MALTA COMMUNICATIONS AUTHORITY

The MCA's Bottom-up Cost Model for Mobile Networks and Proposed Mobile Interconnection Pricing

Consultation and Proposed Decision

Consultation Document

MCA/C/13-1646

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EXECUTIVE SUMMARY

In line with previous decisions on mobile termination rates, the Malta Communications Authority (hereafter 'MCA') intends to set cost-oriented prices for mobile wholesale termination on the three Mobile Network Operators that have been designated as having Significant Market Power in Malta.

For this purpose, the MCA has developed a bottom-up long-run incremental cost (BU-LRIC) Model to calculate the costs incurred by a Maltese hypothetical efficient mobile operator to provide voice termination services.

The costing methodology used for this purpose is based on the 'pure LRIC' concept featured in the European Commission's Recommendation on Termination Rates of 2009[1]. The MCA had decided to adopt the 'pure LRIC' methodology in its decision entitled "Interconnection Pricing Strategy for the Electronic Communications Sector in Malta" published in May 2010[2].

The public consultation document summarises the model structure, the main network configuration assumptions and issues encountered.

The model has been developed based on data provided by the operators, either specifically for this project or as part of the quarterly statistics, supplemented with data gathered by the MCA and assumptions made by Analysys Mason Limited, being the consultants commissioned by MCA to develop this model. At a number of stages during this process, mobile network operators have been privately consulted.

The model yielded a pure-LRIC based wholesale mobile termination service of 0.40 Euro cents per minute.

CONSULTATION

Submissions to this consultation document may be forwarded to the MCA by not later than 6 September 2013. Details for submitting comments are explained in Section 11.

As required by Regulation 7 of the Electronic Communications Networks and Services (General) Regulations, 2011 (Article 7 of the Framework Directive), the MCA's proposals will be notified to the European Commission (hereafter 'EC' or 'Commission') and to other National Regulatory Authorities (hereafter 'NRAs') after the end of this national consultation.

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[1] Commission of the European Communities, COMMISSION RECOMMENDATION of 7.5.2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU, 7 May 2009.

[2] http://www.mca.org.mt/service-providers/decisions/interconnection-pricing-strategy-electronic-communications-sector

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1.0 INTRODUCTION & BACKGROUND

The Malta Communications Authority is consulting on a bottom-up cost model aimed at calculating the mobile termination rates in Malta.

In June 2012 the MCA published a decision notice entitled 'Interim Review of Wholesale Mobile Termination Rate - Response to Consultation & Decision'[3] (hereafter '2012 MTR decision'). Whilst setting an interim glidepath rate of 2.07, based on a target rate set on the average of the pure LRIC rates recorded in Europe at that time, this decision expressed also the Authority's intention to set a specific cost oriented MTR for Maltese mobile network operators (MNOs).

The Malta Communications Authority (hereafter 'MCA') commissioned Analysys Mason Limited (hereafter 'Analysys Mason') to develop a bottom-up long-run incremental cost (BU-LRIC) model of mobile networks in Malta (hereafter 'MBUCM'), which meets the specification and principles of the European Commission's Recommendation on Termination Rates of 2009[4] (hereafter 'EC Recommendation'). The MCA had decided to adopt the 'pure LRIC' methodology in its decision entitled "Interconnection Pricing Strategy for the Electronic Communications Sector in Malta" published in May 2010[5]. The MCA intends to use this model to set cost-oriented prices for mobile wholesale termination applicable to the three Mobile Network Operators (hereafter 'MNOs') that have been designated as having Significant Market Power (hereafter 'SMP') in Malta namely; Melita Mobile Limited (hereafter 'Melita Mobile'), Mobisle Communications Limited (hereafter 'GO Mobile'), and Vodafone Malta Limited (hereafter 'Vodafone Malta').

In order to develop this model, MCA engaged GO Mobile, Vodafone Malta and Melita Mobile in two distinct technical consultation phases, one covering the concepts of the model and the other focusing in details on the specific modelling parameters of the draft model. These were complemented with individual technical meeting with all three MNOs to explain further the model and its concepts. An extensive data request was also sent to the three MNOs in order to reflect as much as possible the local characteristics of mobile networks. The draft model was in turn revised where appropriate to reflect the feedback sent by MNOs.

