*. Given that all three technologies are massively present in the country, OCECPR believes all of them should be captured in the model.

**Transmission Network**

The most commonly used transmission technologies are:

- Microwave Links
- Leased Lines
- Optic Fibre / Dark Fibre

Typically, the choice of one technology or another depends heavily on the required capacity (bandwidth) of the network, and on the geographical environment of the sites. For instance, optic fibre may be preferred when a high capacity link is required but may not be cost effective when lower capacity is needed. On the other hand, microwave links may be more cost effective to connect base stations in more isolated environments.

As all three options are generally being used by mobile operators worldwide, OCECPR finds it appropriate to include them all in the model. The deployment mix of these technologies will be based on the actual use of these technologies by the MNOs.

**Core Network**

There are two different technologies that can be defined for modelling the core Network:

- *3Gpp Legacy Core Network*: Architecture typically used by operators with 2G/3G networks. This architecture includes a separation between the control layer (MSC-S) and the traffic layer (MGW).
- *Evolved Core Network*: Common solution implemented when LTE services are being deployed by an operator. Under the NGN architecture, the core network is IP based.

As the three technological access options will be considered in the model, OCECPR believes it is necessary to contemplate the deployment of a 3Gpp Legacy core network (to handle 2G and 3G access traffic) as well as an evolved core network (to handle 4G access traffic)

### 3.2.2. BULRIC Model for fixed networks

***BULRIC model for a fixed network***

The definition of the modelled operator for the BULRIC model for fixed networks is to be made based on the same alternatives as presented for the model for mobile networks. However, in this case, given that in most markets there has been, for years, a fixed state-owned operator that gathered a high market share, many NRAs have adopted an approach consistent in modelling only that incumbent operator.

This is for instance the case of Malta or Belgium, among others, which stated in their consultation papers:

- Malta (MCA): "The Model uses GO's scale and scope as a proxy of the model's hypothetical efficient operator. The choice of GO as a proxy for the model's hypothetical efficient operator reflects the fact that, to date, the operator offers the majority of the regulated services under review […], as well as having a significant presence in such markets"[10]
- Belgium (BIPT): "This approach ensures that the resulting costs of service are directly (efficiently) comparable to the services offered by Belgacom (the operator under regulatory consideration) particularly for services like unbundling where economies of scale are important. Reference points and input values can

[10] GO is the leading telecommunications provider in the Republic of Malta

be obtained from Belgacom directly, without the need to transform comprehensive sets of inputs to a different operator situation (which would be the case for a new entrant model, for example). The existing operator approach allows the target core and access NGN to be outlined with reference to Belgacom's current plans, which will in most cases largely determine the availability of wholesale services on the Belgian market.

Whilst there are some drawbacks to using this approach, such as the requirement to disguise confidential information which is closely (or exactly) based on Belgacom's actual business information, and the requirement to specify 'efficient' roll-out profiles for NGN elements; these drawbacks are considered minor in comparison to the adoption of other operator types (such as a hypothetical new entrant model). This is because there are various other disadvantages of using other operator types, for example not reflecting costs similar to Belgacom's costs, requiring additional assumptions on network deployment, limited ability to compare the model with top-down data, etc."

This approach is also shared by many other NRAs in Europe, such as AKOS (Slovenia), RRT (Lithuania), Hakom (Croatia), BNetzA (Deutschland), CTU (Czech Republic) or RTR (Austria).

OCECPR believes these arguments are perfectly replicable to the situation of the fixed telecommunications sector in Cyprus, and hence, considers it appropriate to model a hypothetical existing operator based on Cyta. This hypothetical operator will have the same characteristics as Cyta in terms of demand, coverage, and network topology.

### *List of modelled services*

The list of services to be included in the BULRIC Model for fixed networks will be:

- Access services
  - Copper access
    - PSTN retail subscription fee
    - ISDN2 retail subscription fee
    - ISDN30 retail subscription fee
    - Retail Naked DSL subscription fee
    - Local Loop Unbundling (LLU) subscription fee.
    - Local Sub Loop Unbundling (LSLU) subscription fee.
    - Shared Access subscription fee.
    - LLU and LSLU Access with Bonding
    - Wholesale line rental subscription fee
  - Fibre access

- FTTH retail subscription fee
- Virtual LLU over FTTH/GPON
- Virtual LLU over FTTC (including bonding)

- Voice services
  - On-net voice calls
  - Off net voice calls to fixed and mobile operators
  - Outgoing voice calls to non geographic numbers
  - Broadband to broadband voice calls
  - Call termination
  - Call origination
- Lease Lines Connection and
  - E1 National Retail LL
  - E3 National Retail LL
  - STM1 National Retail LL
  - STM4 National Retail LL
  - STM16 National Retail LL
  - E1 Terminating Wholesale LL
  - E3 Terminating Wholesale LL
  - STM1 Terminating Wholesale LL
  - STM4 Terminating Wholesale LL
  - STM16 Terminating Wholesale LL
  - E1 National Trunk Wholesale LL
  - E3 National Trunk Wholesale LL
  - STM1 National Trunk Wholesale LL
  - STM4 National Trunk Wholesale LL
  - STM16 National Trunk Wholesale LL
- Broadband
  - xDSL broadband subscription fee
  - FTTX broadband line subscription fee
  - Bitstream line subscription fee
- International Capacity
  - Backhaul at the Landing station subscription fee
  - International Capacity from the landing stations in Cyprus to the main destination abroad subscription fee
- IPTV
  - IPTV subscription fee

***Definition of the increments***

Similarly to what has been presented for the BULRIC model for mobile networks, the European Commission position is also applicable in this case. That is, "*it is*

*justified to apply a pure LRIC approach whereby the relevant increment is the wholesale call termination service and which includes only avoidable costs*".

However, NRAs are given freedom on how to define the increments applicable to the rest of the services. In this case, international practice shows that, in fixed networks, it is common to define increments making a distinction between access and conveyance. Based on this first-level separation, it is possible to introduce further disaggregation.

For instance, the IBPT (Belgium NRA) stated in its public consultation document that "*the cost model calculates the marked-up long-run average incremental costs (LRAIC+) of a number of large service groups (i.e. large increments):*

- traffic in the core network
- subscriber and FTTO access lines
- various separate (wholesale) ancillary services."

OCECPR believes that a definition of the increments based on the level of the network (access or core) would allow a proper differentiation of the costs associated to subscribers and those related to the traffic generated. Hence, OCECPR will use the following definition of increments in the BULRIC model for fixed networks:

- Voice termination
- Access lines
- Conveyance traffic

***Technology and Network considerations***

**Fixed Access Network**

Given that the operator to be modelled in the fixed network will share the same characteristics as Cyta, OCECPR believes that the following access technologies should be considered:

- ADSL/ADSL2+/VDSL2 deploying vectoring and bonding
- Optical Fibre (GPON)

The model will consider a migration pattern from one technology to another, so that both technologies will coexist in the model.

**Transmission Network**

The transmission technologies commonly adopted by fixed operators are presented below:

- Microwave Links
- SDH Fibre Transmission
- Native Ethernet Fibre Transmission
- WDM Fibre Transmission

Given OCECPR's needs of representing the current status of the fixed incumbent operator in that model, all of the above presented technologies will be taken into consideration to the extent they are being used by Cyta.

**Core Network**

Finally, the core network architectures that are commonly used in fixed networks are presented below:

- *Legacy TDM Network*: Based on switching exchanges (remote, local, secondary, tandem, etc)
- *NGN Core Network*: Based on an IMS all-IP network

The international best practice shows that the NRAs assume both architectures in BULRIC Models, with the most recent models tending to consider only an NGN Core Network. It is OCECPR's consideration that modelling NGN networks is useful for advanced markets with higher broadband speeds.

As of now, it is OCECPR's understanding that CYTA is in process of developing an all-IP network, which is expected to be completed by the end of 2017, and will coexist for a certain stage of the migration work with the existing TDM network.

In light of the previous paragraphs, OCECPR suggests to include both TDM and NGN core network architectures, which will transition from one to another based on Cyta's network plans.

# 4. Margin-Squeeze Model

According to the definition made by the ERG, "*A margin squeeze (also known as price squeeze) is a situation where a vertically integrated firm with market power in a key upstream market, supplies rival firms in associated downstream markets and sets prices for the input and the downstream service in a way that renders unprofitable the activities of its competitors in the retail market*."[11] In a situation of a margin squeeze, competitors are unable to replicate the retail prices of the SMP operator profitably.

The following exhibit presents an example of a price/profit squeeze issue.

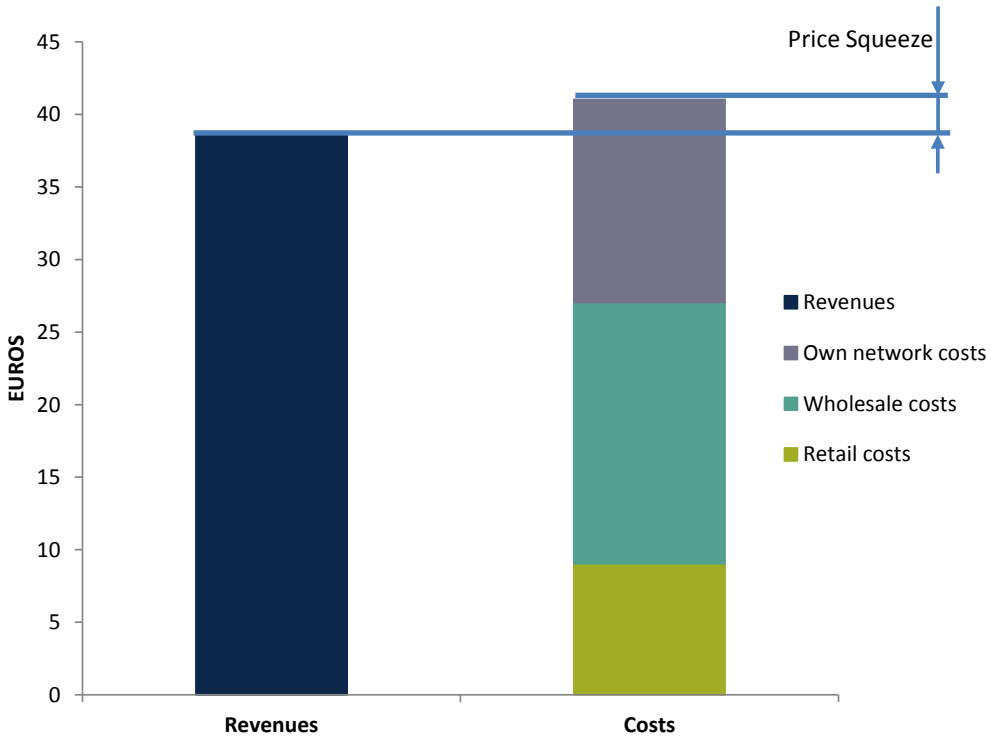


**Exhibit 4.1: Illustrative example of a predatory pricing issue [Source: Axon Consulting]**

The margin-squeeze model will calculate the costs associated to the provision of the services included in the tariffs and corresponding revenues of the retail offers in the fixed and mobile broadband access markets, in accordance with the EC's recommendation "*on consistent non-discrimination obligations and costing*

[11] Report on the Discussion on the application of margin squeeze tests to bundles, ERG, 2009.