1.1 SCOPE OF THE PUBLIC CONSULTATION DOCUMENT

The scope of this document is to provide stakeholders with a description of the model in order to allow them to provide feedback on the modelling approach underpinning MBUCM. This document summarises the model structure, its inputs and main outputs as well as network configuration

[3] http://www.mca.org.mt/decisions/interim-review-wholesale-mobile-termination-rate-response-consultation-decision-june-2012

[4] Commission of the European Communities, COMMISSION RECOMMENDATION of 7.5.2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU, 7 May 2009.

[5] http://www.mca.org.mt/service-providers/decisions/interconnection-pricing-strategy-electronic-communications-sector

assumptions and issues encountered. The model has been developed based on data provided by the MNOs, supplemented with data and assumptions gathered by Analysys Mason and the MCA.

The MCA would like to invite stakeholders to submit their comments regarding specific aspects covered in this document. Any information that will be provided by the stakeholders in response to this consultation document will be evaluated by the MCA and subject to the Authority's discretion, the MBUCM and this proposed decision may be modified to factor in this feedback.

1.2 STRUCTURE OF THE DOCUMENT

The remainder of this document is structured as follows:

- Section 2.0 summaries the legal basis of this review;
- Section 3.0 summarises the principles of long-run incremental costing;
- Section 4.0 introduces the structure of the model;
- Section 5.0 explains the network configuration;
- Section 6.0 describes the market module of the model;
- Section 7.0 presents inputs common to the modules of the model;
- Section 8.0 includes the proposed pricing for mobile termination;
- Section 9.0 presents the consultation questions; and
- Section 10.0 contains the details for the submission of feedback of interested parties.

2.0 LEGAL BASIS

2.1 THE EUROPEAN UNION REGULATORY FRAMEWORK

The European Union (hereafter 'EU') regulatory framework for electronic communications networks and services aims to create a harmonized regulatory environment across Europe and to foster effective competition for the benefit of industry and consumers. The EU Regulatory Framework for Electronic Communications consists of a set of Regulations, Directives, Decisions and other legal instruments, developed with the aim of providing a better functional internal market.

The Framework Directive provides the overall structure for the local regulatory regime and sets out the fundamental rules, policy objectives and regulatory principles across all the directives that NRAs must follow in regulating relevant markets.

In particular, Article 8 of the Framework Directive stipulates that the key policy objectives of the NRAs shall be the promotion of competition, the development of the internal market and the promotion of the interests of citizens of the European Union.

2.2 THE LOCAL LEGISLATIVE FRAMEWORK

The Directives comprising the EU Regulatory Framework were first transposed into Maltese legislation on the 14th of September 2004 and further amended on the 12th of July 2011.

The relevant national legislation are the Malta Communications Authority Act (Cap 418), the Electronic Communications (Regulation) Act (Cap. 399) (hereinafter referred to as 'the ECRA'); and the Electronic Communications Networks and Services (General) Regulations of 2011 (hereinafter referred to as 'the ECNSR').

The ECRA stipulates that, following the definition of a market in accordance with article 9 of the Act, the MCA shall carry out an analysis of such a market taking into account the markets identified in the EU recommendations and taking the utmost account of the guidelines issued by the European Commission in accordance with Article 15 of the Framework Directive. This goes to ensure that that regulation remains appropriate in the light of changing market conditions.

The ECRA also specifies that, where the MCA determines that a relevant market is not effectively competitive, it shall designate an undertaking with Significant Market Power (SMP), either individually or jointly with other undertakings, in accordance with article 6, and shall impose on such an undertaking appropriate specific regulatory obligations referred to in sub regulation (2) or maintain or amend such obligations where they already exist.

2.3 THE EU COMMISSION RECOMMENDATION ON RELEVANT MARKETS

The EU Commission Recommendation on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation (hereafter 'EC Markets Recommendation') promotes harmonisation across the single market and guarantees legal certainty across the EU.