*methodologies to promote competition and enhance the broadband investment environment*"[12].

At the end of the calculation process, the PS test is performed according to the following relation:

$$R - (CW + CR + CN + M) \geq 0$$

Where (1) R is the revenues from customer, (2) CW is the wholesale costs, (3) CR is the retail costs, (4) CN is the network costs, and (5) M is the reasonable margin (defined as a percentage of the cost that can be changed by the user in the control panel).

This section presents the main methodological aspects that are deemed of relevance by OCECPR in the development of the margin-squeeze model. Specifically, the following key issues are treated in the paragraphs below:

- Reference Operator
- Aggregation Level
- Products
- Cost Standard
- Relevant downstream costs
- Reasonable Profit
- Time modelling for costs

### 4.1.1. Reference Operator

The implementation of a margin squeeze test involves a certain number of key methodological choices. One of them is a choice of the level of efficiency of the operator used in the test. It must be decided if the efficiency level of the tested operator is comparable to the scale of the SMP operator or to the scale of the generic (alternative) operator.

In this context, three different approaches are generally applied by NRAs:

1. **Equally efficient operator** (EEO): efficient operator in the downstream market with the scale of the SMP operator, so the costs can be taken from the SMP operator's regulated accounts.

[12] European Commission, C(2013) 5761, 2013

2. **Reasonably efficient operator** (REO): efficient operator in the downstream market, with a cost base of a generic (alternative) operator which does not have (yet) the scale of the SMP operator.
3. **Adjusted equally efficient operator** (adjusted EEO): efficient operator based on the SMP operator's costs, adjusted to the scale of the generic (alternative) operator for which the margin squeeze test is conducted.

According to the EC Recommendation, "*Downstream costs are estimated on the basis of the costs of the SMP operator's own downstream businesses (EEO test)*". Hence, it is clear, according to the EC, that only alternatives 1 or 3 would be appropriate.

The EC also states that when any of the following circumstances are met, it would be appropriate to introduce adjustments on the scale of the EEO:

- when market entry or expansion has been frustrated in the past or;
- when very low volumes of lines and limited geographic reach as compared to the SMP operator's network indicate that the objective economic conditions do not favour the acquisition of scale by alternative operators

Given the fixed market situation in Cyprus, where the scale of the alternative operators is limited, adopting an adjusted EEO approach is considered would be the recommended approach by the EC.

In defining the actual market share of the adjusted EEO, the Norwegian Communications Authority studied the approaches adopted by different NRAs, concluding that "*NRAs often use a 20% to 25% market share*"[13]. This is contrasted with OCECPR's studies, which show that Greece has adopted a 13,5% market share, Norway adopted a 20% market share, and Croatia adopted a 25%. OCECPR considers that a reasonable approach would be to consider an scale of the adjusted EEO equal to 20% of the market.

### 4.1.2. Aggregation Level

The EC Recommendation does not specify the level of aggregation that should be adopted in the development of margin squeeze models. On the other side, NRAs have typically adopted one of the alternatives presented below:

[13] Principles for margin squeeze tests for fibre access in Market 4 and 5, February 2015.

- product-by-product analysis: test performed on each bundle/standalone offer, with each one having to be profitable to pass the test.
- aggregation of (a group) of products: test performed on a group of bundles/standalone offers, which as a group need to be profitable to pass the test.
- combinatorial approach: different combinations of the previous alternative are taken into account in order to run the test.

In its guidance on the EC Recommendation, the BEREC outlined that "*There are a number of reasons underpinning the use of a product-by-product test in an ex-ante setting where an operator has SMP upstream to one or a number of wholesale inputs required to replicate an offer at the retail level. In particular, the use of a product-by-product approach ensures that each bundle/standalone offer is replicable and that there can be no form of cross-subsidy between bundles/standalone offers*".

At the same time, what the EC did recommend was that "*The NRA need not to run the test for each and every new retail offer but only in relation to flagship products to be identified by the NRA*", and defined 'flagship products' as the "*most relevant retail products including broadband services*".

OCECPR will conduct a product-by-product analysis of the products offered by Cyta in the fixed and mobile markets, as well as those commercialised by MTN in the mobile market.

### 4.1.3. Products

The EC Recommendation states that "*NRAs should identify flagship products on the basis of their current and forward-looking market observations, in particular taking account of their relevance for current and future competition. This should include and assessment of retail market shares in terms of the volumes and value of products based on NGA regulated wholesale inputs and, where available, advertising expenditure.*"

On the analysis of the alternatives adopted by other European NRAs, it seems that there is a common trend on how flagship products should be defined:

- MCA (Malta): "The MCA proposes the following criteria that GO needs to consider when determining which of its retail broadband offers, be they bundles or stand-alone, fall within the set of flagship products:
  - *1. Those products which, in descending order, represent in sum 70% of GO's broadband subscriber base;*

- *2. In the event that there is any product/s which individually accounts for a revenue share of 10% or more of the total revenues of broadband based offers, but which has not been captured under the 70% threshold, this product will be added to the list of flagship products;*
- *3. One stand alone business and residential broadband product which accounts for the highest share in terms of subscribers unless captured in any of the above criteria."*

- NKOM (Norway): "Flagship products comprise those tariffs with the highest revenue which cover 70% of the revenue within the relevant 12 months term before the MST is conducted. In addition, products with a market share of 10 % either with respect to subscriber numbers or revenue within this time frame will be included in the MST."
- ILR (Luxemburg): "Flagship products: products which in sum represent a revenue share of 70% of all retail products of the SMP operator in the broadband market. Additionally, all products which represent a revenue share of at least 10% are treated as flagship products"

OCECPR will analyse the complete product portfolio of Cyta's fixed segment, whereas it will only analyse those flagship products offered by Cyta and MTN in the mobile market that jointly represent a revenue share of 70% of all retail products of each of the two operators in the mobile market.

### 4.1.4. Cost Standard

Annex II of the 2013 Recommendation states that the ex ante economic replicability test is intended to assess "*whether the margin between the retail price of the relevant retail products and the price of the relevant NGA-based regulated wholesale access inputs covers the incremental downstream costs and a reasonable percentage of common costs*". Additionally, it states that "*the incremental cost of providing the relevant downstream service is the appropriate standard. A LRIC+ model should be used to calculate the incremental cost (including sunk costs) and to add a mark-up for common costs related to the downstream activities*".

In line with the 2013 recommendation, OCECPR supports this methodology and is proposing the use of the LRIC+ approach which allows for recovery of the total efficiently incurred costs. However, when this data is not available, fully distributed costs (FDC) may need to be used based on data from the SMP operator's accounts.

### 4.1.5. Relevant downstream costs

The development of a margin squeeze model must consider all the incremental costs that are incurred in the provision of the SMP's retail offerings. These shall include:

- **Own network costs**. Represent the costs an alternative operator would have for deploying its own network, which may include the following network elements:
  - Equipment at the point of co-location (Ethernet switch, ports);
  - Transmission (network nodes and links), including international capacity;
  - Cost related to interconnection locations
  - Operating and maintenance costs
  - Capital costs related to network infrastructure

  These network elements will be dimensioned so that they can cope with the demand of the reference operator. Capital related expenses will be depreciated according to the same useful lives considered in the Bottom-Up model for fixed networks.

- **Costs for terminating traffic in other networks.** Based on the termination rates regulated by the OCECPR.
- **Retail costs.** According to BEREC[14], NRAs generally include the following retail cost categories:
  - Customer acquisition and retention
  - Customer care
  - Marketing and advertising
  - Billing
  - Sales personnel salary/Sales commission
  - Bad debt
  - CPE/Distribution of CPE
  - Product development/management
  - Common costs.

  The model will assumes that retail costs are driven by the number of new customers and by the number of current customers. New customers (net

[14] BEREC Guidance on the regulatory accounting approach to the economic replicability test, 2014, p. 20.

additions) will drive subscriber acquisition, sales and distribution and installation costs. Other retail costs will be grouped as current customer driven.

- **Other costs (regulatory, number portability etc.).** Besides the above mentioned downstream costs and retail costs, other costs may exist that could be of relevance, such as expenses due to regulatory obligations or number portability, which will also be included in the model.
- **Other common costs**. Administration and management costs, which cannot be allocated to individual services, will be considered and allocated based on the use of an Equi-proportional mark-up (EPMU). The percentage of administration and management costs to be included will be calculated based as the ratio of total common costs to total incremental costs.

The sources that will be employed in order to gather the information required to properly consider these costs, are presented below:

- Wholesale prices for regulated and non-regulated products
- Information obtained from the SMP operator in the data gathering process
- Cost data extracted from Bottom-Up or Top-Down models
- Statistics gathered by the OCECPR
- Benchmark values on certain parameters where local data is not available.

### 4.1.6. Reasonable Profit

The relevant competitive return or margin in a margin squeeze context is usually identified indirectly by using a WACC approach for the downstream business. The WACC should reflect the risk of the retail business of the reasonably efficient operator. Otherwise, the margin between the wholesale and the retail price is not sufficient for an efficient competitor to earn an appropriate return on capital in the retail market.

For the development of the margin-squeeze model, OCECPR will consider the same WACC as that adopted for the Bottom-Up model for fixed networks.