This Recommendation identifies the provision of '*voice call termination on individual mobile networks (Market 7), as a relevant market susceptible to ex ante regulation'.*

2.4 THE EC RECOMMENDATION ON THE REGULATION OF TERMINATION RATES IN EUROPE

In 2009, the European Commission issued a recommendation on fixed and mobile termination rates[6]. The objective of the EC Recommendation was to define and set out clear common principles, in accordance with the current regulatory framework on:

- The regulation of cost-oriented fixed and mobile termination rates in the EU, including common principles on the concepts of an efficient operator and symmetric regulation; and

- The identification and calculation of efficient costs consistent with those incurred in a competitive market.

For mobile termination rates, the EC Recommendation prescribed that the termination rates should be:

- based on a bottom-up LRIC model of an efficient modern network with a next-generation core network;

- based on an increment defined as the activity of third party termination on the modelled network (also known as "pure LRIC").

2.5 RELEVANT MCA DECISIONS

In line with the MCA's decision on the market analysis of the mobile termination market entitled 'Wholesale voice call termination on individual mobile networks: Identification and Analysis of Markets, Determination of Market Power and Setting of SMP Conditions (November 2009)[78] (hereafter 'the Market Analysis'), the following MNOs were designated with an SMP status:

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[6] Commission Of The European Communities, COMMISSION RECOMMENDATION of 7.5.2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU, 7 May 2009

[7] http://www.mca.org.mt/sites/default/files/articles/MTRs_Final_Decision_161109.pdf

- Vodafone Malta Limited;
- Mobisle Communications Limited and
- Melita Mobile plc.

One of the obligations that were imposed on the above mentioned MNOs is price control and cost accounting.

The decision proposed in this consultation document implements this obligation in accordance with Regulation 16 of the ECNSR.

Moreover, the MCA had decided to adopt the 'pure LRIC' methodology to calculate mobile termination rates in its decision entitled "Interconnection Pricing Strategy for the Electronic Communications Sector in Malta" published in May 2010[9].

[8] The above-mentioned Market Analysis was followed by a public consultation published in July 2013 (http://www.mca.org.mt/consultations/mca-consultation-provision-voice-call-termination-individual-mobile-networks-malta)

[9] http://www.mca.org.mt/service-providers/decisions/interconnection-pricing-strategy-electronic-communications-sector

3.0 PRINCIPLES OF LONG-RUN INCREMENTAL COSTING

This section discusses the main concepts and principles underlying the long-run incremental costing methodology featured in MBUCM.

3.1 COMPETITIVENESS AND EFFICIENT COST RECOVERY

Long-run incremental costs (LRIC) reflect the level of costs that would occur in a competitive market. Competition ensures that operators achieve a normal profit and normal return over the lifetime of their investment (i.e. the long run). This also ensures that inefficiently incurred costs are not recoverable. Under ex-ante regulation, remedies are imposed to mimic the outcome of competition in markets where SMP is found.

3.2 LONG-RUN COSTS

Costs are incurred in an operator's business in response to the existence of, or a change in, service demand, captured by the various cost drivers. Long-run costs include all the costs that will ever be incurred in supporting the relevant service demand, including the ongoing replacement of assets used. As such, the duration 'long run' can be considered at least as long as the network asset with the longest lifetime. Long-run costing also means that the size of the network deployed is reasonably matched to the level of demand it supports, and any over- or under-provisioning would be levelled out in the long run.

Consideration of costs over the long run can be seen to result in a reliable and inclusive representation of cost, since all the cost elements would be included for the service demand supported over the long-run duration, and averaged over time. On the other hand, short-run costs are those which are incurred at the time of the service output, and are typically characterised by large variations: for example, at a particular point in time, the launch of, or increase in, a service demand may cause the installation of a new capacity unit, giving rise to a high short-run unit cost, which then declines as the capacity unit becomes better utilised with growing demand.

Therefore, in a LRIC method, it is necessary to identify incremental costs as all cost elements, which are incurred over the long run to support the service demand of the increment.

3.3 INCREMENTAL COSTS

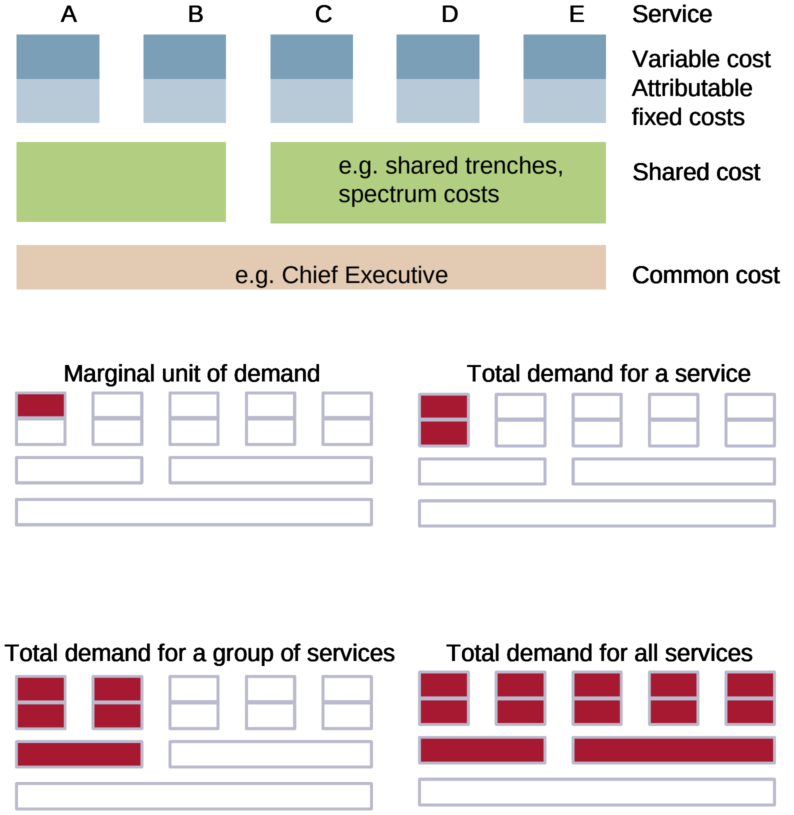
Incremental costs are incurred in the support of the increment of demand, assuming that other increments of demand remain unchanged. Put another way, the incremental cost can also be calculated as the avoidable costs of not supporting the increment.

There is flexibility in the definition of the increment, or increments, to apply in a costing model, and the choice should be suitable for the specific application. Possible increment definitions include:

- the marginal unit of demand for a service;
- the total demand for a service;
- the total demand for a group of services;
- the total demand for all services in aggregate.

Figure 3.1 illustrates how the possible increment definitions interact with the costs that are incurred in a five-service business.

Figure 3.1: Possible increment definitions [Source: Analysys Mason, 2012]

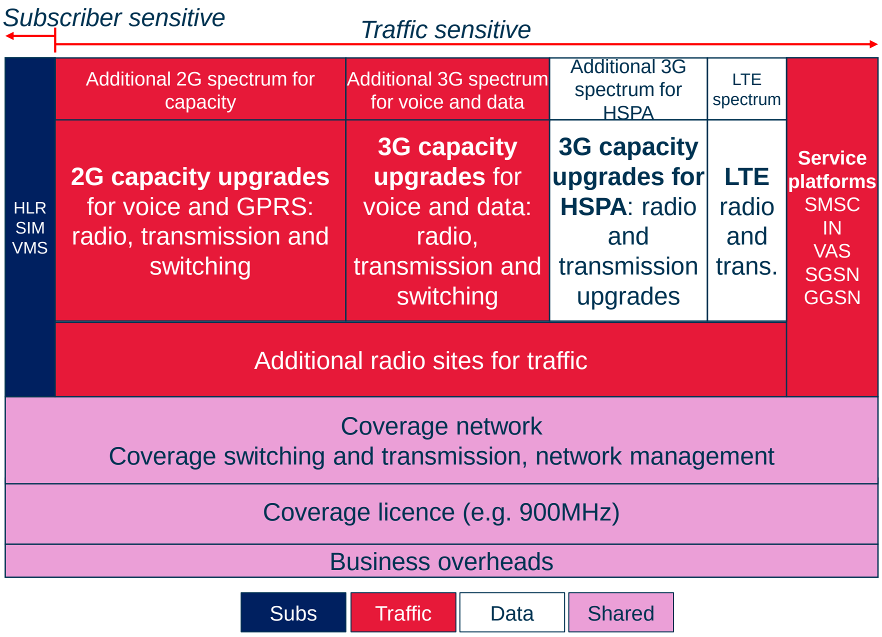


3.4 INCREMENTS

What follows is a description of the two specific sets of incremental costs which are calculated by the model.