### 4.1.7. Time modelling for costs

In the assessment of the value of the costs and revenues in the margin squeeze model, there is a choice between static approaches, based on current financial figures, and methods that take into account future profitability and costs. In more detail:

- A **static** approach considers that cost and revenue inputs such as assets, customer acquisition costs, set-up fees and investments are annualised (spread over a fixed period of time) or depreciated (accounting depreciation of assets), but it does not consider environmental changes (for example, how the usage of the service changes over time, how customers would react to new services, or how the economic crisis can impact revenues). In this respect the static approach is very conservative since it does not allow speculation regarding the success or misfortunes of the products tested.
- The **dynamic** approach, also called Discounted Cash Flow (DCF), considers how services are used and how cash flows vary over the years, in addition to the depreciation and annualisation. DCF is considered a valid method used in business planning and financial evaluations.

Static approaches are usually employed in cases of stable markets with predictable revenues and costs and low variation elements in the business. As a rule-of-thumb, it is the most straightforward methodology to estimate business and financial values without the need of complex calculations in order to predict the value of investments in the future. It's advantageous due to the fact that it does not speculate on future costs and revenues, but solidly bases the test on today's situation. Whether the test is performed regularly with updated information, or as a one-off, it delivers a reasonable and valid estimation.

The OCECPR proposes the use of the static approach, as it delivers a reasonable and valid estimation. It should be noted that opting for the static approach does not in any form imply that investments and one-off costs incurred by undertakings need to be recovered over a period of only one year. On the contrary, the spread of investments and one-off costs such as network assets and customer acquisition costs are spread over a number of years or annualised.

# 5. Ancillary Services Model

The OCECPR notes that there is a number of services included (or which may be included) in the wholesale reference offers, that are not appropriate to be included in the fixed or mobile BULRIC models. Services which shall not be incorporated in the main BULRIC models are those that meet one or more of the following conditions:

- Services which do not make use of network equipment, in particular services related to one-off interventions or ancillary services
- Services which make use of very specific and limited number of network resources
- Services of reduced materiality

With the objective of setting appropriate wholesale tariffs for such services, the OCECPR intends to develop a separate and simpler costing module, which will not be linked to the BULRIC models described in the above sections.

Given the length of the number of ancillary services to be included in this model, these have been split according to the reference offer they belong to:

## 5.1. Connection Services

- Cooper access
  - PSTN retail connection fee
  - ISDN2 retail connection fee
  - ISDN30 retail connection fee
  - Retail Naked DSL connection fee
  - Local Loop Unbundling (LLU) connection fee
  - Local Sub Loop Unbundling (LSLU) connection fee
  - Shared Access connection fee
  - Wholesale line rental connection fee
- Fibre access
  - FTTH retail connection fee
- xDSL broadband connection fee
- FTTX broadband line connection fee
- Bitstream line connection fee
- International Capacity
  - Backhaul at the Landing station connection fee

- ❖ International Capacity from the landing stations in Cyprus to the main destination abroad connection fee

- IPTV
  - ❖ IPTV connection fee

## 5.2. **Carrier selection and preselection Reference Offer**

- Activation/Deactivation of services for selection/preselection
  - ❖ Activation of selection service
  - ❖ Activation of pre-selection service
  - ❖ Activation of selection and pre-selection services
  - ❖ Deactivation selection and/or pre-selection service
  - ❖ Ενεργοποίηση Υπηρεσίας Προεπιλογής Φορέα ανά αίτηση Συνδρομητή
  - ❖ Refused application for pre-selection service
  - ❖ Ακύρωση αίτησης για την οποία δεν έχει σταλεί έγκαιρα από τον Παροχέα στη Cyta η πρωτότυπη αίτηση Συνδρομητή
- ΤΕΛΗ ΥΠΗΡΕΣΙΑΣ ΠΑΡΟΧΗΣ ΠΛΗΡΟΦΟΡΙΩΝ ΧΡΕΩΣΗΣ Ή/ΚΑΙ ΧΡΕΩΣΤΙΚΩΝ ΠΑΛΜΩΝ ΓΙΑ ΚΛΗΣΕΙΣ ΠΟΥ ΔΡΟΜΟΛΟΓΟΥΝΤΑΙ ΜΕΣΩ ΤΗΣ ΥΠΗΡΕΣΙΑΣ ΕΠΙΛΟΓΗΣ ΚΑΙ ΠΡΟΕΠΙΛΟΓΗΣ ΦΟΡΕΑ
  - ❖ Ενεργοποίηση παροχής πληροφοριών χρέωσης κλήσεων και χρεωστικών παλμών για τις Υπηρεσίες
  - ❖ Παροχή υπηρεσίας παροχής πηροφοριών χρέωσης ή/και χρεωστικών παλμών ανά Συνδρομητή
- ΤΕΛΗ ΠΑΡΟΧΗΣ ΦΡΑΓΩΝ ΕΞΕΡΧΟΜΕΝΩΝ ΚΛΗΣΕΩΝ ΜΕ ΧΡΗΣΗ ΤΟΥ ΚΩΔΙΚΟΥ ΠΡΟΕΠΙΛΟΓΗΣ ΦΟΡΕΑ
  - ❖ Activation of barriers for outgoing calls
  - ❖ Παροχή υπηρεσίας φραγών εξερχόμενων κλήσεων ανά Συνδρομητή
- ΤΕΛΗ ΥΠΗΡΕΣΙΑΣ ΕΝΑΛΛΑΚΤΙΚΗΣ ΔΙΟΔΕΥΣΗΣ
  - ❖ Τέλος ενεργοποίησης της Υπηρεσίας Εναλλακτικής Διόδευσης ανά Τοπικό Κέντρο
  - ❖ Τέλη Συλλογής Κλήσεων ανάλογα με τη δρομολόγηση της κλήσης

## 5.3. **Interconnection Reference Offer**

- Basic interconnection services
  - ❖ Υπηρεσία Δρομολόγησης Κλήσεων μέσω του Σταθερού Δημοσίου Τηλεφωνικού Δικτύου της Cyta

- ❖ Υπηρεσία Δρομολόγησης Κλήσεων μέσω του Δημοσίου Δικτύου Ηλεκτρονικών Επικοινωνιών GSM της Cyta

- Other interconnection services
  - ❖ Termination in directory enquiry services of CYTA
  - ❖ Τερματισμός σε Υπηρεσίες Προσωπικού Αριθμού
  - ❖ Τερματισμός στην Υπηρεσία «Ένας Αριθμός»
  - ❖ Termination of voice mail service
- ΤΕΛΗ ΣΥΝΔΕΣΗΣ ΣΕ ΚΟΜΒΟ ΜΕΤΑΦΟΡΑΣ ΣΗΜΑΤΟΔΟΣΙΑΣ
- ΤΕΛΗ ΖΕΥΞΕΩΝ ΔΙΑΣΥΝΔΕΣΗΣ ΚΑΙ ΜΕΡΙΚΩΣ ΜΙΣΘΩΜΕΝΩΝ ΚΥΚΛΩΜΑΤΩΝ
  - ❖ Τέλη εγκατάστασης Πύλης Κόμβου Διασύνδεσης Στο Σταθερό Δίκτυο της Cyta
    - 1η Ζεύξη σε ΠΜ με νέα σηματοδοσία προς τον Ελεγκτή Πυλών Μέσων (ΕΠΜ) μέσω του αντίστοιχου κόμβου μεταφοράς σηματοδοσίας (STP)
    - 1η Ζεύξη σε ΠΜ με νέα σηματοδοσία προς τον αντίστοιχο ΕΠΜ μέσω υφιστάμενης σύνδεσης του ΕΠ με το δίκτυο STP
    - 1η Ζεύξη σε άλλη ΠΜ που ελέγχεται από τον ίδιο ΕΠΜ που είναι ήδη συνδεδεμένος ο ΕΠ
    - 1η Ζεύξη σε ΤΤΚ με απευθείας σηματοδοσία
    - 1η Ζεύξη σε ΤΤΚ με νέα σηματοδοσία μέσω ενός HiS (STP)
    - 1η Ζεύξη σε ΤΤΚ με νέα σηματοδοσία μέσω δύο HiS (2xSTP)
    - Εγκατάσταση σε Πύλη Μέσων
    - Εγκατάσταση σε Τηλεφωνικό Κέντρο
  - ❖ Τέλος εγκατάστασης Πύλης Διασύνδεσης 155 Mbps στο Δίκτυο Ηλεκτρονικών Επικοινωνιών GSM της Cyta
    - Τέλος Εγκατάστασης Πύλης 155 Mbps

## 5.4. **LLU Reference Offer**

- Information services
  - ❖ Investigation availability service
    - Active local loop
    - Inactive local loop
    - Shared access to the local loop
    - Active local sub-loop
    - Inactive local sub-loop
  - ❖ Information on specific local loops with automated access
  - ❖ Information on specific local loops and local sub-loops without automated access
    - Μήκος Ενεργού Τοπικού Βρόχου

- Μήκος και μετρήσεις ποιότητας Ενεργού Τοπικού Βρόχου
- Κεντρικός Κατανεμητής Καλωδίων (ΚΚΚ) και διακλαδωτής καλωδίων Ενεργού Τοπικού Βρόχου και Τοπικού Υπο-Βρόχου
- Κεντρικός Κατανεμητής Καλωδίων (ΚΚΚ) και διακλαδωτής καλωδίων Ανενεργού Τοπικού Βρόχου και Τοπικού Υπο-βρόχου
- Μήκος και μετρήσεις ποιότητας Ανενεργού Τοπικού Βρόχου και Τοπικού Υπο-βρόχου
- Μήκος και μετρήσεις ποιότητας Ενεργού Τοπικού Υπο-βρόχου

❖ Other information services

- Manually information and on the basis of the procedure laid down in Article 6.1.5.9 of Annex 5 to the Agreement
  - Περιοχή κάλυψης (οδοί που εξυπηρετούνται), τοποθεσία/διεύθυνση και ονομασία των Κεντρικών Κατανεμητών Καλωδίων (ΚΚΚ) και διακλαδωτών καλωδίων (ΔΚ)
  - Αριθμός Ενεργών και Ανενεργών Τοπικών Βρόχων ανά ΚΚΚ και ΔΚ
  - Καλωδιακή απόσταση από τους διακλαδωτές καλωδίων (ΔΚ) μέχρι τους αντίστοιχους Κεντρικούς Κατανεμητές Καλωδίων (ΚΚΚ)