The cost structure of the model is illustrated below.

Figure 3.2: Structure of mobile network costs



3.4.1 LRAIC+

The model produces the long-run average incremental costs (LRAIC) plus a mark-up for common overheads costs for all of the modelled services. These average incremental costs are obtained by applying service costing routing factors to the annualised costs of each network element, taking into account the total output (Mbit/s, minutes, connections, etc.) that is carried by the network element in the year.

The formula for this LRAIC unit cost per service calculation is:

$$Cost(Service_k) = \sum_{assets} \cos t\_per\_unit\_output(asset_i) \times RouteingFactor(asset_i, service_k)$$

Where:

- $Cost\,(service_k)$ = LRAIC of service *k*
- *Cost per unit output* $(asset_i)$ = Annualised cost for asset *i* divided by total output carried in the year
- *RoutingFactor* is the matrix of service costing routing factors for each asset and service

The service costing routing factors applied to the annualised costs are identical to the network dimensioning routing factors. This means that the sharing of core network costs by traffic essentially is based upon the *service* traffic rather than the *aggregate network traffic*.

The overheads are marked up to the LRAIC+ using an equi-proportionate percentage.

3.4.2 Pure LRIC

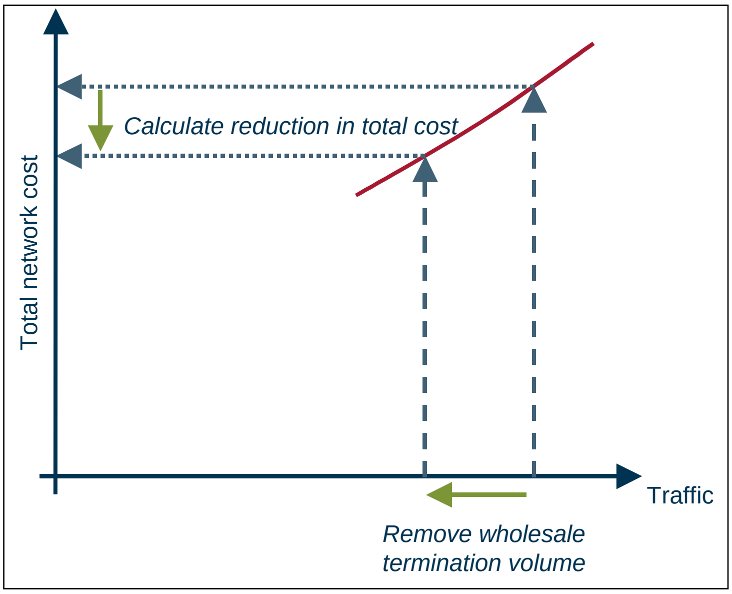
As discussed in Section 1.1, the main purpose of the model is to calculate the pure LRIC of mobile termination services. The modelling of a pure LRIC increment for the mobile termination services is cited in the 2009 EC Recommendation for wholesale termination (2009/396/EC).

The pure LRIC increment differs from the LRAIC+ increment mainly in terms of the number of services or amount of traffic included in the increment volume applied in the model, and consequently the size of residual common costs remaining for the (optional) mark-up step.

Long-run average incremental costing is typically described as a large increment approach – all services which contribute to the economies of scale in the network are added together in a large increment; individual service costs are then identified by sharing out the large (traffic) incremental cost according to average resource consumption routing factors. The adoption of a large increment – most likely some form of aggregate 'traffic' – means that all the services that are supplied are treated together and 'equally'. Where one of those services may be regulated, the regulated service neither bears, nor benefits excessively from, the lower costs arising from economies of scale. Conversely, the definition proposed by the EC is a small increment approach.