▶ Other fees

❖ Ανώτατο Τέλος Αλλαγής Τοπικού Βρόχου ή Τοπικού Υπο-Βρόχου

❖ Ανώτατο Τέλος Αδικαιολόγητου Αιτήματος για Υποστήριξη κατά την Παροχή και Αδικαιολόγητης Αναφοράς Βλάβης

❖ Ανώτατο Τέλος Επιπρόσθετης Επίσκεψης

❖ Ανώτατα Τέλη Ακύρωσης Αιτήσεων για Αλλαγή Τοπικού Βρόχου ή Τοπικού Υπο-Βρόχου για Υποστήριξη κατά την Παροχή και για Αναφορά Βλάβης

- Ανώτατο Τέλος ακύρωσης αίτησης για Αλλαγή Τοπικού Βρόχου ή Τοπικού Υπο-βρόχου
- Ανώτατο Τέλος ακύρωσης αίτησης για Υποστήριξη κατά την Παροχή
- Ανώτατο Τέλος ακύρωσης Αναφοράς Βλάβης

## 5.5. **WLR Reference Offer**

▶ PSTN wholesale services

❖ Activation on a new PSTN line

❖ Αποσύνδεση/ Επανασύνδεση Γραμμής PSTN

- Προσωρινή Διακοπή Γραμμής PSTN και Επανασύνδεση
- Deactivation of PSTN lines
- Μεταφορά Γραμμής εντός επαρχίας
- Change of number

- ISDN BRA wholesale services
  - Activation on a new ISDN BRA line
  - Temporary cessation of ISDN BRA service and reconnection
  - Deactivation of ISDN BRA lines
  - Μεταφορά Γραμμής εντός επαρχίας
  - Μεταφορά Γραμμής ISDN BRA και αλλαγή NT
  - Change of number

- ISDN PRA wholesale services
  - Activation on a new ISDN PRA line
  - Deactivation of ISDN BRA lines
  - Transport route within Province
  - Change of number — first 300 figures
  - Αλλαγή Γεωγραφικού Αριθμού –Πρόσθετοι Αριθμοί (εκατοντάδα ή μέρος)

## 5.6. **Mobile Reference Offer**

***Services to mobile Service Providers (SP) and Enhanced Service Providers (ESP)***

**ΥΠΗΡΕΣΙΕΣ ΣΥΝΔΡΟΜΗΤΙΚΗΣ ΚΙΝΗΤΗΣ ΤΗΛΕΦΩΝΙΑΣ**

- Activation of the SP or the ESP
  - Activation of the SP or the ESP
  - Additional fee for activation of ESP which maintains his own home location register (HLR)
- Activation of users
  - Activation of SIM card
- Billing Information
- Traffic services
  - International Roaming Services
    - User covered in Zone 1
      - Outgoing calls
        - Calls to States in Zone 1 and calls to Cyprus
      - SMS

- Data Services
- ❖ Τερματισμός σε Τελικούς Χρήστες του Σταθερού Δικτύου της ΑΤΗΚ
- ❖ Termination in CYTA 11892 information services 11892
- ❖ Termination in Extraordinary Emergency Services 112/199
- ❖ Termination in three-digit and four-digit number service (except 1893, 1895)
- ❖ Τερματισμός σε Υπηρεσίες Προσωπικού Αριθμού
- ❖ Τερματισμός σε Υπηρεσία Ένας Αριθμός
- ❖ Υπηρεσία διερεύνησης δρομολόγησης κλήσεων μέσω του κινητού δικτύου της ΑΤΗΚ

▶ Other services

- ❖ Τέλη Διαχείρισης των Τελικών Χρηστών του Δικαιούχου με μη αυτοματοποιημένη πρόσβαση
- ❖ Τέλη Διαχείρισης Τελικών Χρηστών Δικαιούχου με αυτοματοποιημένη πρόσβαση

**ΥΠΗΡΕΣΙΕΣ ΠΡΟΠΛΗΡΩΜΕΝΗΣ ΚΙΝΗΤΗΣ ΤΗΛΕΦΩΝΙΑΣ**

▶ Activation of the SP or the ESP

- ❖ Activation of the SP or the ESP
- ❖ Additional fee for activation of ESP which maintains his own home location register (HLR)

▶ Activation of users

- ❖ Activation of SIM card

▶ Traffic services

- ❖ Billing Information
- ❖ International Roaming Services
  - User covered in Zone 1
    - Outgoing calls
      - Calls to States in Zone 1 and calls to Cyprus
    - SMS
    - Data Services
- ❖ Termination in Extraordinary Emergency Services 112/199
- ❖ Υπηρεσία διερεύνησης δρομολόγησης κλήσεων μέσω του κινητού δικτύου της ΑΤΗΚ

▶ Other services

- ❖ Τέλη Διαχείρισης των Τελικών Χρηστών του Δικαιούχου με μη αυτοματοποιημένη πρόσβαση

***Services to MVNO Type-A***

▶ Activation of the MVNO Type-A

▶ Billing information

▶ Traffic services

- ❖ International Roaming Services
  - User covered in Zone 1
    - Outgoing calls
      - Calls to States in Zone 1 and calls to Cyprus
    - SMS
    - Data Services
- ❖ Τερματισμός σε Τελικούς Χρήστες του Σταθερού Δικτύου της ΑΤΗΚ
- ❖ Termination in CYTA 11892 information services 11892
- ❖ Termination in Extraordinary Emergency Services 112/199
- ❖ Termination in three-digit and four-digit number service (except 1893, 1895)
- ❖ Τερματισμός σε Υπηρεσίες Προσωπικού Αριθμού
- ❖ Τερματισμός σε Υπηρεσία Ένας Αριθμός
- ❖ Υπηρεσία διερεύνησης δρομολόγησης κλήσεων μέσω του κινητού δικτύου της ΑΤΗΚ

***Services to MVNO Type-B***

- ▶ Activation of the MVNO Type-B
- ▶ Τέλη Σύνδεσης σε Κέντρο Μεταγωγής Κινητών Υπηρεσιών (MSC) της ΑΤΗΚ
- ▶ Billing information
- ▶ Traffic services
  - ❖ International Roaming Services
    - User covered in Zone 1
      - Outgoing calls
        - Calls to States in Zone 1 and calls to Cyprus
      - SMS
      - Data Services
  - ❖ Τερματισμός σε Τελικούς Χρήστες του Σταθερού Δικτύου της ΑΤΗΚ
  - ❖ Termination in CYTA 11892 information services 11892
  - ❖ Termination in Extraordinary Emergency Services 112/199
  - ❖ Termination in three-digit and four-digit number service (except 1893, 1895)
  - ❖ Τερματισμός σε Υπηρεσίες Προσωπικού Αριθμού
  - ❖ Τερματισμός σε Υπηρεσία Ένας Αριθμός
  - ❖ Υπηρεσία διερεύνησης δρομολόγησης κλήσεων μέσω του κινητού δικτύου της ΑΤΗΚ

## 5.7. **Leased Lines Reference Offer**

- ▶ Reject the Request for Wholesale Leased Lines

- Other Services
  - Τέλος Αδικαιολόγητης Αναφοράς Βλάβης
  - Τέλος Επιπρόσθετης Επίσκεψης

## 5.8. **Broadband Reference Offer**

- BROADBAND ACCESS 2 IP
  - Enhanced Speed Delivery (Enhanced Upload)
  - Το τέλος για τη μεταφορά της κίνησης [επιπρόσθετο ΜΝΚ ή Ιδεατό Δίκτυο Τοπικής Πρόσβασης (VLAN)] προς και από τα υποστατικά του Τελικού Χρήστη μέχρι τις Πύλες είναι το ακόλουθο (with and without configurator):
  - Temporary Monthly Disconnection for Wholesale xDSL 2 or Wholesale VDSL 2 lines
  - Reconnection which has temporarily stopped
  - Τέλος Επανασύνδεσης Προϊόντων Χονδρικού xDSL 2 ή Χονδρικού VDSL 2 σε περίπτωση μεταφοράς του Τοπικού Βρόχου σε νέα διεύθυνση εγκατάστασης
- BROADBAND ACCESS 3 IP
  - Ethernet Access (with and without collocation)
  - Τέλη Παροχής Νοητού Ιδιωτικού Δικτύου – Ethernet – connection fee:
  - Τέλη Θύρας στον ΕΕΑΠ
  - Wholesale xDSL 3 and Wholesale VDSL 3 (with and without configurator):
  - Enhanced Speed Delivery (Enhanced Upload)
  - Temporary Monthly Disconnection
  - Reconnection which has temporarily stopped
  - Τέλος Επανασύνδεσης προϊόντων Χονδρικού xDSL 3 ή Χονδρικού VDSL 3 σε περίπτωση μεταφοράς του Τοπικού Βρόχου σε νέα διεύθυνση εγκατάστασης
- OTHER wholesale charges
  - Πληροφορίες για τη δυνατότητα παροχής Πρόσβασης 2 xDSL και Πρόσβασης 3 xDSL
    - Αυτοματοποιημένος Έλεγχος για δυνατότητα παροχής Πρόσβασης 2 xDSL, Πρόσβασης 2 Naked xDSL ,Πρόσβασης 3 xDSL και Πρόσβασης 3 Naked xDSL
    - Μη αυτοματοποιημένος Έλεγχος για δυνατότητα παροχής Πρόσβασης 2 xDSL Πρόσβασης 2 Naked xDSL , Πρόσβασης 3 xDSL,
  - Unjustified Harm Reporting

- Additional Visit

## 5.9. **Other services**

- Activation services
  - Activation of PSTN line
  - Activation of ISDN2 line
  - Activation of ISDN30 line
  - Activation of FTTH line
  - Activation of xDSL line
  - Activation of BBT service
  - Activation of Virtual Local Loop Unbundling (GPON)
- Colocation services
  - Colocation LLU Recurring Service
  - Ducts colocation Recurring Service
  - Masts colocation Recurring Service
  - Buildings colocation Recurring Service
  - Colocation LLU Non Recurring Service
  - Ducts colocation Non Recurring Service
  - Masts colocation Non Recurring Service
  - Buildings colocation Non Recurring Service
  - Survey charge that applies when access seekers apply for duct collocation service
  - Survey charge that applies when access seekers apply for an expansion of LLU/SLLU DSLAM capacities

# 6. NCUS Model

This section presents the main methodological aspects that are deemed of relevance by OCECPR in the development of the Net Cost of Universal Service (NCUS) Model.

The first step in the estimation of the NCUS is the definition of the US components that may be subject to compensation. In particular, Article 4 of OCECPR's Decree Κ.Δ.Π. 140/2005 "*περί Καθορισμού του Καθαρού Κόστους της Καθολικής Τηλεπικοινωνιακής Υπηρεσίας Διάταγμα του 2005*", states that the Net Cost of the Universal Service may include the following components:

1. Fixed telephony
2. Enquiry services
3. Discounts for people with disabilities and in social exclusion
4. Indirect benefits

The approximation that will be taken by the OCECPR to calculate the costs associated to the provision of these USO is presented in detail in the subsections below. At the same time, it should be noted that the 'Fixed Telephony' component will be estimated following the 'Uneconomic Areas' approach, as done in Spain, Italy or Ireland.

## 6.1. Uneconomic Areas

The determination of the NCUS of Uneconomic Areas involves the calculation of the Net Cost of providing fixed telephony access in those areas where such provision represents an unfair burden on the designated undertaking. The following key issues related to Uneconomic Areas are treated in this section:

- Treatment of Costs - Accounting Standard
- Relevant geographical area of reference
- Distribution of costs and revenues to geographical areas
- Treatment of the incoming call effect
- Profitability assessment
- Net Cost calculation

### 6.1.1. Treatment of Costs - Accounting Standard

One of the main issues that needs to be resolved when calculating the Net Cost of Universal Service (NCUS) resides in which cost standard should be taken as a reference for such calculations.

In this regard, Article 9 of OCECPR's Decree Κ.Δ.Π. 140/2005 states that:

"*(1) Η μέθοδος υπολογισμού και καταμερισμού του κόστους και των εσόδων από την παροχή Καθολικής Τηλεπικοινωνιακής Υπηρεσίας οφείλει να είναι συνεπής, στο μεγαλύτερο δυνατό βαθμό, με την μέθοδο υπολογισμού του κόστους και των εσόδων για τον καθορισμό των τελών διασύνδεσης σύμφωνα με τους Περί Υπολογισμού των Τελών Διασύνδεσης (Τηλεπικοινωνιών) Κανονισμούς του 2002.*

For this matter OCECPR will use the methodology of Fully Distributed Historic Costs.

### 6.1.2. Relevant geographical area of reference

In order to estimate the net cost associated to the provision of fixed telephony services to Uneconomic Areas it is essential to define at which geographical level is Cyta's profit (or loss) going to be assessed.

Even though the Universal Service Directive does not specify the granularity at which this calculation should be performed, the analysis of the common practice adopted by other European NRAs shows that they typically assess operators' profitability at a local exchange level:

| Country | Geographical level adopted |
|---|---|
| **Spain** | 500 zones based on the old numbering system (50 independent areas containing wireless provision of USO) |
| **Portugal** | 1.850 MDF areas |
| **Greece** | At MDF area level |
| **France** | 35 zones based on density of population (1 containing 3 isolated areas using satellite and mobile technologies) |
| **Italy** | At MDF area level |
| **Ireland** | At MDF area level |

**Table 6.1: Relevant geographical areas considered as a reference in the NCUS calculation in different countries [Source: Axon Consulting]**

When assessing the approach to be followed, OCECPR believes that the level which would be considered by an operator in order to decide whether or not to cover a specific area would be at the MDF area. Therefore, OCECPR suggests to estimate the Uneconomic Areas component of the NCUS at this level.

### 6.1.3. Distribution of costs and revenues to geographical areas

An appropriate cost identification and classification (or disaggregation), i.e. defining cost pools with similar nature, for distributing the costs to LE is usually based on the cost dimensions available in the regulatory cost accounting, e.g. cost nature, cost type, cost by activity.

As can be shown in the table below, a set of selected countries employ approaches based on different aggregation levels of costs.

| Country | Geographical level adopted |
|---|---|
| **Spain** | Costs are disaggregated in 33 cost pools |
| **Portugal** | Costs are disaggregated in 40 cost pools |
| **Greece** | Costs are disaggregated in 24 cost pools |
| **France** | Cost are disaggregated in 18 "work units" |
| **Italy** | N/A |
| **Ireland** | N/A |

**Table 6.2: International benchmark about the cost distribution considered in the NCUS calculation [Source: Axon Consulting]**

The level of disaggregation should ideally allow the recognition of proper cost drivers that make the USP incurring the corresponding costs. To do so, OCECPR may consider the definition of cost pools as a two-dimensional entity based on sets of relevant services and costs. This would allow the recognition of both, service-driven and cost type-driven particularities.

In particular, OCECPR expects to adopt a similar approach as that presented in the table below:

| | | | ALLOCATION DRIVER | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Cost Category** | **Description** | | **Connection** | **Rental** | **Traffic** | **Wholesale** | **Value Added** | **Voicemail** |
| IT | PERSONNEL RELATED COSTS | GENERAL | # of new connection | # of lines | # of retail minutes | # of wholesale minutes | # of lines | # of lines |
| OFFICEEQP-OTHER | | | | | | | | |
| CONTRACTORS | | | | | | | | |
| EMPLOY-CONTRIB | | TECHNICAL | Payroll of connection activities | Payroll of rental activities | # of retail minutes | # of wholesale minutes | # of lines | # of lines |
| OTHER | | | | | | | | |
| TAX | REVENUE DRIVEN | | Revenue from new connections | Revenue from rental | Revenue from traffic | Revenue from wholesale | Revenue from value added services | Revenue from voicemail |
| MARKETING | | | | | | | | |
| OVERHEAD | OTHERS | | # of new connection | # of lines | # of retail minutes | # of wholesale minutes | # of lines | # of lines |

**Table 6.3: Cost allocation driver per cost category and type of cost (OPEX) [Source: Axon Consulting]**

OCECPR expects that this level of disaggregation will ensure the compliance with the principle of causality, and maximize the robustness of the calculation as:

- Will facilitate a proper recognition of cost accounts with similar nature
- Will allow a reasonable disaggregation for allocation purposes

With regards to the distribution of Capex, OCECPR would expect to use one of the following drivers, depending on the level of information available at Cyta's Databases:

- Annualized cost of the assets that belong to each MDF
- Estimation of the assets costs at each MDF as the product (PxQ) of the number of units installed and their CCA valuation.
- Use of other operational parameters (such as average loop length, ratio of duct sharing, infrastructure configuration per MDF, occupancy rates etc.)

With regards to the allocation of revenues, OCECPR understands that this information would be already available within Cyta's databases, and therefore, expected this data to be provided by the operator. In case this information weren't available, OCECPR will employ alternative drivers as a proxy, as presented in the table below:

| Service type | Allocation driver |
|---|---|
| PSTN Connections | Number of new connections |
| PSTN Rental | Number of PSTN Lines |
| Retail Traffic | Effective number voice minutes, adjusted by the unitary revenue of each subservice |
| Traffic origination | Wholesale outgoing traffic, adjusted by the unitary revenue of each subservice |
| Traffic termination | Wholesale incoming traffic, adjusted by the unitary revenue of each subservice |
| Traffic termination | Wholesale incoming traffic, adjusted by the unitary revenue of each subservice |

**Table 6.4: Revenue allocation driver per service [Source: Axon Consulting]**

### 6.1.4. Treatment of the incoming call effect

Although neither the current European regulatory framework nor the OCEPR's decrees refers to the incoming calls effect, several European NRAs have taken it into consideration for the calculation of the NCUS.

The incoming calls effect is related to calls initiated in economic areas that go to uneconomic areas that cannot be made any more when the service to these areas is discontinued. The corresponding revenues forgone and costs avoided will therefore have to be reclassified as being forgone/avoided in the uneconomic areas and not associated to economic areas where they were initiated.

As illustrated in the table below, this effect is commonly employed in other EU countries for the estimation of the NCUS, including Italy, France and Portugal. In line with the international common practice, OCECPR will take them into consideration when calculating the NCUS:

| Country | Consideration of incoming calls | Comments |
|---|---|---|
| **Spain** | ✓ | Implicit in the NCUS calculation methodology (isolated MDF deployment) |
| **Portugal** | ✓ | Estimate revenues from calls to uneconomic areas and recalculate profitability iteratively |
| **Greece** | ✓ | Estimate revenues from calls to uneconomic areas |
| **France** | ✓ | Implicit in the NCUS calculation methodology (iterative process removing MDF's) |
| **Italy** | ✓ | Estimate revenues from calls to uneconomic areas |
| **Ireland** | ✓ | Identify revenues to uneconomic customers[15]. |

**Table 6.5: International benchmark about the methodology employed to estimate the incoming calls effect in the NCUS calculation [Source: Axon Consulting]**

OCECPR's selected methodology will be based, provided that the necessary information exists, on the creation of an origin-destination matrix for each local exchange, in which the traffic originated/terminated in any of the unprofitable local exchanges will be removed. The profits the USP may be obtaining from the provision of these services will then be discounted on the amount of the NCUS calculated in the previous steps

### 6.1.5. Profitability assessment

In order to identify whether a Local Exchange area should be subject to compensation for the NCUS, it is important to define how profitability will be calculated.

Even though neither EC Directives nor OCECPR's existing decrees define a specific methodology, the Spanish NRA considers in its Decision MTZ 2012/1273 that "*all revenues and costs of all services, both wholesale and retail should be taken into account in the profitability analysis of the areas, since the operators will provide customers not only universal services but also other services not included in US obligations in order to make profitable investments*".

That is, only those Local Exchanges whose overall profitability is negative will be subject to compensation.