In the Recommendation, the incremental cost of **only the volume of wholesale termination**[10] is assessed 'at the margin' of the cost function. By building a bottom-up cost model containing network design algorithms, it is possible to use the model to calculate the incremental cost: by running it with and without the increment in question.

Figure 3.3: Calculating the incremental cost of termination traffic [Source: Analysys Mason]



10 I.e. termination of calls from third parties, but not of on-net calls.

In practice, in MBUCM, the pure LRIC is calculated by running the model twice; once with wholesale voice termination and another time without. The resulting total network costs in each case, derived from the number of assets required in each case as for the LRAIC+ calculation, are stored as a hard-coded value. The total network costs without termination are then subtracted from the total network costs with termination and this difference is divided by the volume of voice termination traffic to give the incremental cost of voice termination per minute.

Although the model can calculate both LRAIC+ and pure LRIC, in line with the EU Recommendation, pure LRIC methodology is used for voice termination.

3.5 EFFICIENTLY INCURRED COSTS

In order to set the correct investment and operational incentives for regulated operators, it is necessary to allow only efficiently incurred expenditures in cost-based regulated prices. The specific application of this principle to a set of cost models depends significantly on a range of aspects:

- the detail and comparability of information provided by local individual operators;
- the detail of modelling performed;
- the ability to uniquely identify inefficient expenditures;
- the stringency in the benchmark of efficiency which is being applied; and
- whether efficiency can be distinguished from below-standard quality.

Cost inputs have been collected in the data collection phase and have been compared against available benchmark costs. Where possible in the model, bottom-up costs have been reconciled with top-down costs identified in operator accounts.

3.6 COSTS OF SUPPLY USING MODERN TECHNOLOGY

In a market, a new entrant that competes for the supply of a service would deploy modern technology to meet its needs – since this should be the efficient network choice. This implies four 'modern' aspects: the choice of network technology (e.g. IP vs. TDM), the capacity of the equipment, the price of purchasing that capacity, and the costs of operating and maintaining the equipment. Therefore, a LRIC model should be capable of capturing these aspects:

- The choice of technology should be efficient. Legacy technologies, which are in the process of being phased out, should not be considered modern.

- Equipment capacity should reflect the modern standard. New generation switches may also be optimised to give improved capacity (e.g. MSC-Server performs control-plane switching, while the separate MGW switches the user-plane voice traffic).

- The modern price for equipment represents the price at which the modern asset can be purchased over time. It should represent the outcome of a reasonably competitive tender for a typical supply contract in Malta.

- Operation and maintenance costs should correspond to the modern standard of equipment, and represent all the various facility, hardware and software maintenance costs relevant to the efficient operation of a modern standard network.

4.0 MODEL STRUCTURE

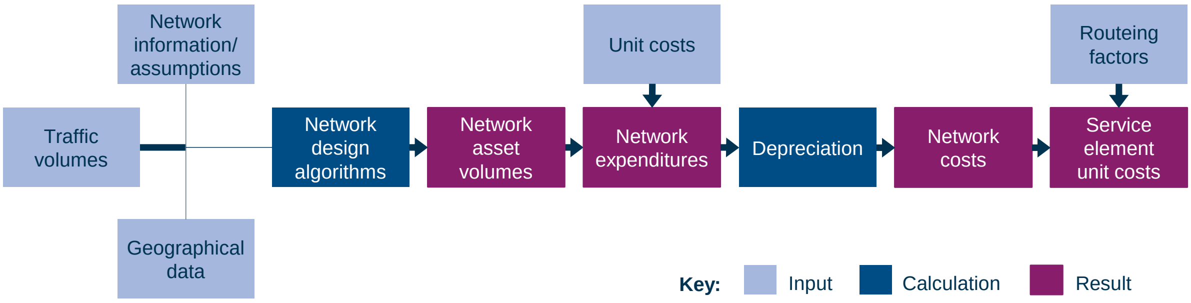
This section summarises some fundamental modelling design and structure issues.