[15] When the amount of revenues from calls made from a profitable customer to unprofitable customers is above the profits of this customer, the difference is not considered

### 6.1.6. Net Cost calculation

After the local exchanges subject to compensation have been identified, the NCUS will be determined after assessing the net loss that may exist in those areas associated only to the costs and revenues related to the USO services, as it is mandated by Article 5 of OCECPR's Decree Κ.Δ.Π. 140/2005.

Based on the above, these services would comprise:

- Connection at a fixed location
- Monthly subscription for fixed access
- Fixed telephony traffic

At the same time, OCECPR will consider the existing interrelation of outgoing-incoming traffic between the Local Exchanges, so as to assess the impact in the cash flow of other LEs after removing the unprofitable LEs (which would have not been installed by the USO Provider if it didn't have such obligations).

Based on the above, the NCUS associated to Uneconomic Areas will be calculated based only on the net loss obtained from the provision of US related services, including the assessment of the incoming call effect presented in section 6.1.4.

## 6.2. Enquiry services

Article 4 (1)(a) of OCECPR's decree KDP 140/2005 introduces the provision of enquiry services as part of the universal service obligations.

In order to estimate the NCUS associated to this component, OCECPR will use the results extracted from the USO Provider's accounting system, under the LRIC cost standard. Such products are listed below:

- Termination to 11892
- Operators Services : 192
- Operators Services : 198

## 6.3. Discounts for People with Disabilities and in Social Exclusion

Article 108 of the Regulation of Electronic Communications and Postal Services Law of 2004 states the following:

> *"The scope of Universal Service, which is to be determined by a Decision of the Commissioner, will include at least the following services:*
>
> *[…]*
>
> *(d) Special measures for disabled or socially disabled end users."*

In addition to the above, Article 4 (1) (β) of OCECPR's decision Κ.Δ.Π. 140/2005 states that this Universal Service Obligation may be considered as a part of the NCUS. The Net Cost associated to this component will be obtained by OCECPR as the net loss obtained as a result of the special price offered to these customers, as presented below:

$$NCUS = \#CustomersDisabilities \times (AccessCost - Price\ paid_{disabilities}) + \#CustomersSocialExclusion \times (AccessCost - Price\ paid_{Social\ Exclusion})$$

Where the 'AccessCost' will be obtained from the USO Provider's costing system, under the LRIC cost standard

## 6.4. **Indirect benefits**

Concerning to Indirect Benefits, the Universal Service Directive states that *"Taking into account intangible benefits means that an estimate in monetary terms, of the indirect benefits that an undertaking derives by virtue of its position as provider of universal service, should be deducted from the direct net cost of universal service obligations in order to determine the overall cost burden"*

The Directive is not exhaustive or even prescriptive, as to what the NRA should take into account as relevant indirect benefits.

OCECPR's Decree Κ.Δ.Π. 140/2005 states that the Net Cost of the Universal Service should be reduced by the intangible benefits that may arise from the provision of these services, including the strengthening in the recognition of the business identity of the Universal Service Provider, the coverage achieved by the network and benefits from marketing.

The following table summarizes the relevant indirect benefits considered by a sample of European countries, including an assessment of their relative materiality:

| Country | Brand Value | Ubiquity | Life Cycle | Wholesale Discount | Customer Database | Mailing |
|---|---|---|---|---|---|---|
| Spain | ✓ | ✓ | ✓ | ✗ | ✓ | ✗ |
| Italy | ✓ | ✓ | ✓ | ✗ | ✓ | ✓ |
| Ireland | ✓ | ✓ | ✓ | ✗ | ✗ | ✗ |
| MATERIALITY | HIGH | MEDIUM/ LOW | LOW | - | LOW | LOW |

✓ Considered IB ✓ Considered IB and defined to be negligible ✗ Not considered IB

**Table 6.6: Indirect Benefits considered in the NCUS calculation across different European countries [Source: Axon Consulting]**

Thus, considering the best international practices shown above, as well as the materiality of each one of the components over the total Net Cost, OCECPR considers that only the following categories should be comprised in the calculation:

- Brand Value
- Ubiquity

The following sections describe the calculation approach that OCECPR intends to use for the valuation of these indirect benefits.

### 6.4.1. Brand Value

Brand value or enhanced brand recognition refers to the benefits generated as a result of greater brand recognition, corporate reputation and associated goodwill as a result of the provision of USO services.

For the valuation of this benefit, OCECPR intends to use the calculation of the attributable USP's brand value to the USO provision. This methodology estimates the brand value through the portion of the company brand value obtained due to the provision of the USO. Specifically, the following formulae is proposed:

$$IB_{BV} = BV \times WACC \times \%R_{USO} \times \%Lines_{USO}$$

Where:

- BV: Brand value of the company extracted from an international institution (such as EBI[16] or BFI[17])
- WACC: Weighted Average Cost of Capital
- % of revenues from USO services: % of revenues related to services under USO scope over the total revenues of the USP.
- % of lines from USO: % of access lines to be compensated as part of the uneconomic areas component over total access lines.

### 6.4.2. Ubiquity

Ubiquity benefits potentially enjoyed by a designated USP provider are those derived from additional profits enjoyed by a USP which are generated from retaining a proportion of customers who move from uneconomic areas to economic areas. This is in contrast to those who move from uneconomic to economic areas and choose to switch to other alternative operators.

Specifically OCECPR proposes to estimate this benefit as per the following formulae:

$$IB_{UBIQUITY} = Base\ Lines\ x\ Average\ margin\ per\ line$$

$$Base\ Lines = Migrated\ Lines\ x\ CYTA\ Fixed\ Market\ Share$$

$$Migrated\ Lines = Lines\ in\ uneconomic\ areas\ x\ Migration\ Rate$$

$$Migration\ Rate = \frac{Population\ migrated\ from\ rural\ areas\ to\ urban\ areas}{Population\ in\ rural\ areas}$$

[16] European Brand Institute
[17] Brand Finance Institute

# Annex A. Glossary of terms

- **Fully Allocated Costs (FAC):** this methodology attributes all the network costs (including common and joint costs) to services, based on the utilisation each service makes of the different network assets.
- **Pure Long Run Incremental Costs (Pure LRIC):** this methodology calculates the costs that would be saved if certain services, group of services or activities (defined as an increment) were not provided. These incremental costs are aligned with the variable costs in the long run. Using this approach, neither common costs, nor joint costs are allocated to the services.
- **Long Run Incremental Costs plus Common Costs (LRIC+)**, unlike the pure LRIC approach, this allows the recovery of common and joint costs that are not incremental to any given service.
- **Network CapEx**, refers to the investment made by the operators for developing the network, including network equipment purchasing, network infrastructure (e.g. network buildings, ducts), supporting IT systems (e.g. network OSS), one-off fees for subcontracted network services (e.g. leased lines activation charges), and installation costs.
- **Network OpEx**, refers to the recurrent costs associated to operating the network, including network personnel, outsourced maintenance services, power (electricity and fuel), recurrent charges for subcontracted network services (e.g. leased lines, dark fibre), network sites rentals
- **G&A costs**, which are associated with management activities and are common for network and commercial activities (human resources, finance, management, etc.)
- **Avoidable costs**, are those which would not be incurred in if a service or a set of services were not provided by the operator.
- **Incremental Costs**, forward-looking economic costs incurred by the operator to provide an additional amount of a service or set of services.
- **Joint and common costs**, are shared between two or more services. Reducing the volume of a single service may not reduce joint and common costs, but reducing the output of all services will reduce them.

# Annex B. Overview on dimensioning algorithms for BULRIC models

This annex aims to provide additional transparency on the approach to be adopted in the development of the Bottom-Up LRIC models, including an overview of the most relevant aspects in the dimensioning of the mobile and fixed networks.

## B.1. Mobile networks

The Bottom-Up LRIC model for mobile networks will use different combinations of the GSM/UMTS/LTE access technologies and will be flexible in the definition and adjustment of the key modelling methodological options. The model will also be capable of differentiating costs associated to the provision of voice and data services according to the network through which they are provided, differentiating as well the data traffic associated to the provision of internet services, or the data traffic associated with other VAS (Value Added Services), such as MMSs.

The following exhibit presents the structure of the BU-LRIC Model for mobile networks:

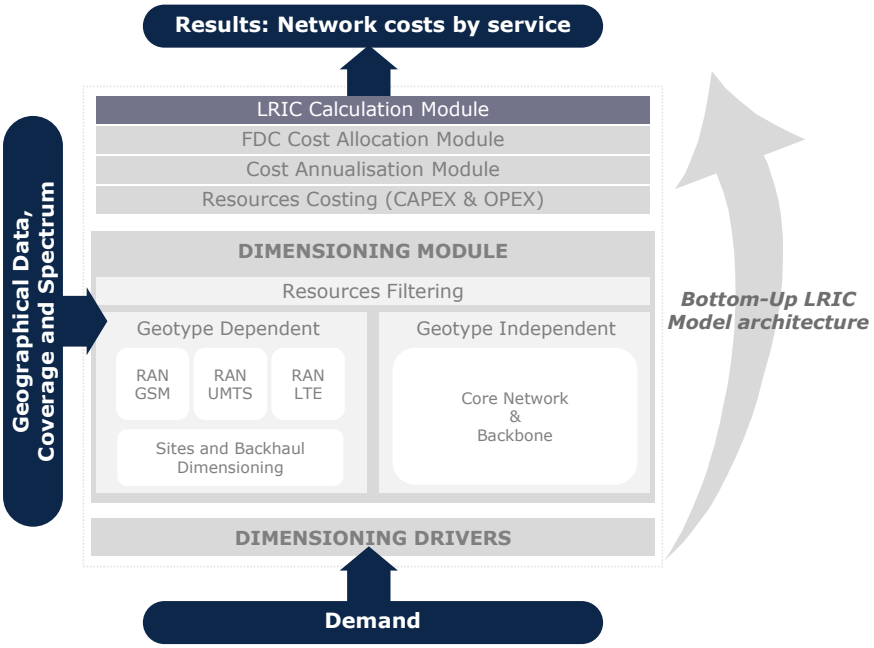


**Exhibit B.1: Schematic diagram of the Bottom-Up LRIC model for mobile networks [Source: Axon Consulting]**

The Dimensioning Module performs the calculation of the number of resources required for satisfying the demand. There are different modules for the calculation

of those resources that are geotype dependent (access and backhaul) and those that are not (core network and backbone). The most important calculation blocks contained in this module are the following:

- **RAN GSM block** is in charge of the calculation of GSM access network resources
- **RAN UMTS block** is in charge of the calculation of UMTS access network resources
- **RAN LTE block** is in charge of the calculation of LTE access network resources
- The **sites and backhaul dimensioning block** calculates the radio sites required. It assumes certain co-location between access technologies (GSM, UMTS and LTE). This co-location can be configured through input parameters. This block also calculates the transmission required for connecting the radio sites with the controllers and core network (backhaul)
- The **core and backbone networks block** is in charge of dimensioning the core equipment required (e.g. MGW, MSC-S, HLR, SMS-C) and the transmission between core locations

***Network architecture***

The network topology heavily affects the cost structures of operators, in the sense that they may introduce roll out constraints which would hamper ideal optimisation of the network financials. The network topology will be reflected by means of a vast set of network dimensioning parameters. These parameters will allow swift simulation and calibration of different network topologies, in regards to access network, backhaul, core network and backbone.

The deployment of 4G typically has relevant implications in the architecture of the core network, as it is frequently the case that at least during a period of time the presence of 4G forces mobile operators to maintain two coexisting architectures:

- **3Gpp Legacy Core Network**, including the separation of the control and traffic layers (MSC-S+MGW). This core technology is adequate for GSM and UMTS. The following exhibit presents an illustrative topology of a mobile network, based on 3Gpp Legacy Core Network:

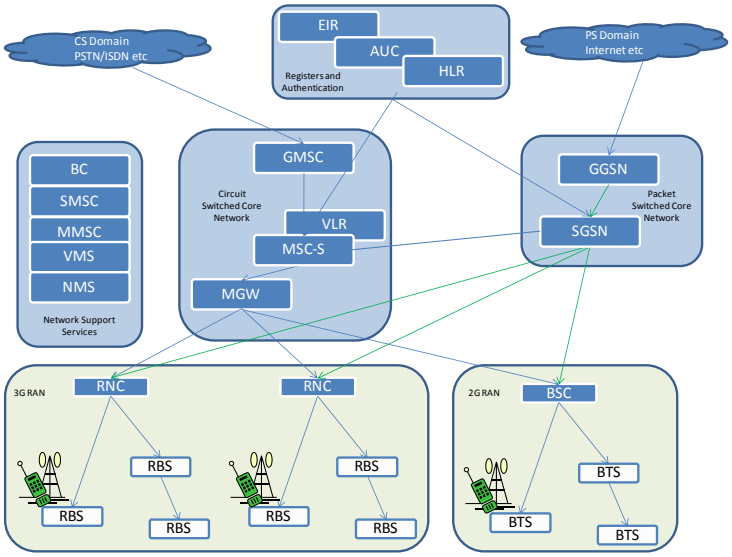


**Exhibit B.2: Illustrative structure of a mobile network based on 3Gpp legacy core technology [Source: Axon Consulting]**

- **Evolved Core Network**: The evolved core has the necessary equipment for supporting LTE Access networks and it is based on All-IP transmission. Additionally, it may include IMS equipment for supporting services generated by 2G and 3G access networks. The following exhibit presents an illustrative example of a mobile network, fully based on an Evolved Core Network:

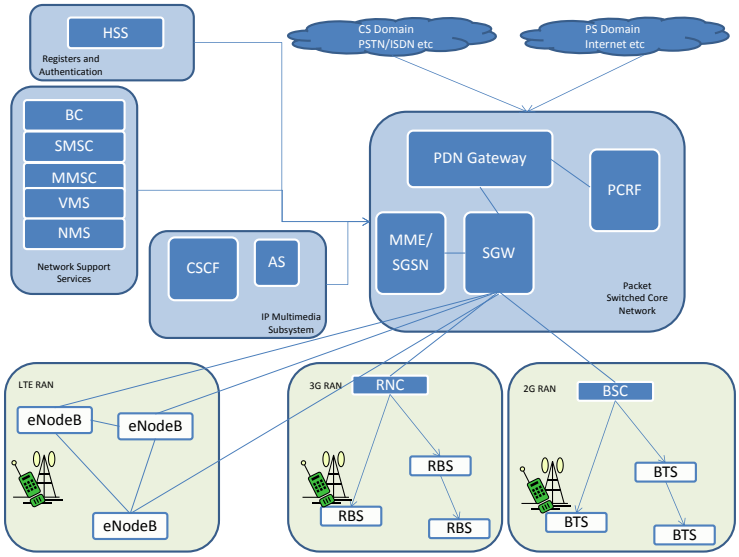


**Exhibit B.3: Illustrative structure of a mobile network based on Evolved Core Network technology [Source: Axon Consulting]**

### *Dimensioning algorithms*

The Dimensioning Module uses detailed algorithms for the calculation of resources in each block mentioned previously. As a sample of such algorithms, the following exhibit presents the algorithms used in the Bottom-Up LRIC model for modelling access sites:

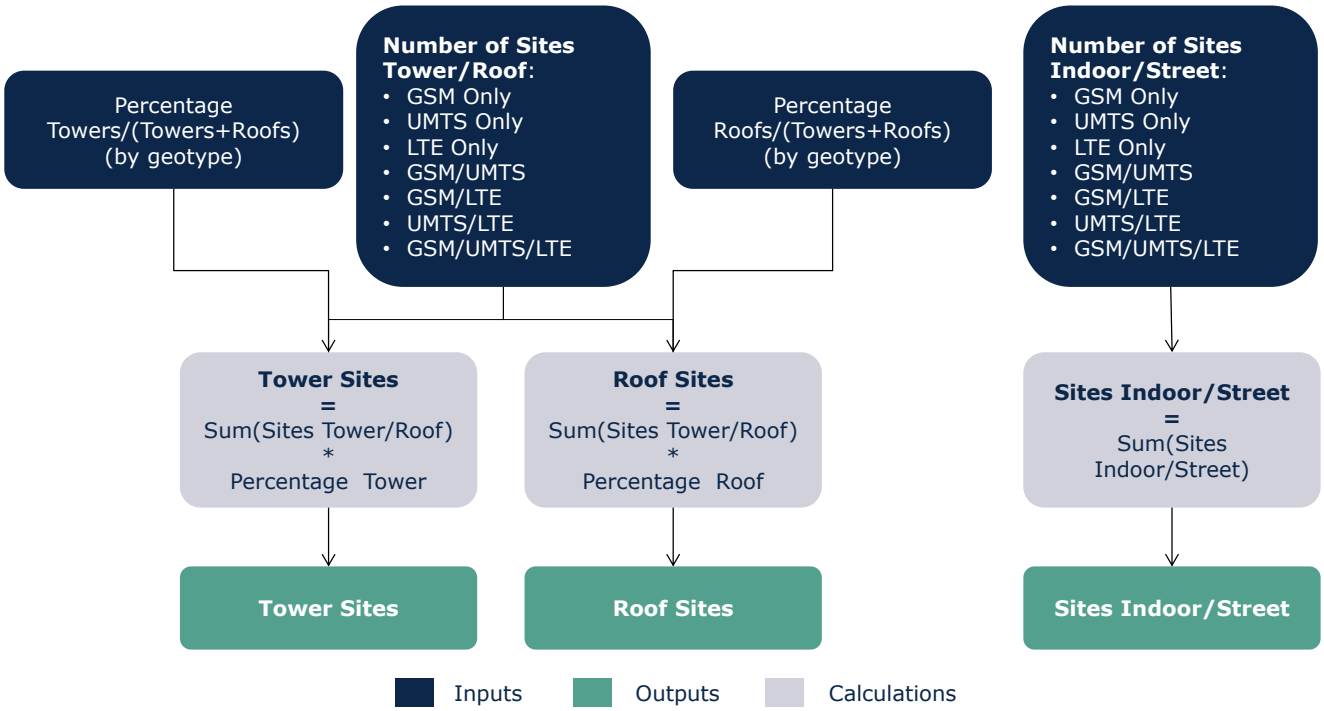


**Exhibit B.4: Procedure to calculate the Total Number of Sites [Source: Axon Consulting]**

As it is shown in above exhibit, to obtain the total number of sites rooftop/tower, in a first instance the number of sites of all combinations of locations roof/tower is added. To calculate the sites to be placed on rooftops and on towers, the actual percentage of installed sites for each type and for each geotype is then considered.

## B.2. Fixed networks

The Bottom-Up LRIC model for fixed networks will consider the technological options available in the moment, and those that will be implemented in the short and medium term, which allow the provision, at least, of all those services identified in the Commission Determination on Access List.

The following exhibit presents the structure of our Bottom-Up LRIC Model for fixed networks.

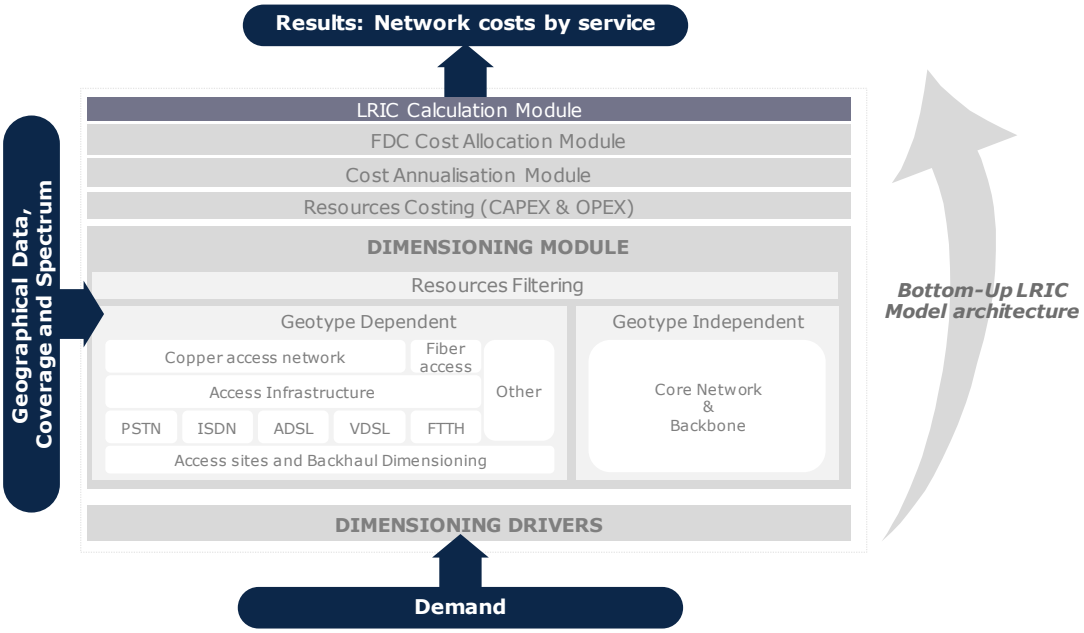


**Exhibit B.5: Schematic diagram of the Bottom-Up LRIC model for fixed networks [Source: Axon Consulting]**

**The Dimensioning Module** carries out the calculation of the number of resources required for satisfying the demand. There are different modules for the calculation of those resources that are geotype dependent (access and backhaul) and those that are not (core network and backbone). The most important calculation blocks contained in this module are the following:

- **Copper access network block** dimensions the copper-related access network to serve the operator's customers with PSTN/ISDN/ADSL/VDSL technologies.
- **Fibre access network block** dimensions the copper-related access network to serve the operator's customers with FTTx technologies.
- **Access sites and backhaul dimensioning block** calculates the local and remote exchanges sites required. This block also calculates the transmission required for connecting these exchange sites with higher levels of the network
- **Core and backbone networks block** is in charge of dimensioning the core equipment required and services platforms

### *Network architecture*

The following main core technologies are currently used by fixed operators in Cyta and will therefore be included in the model:

- **Legacy TDM switching,** based on switching exchanges (local, secondary, nodal, tandem, etc.). This technology is only suitable for voice services and it is complemented with a packet switching network for broadband services

- **NGN core network**, core network based on an all-IP architecture. The provision of traditional services (i.e. voice) is supported by dedicated servers such as soft-switches. Additionally, it is common practice to use Media Gateways (MGW) to provide TDM connectivity for interconnection with traditional networks

The following exhibit presents an illustrative example of the structure of a typical NGN core network:

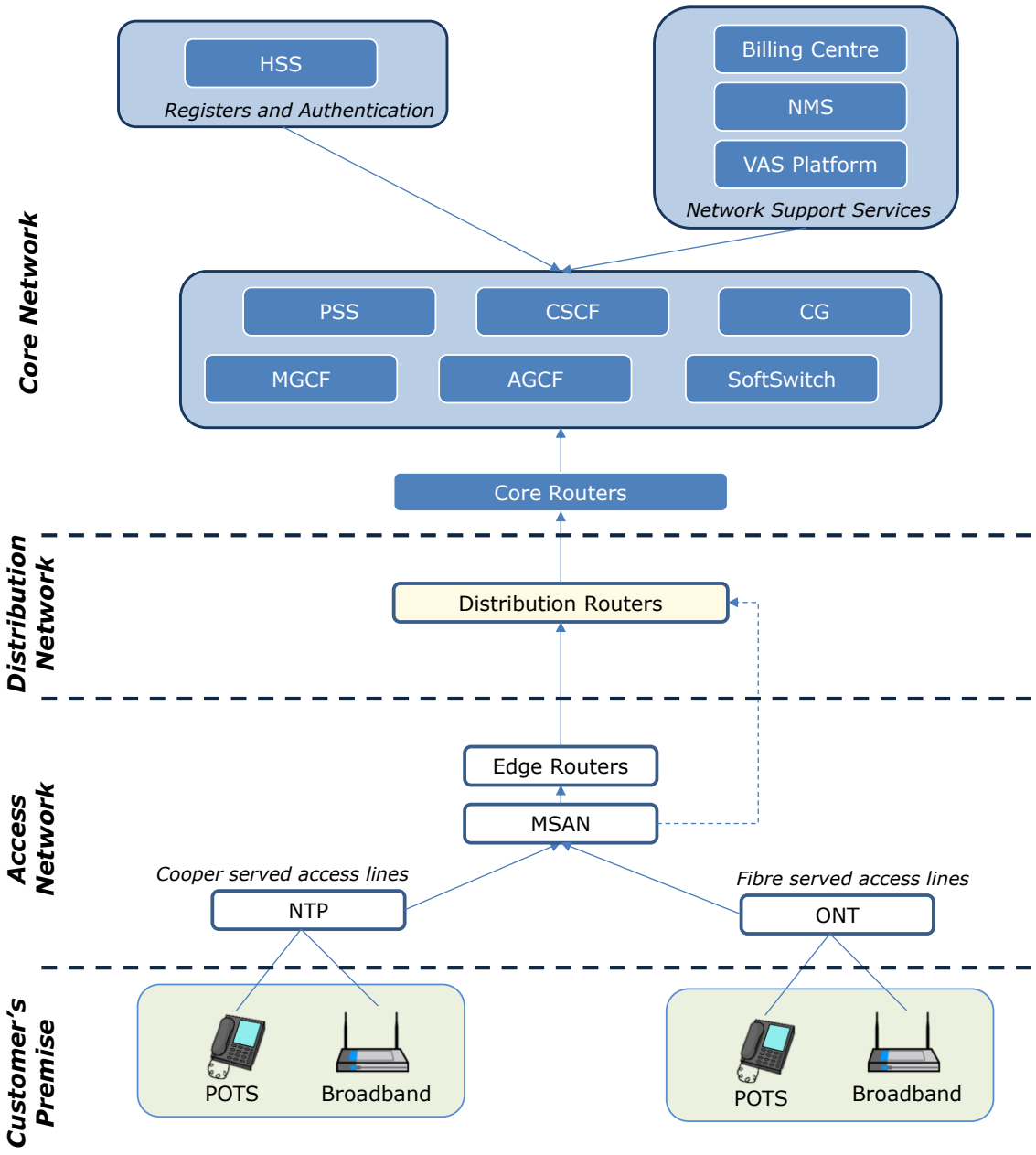


**Exhibit B.6: Illustrative structure of a fixed network based on NGN technology. [Source: Axon Consulting]**

### *Dimensioning algorithms*

The Dimensioning Module uses detailed algorithms for the calculation of resources in each block mentioned previously. As a sample of such algorithms, the following exhibit presents the algorithms used in the Bottom-Up LRIC model for modelling edge routers:

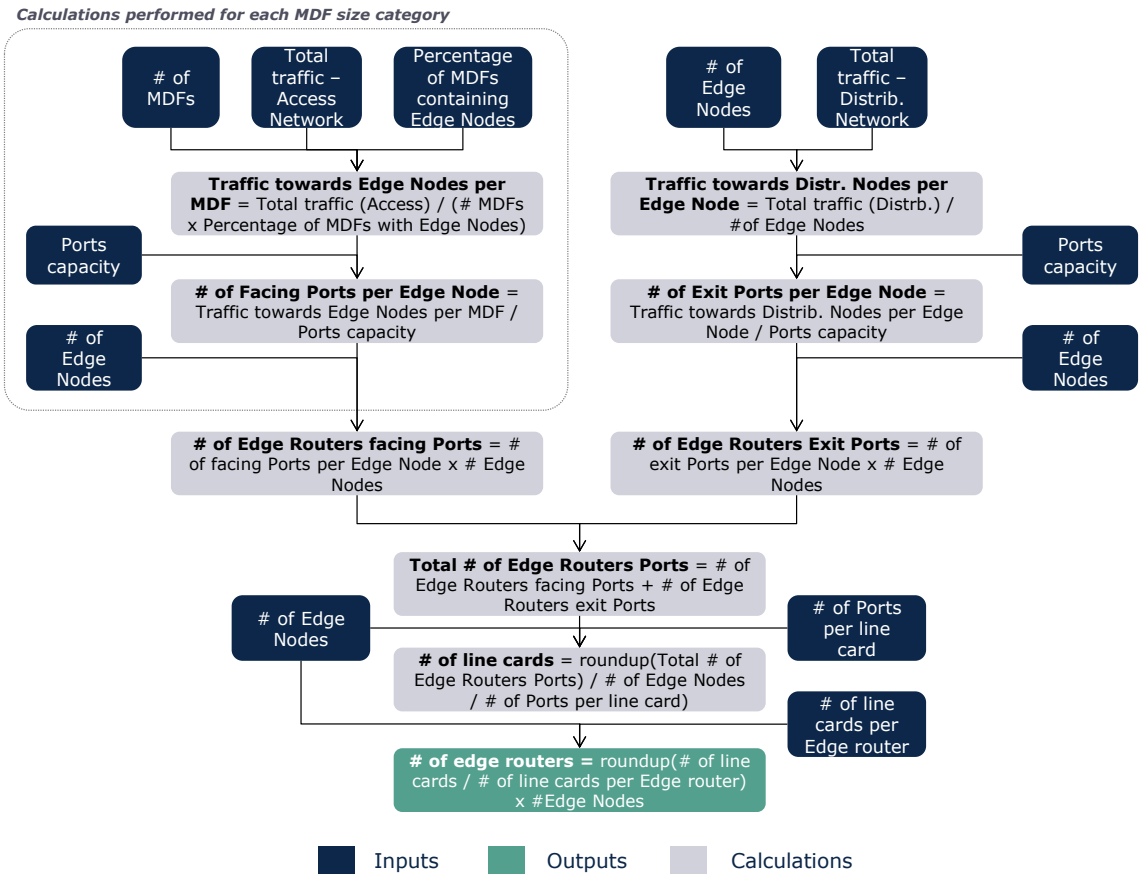


**Figure 6.1 Illustrative algorithm for the dimensioning of the edge routers of an NGN core network [Source: Axon Consulting]**

The dimensioning of the edge routers is performed based on the number of ports that would be required to handle the traffic coming from the MSAN Locations towards the edge nodes (facing ports) as well as the ports required for forwarding the traffic to distribution routers (exit ports). It should be noted that all the traffic that is forwarded to an edge router will not need to be forwarded to distribution routers when the traffic is considered to be intra edge node (as would be the case in a call between two users comprised in the same edge node).

The number of facing and exit ports of the edge routers is obtained in the previous steps of the dimensioning of the links between MSAN Locations and Edge Nodes (facing ports) and between Edge Nodes and Core Nodes (exit ports).