4.1 MODEL TYPE

The MCA aimed at developing a bottom-up model of a mobile core and access network which meets the specification and principles of the 2009 EC Recommendation on wholesale termination and that on regulated access to NGN. For this purpose a bottom-up LRIC methodology was adopted.

MBUCM has been built on a number of modelling/calculation steps, as shown in Figure 4.1 below.

Figure 4.1: Bottom-up cost model



The **Network information/assumptions** module considers which assets are required for the network and contains a database of their capacities and lifetimes. The **Geographic data** module consists of network locations or site classifications and their individual requirements which might be influenced by their remoteness and/or local topology. The traffic generated by these locations is calculated bottom-up in the **Traffic volumes** module. **Network design algorithms** then uses this data to construct an efficient network and, having built it, produces the required **Network asset volumes**. These are then turned into yearly **Network expenditures** with inputs of their **Unit costs**.

The **Depreciation** module is a self-contained implementation of the selected depreciation method which depreciates each asset individually. The resulting annualised costs are then aggregated to give **Network costs**. Thereafter, **Routing factors** determine the allocation of the network costs to different **Service elements** on the basis of the network load generated by the individual services. These normally reflect the cost drivers used in the network design algorithms.

4.2 MODEL MODULARITY

The model is built using a modular approach and is divided into:

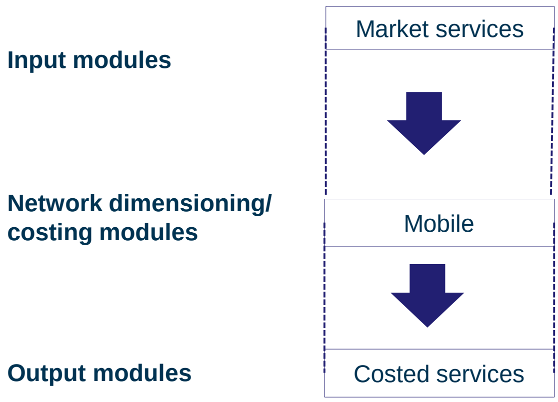
- One Input module that includes the demand for services;

- One Network dimensioning/costing module that models the mobile network, the outputs of which are the costs of network elements. It therefore includes both passive and active network elements;

- One Output module that includes the calculation and representation of the cost of services. It also contains a control sheet from which parameters and sensitivities can be set and scenarios selected.

This concept is highlighted in *Figure 4.2*.

Figure 4.2: Overview of model flow



4.3 CHOICE OF OPERATOR AND SCALE

Although there are three MNO and a small number of MVNOs/alternative service providers in Malta, the purpose of MBUCM is not to model the actual individual operators but to model the services of a hypothetical efficient mobile operator.

The MCA approached the concept of the hypothetical efficient mobile operator in the following manner:

- Identify the key operator differences that characterise local operators, such as market share, busy hour profile, level of coverage, amount of spectrum, network coverage technology, traffic per subscriber, choice of transmission technology, number of switching nodes and the possibility of assets sharing with a fixed operator;

- Assess the actual deployment of an individual MNO based on those key operator differences so that the characteristics of the hypothetical efficient mobile operator choices would be grounded in reality;

- Observe the effect of the key operator differences on the related costs of the modelled operator to ultimately arrive at preferred choices for the characteristics of the hypothetical efficient mobile operator.

With regards to the market share of the hypothetical efficient mobile operator, the MCA considered two alternatives:

- **Minimum-scale operator market share**: The EC Recommendation discusses a minimum-scale operator; however, a minimum-scale operator is hard to define when both the network and the market share of the smallest operator are still growing steadily. Minimum-efficient scale could be interpreted as when the initial coverage network has been properly utilised;

- **1/N 'reasonably efficient' approach**: This approach has been used to define the efficient scale operator in a number of other European markets (in this case N=3) and offer a practical and workable view of a long run equilibrium. However, the adoption of a 1/N approach would require certain input decisions to be made in a consistent way (e.g. amount of spectrum).

Given the above, the MCA opted for the 1/N 'reasonably efficient' approach to define the market share of the hypothetical efficient mobile operator.

Figure 4.3: Key characteristics of the hypothetical efficient generic operator [Source: Analysys Mason, 2013]

Characteristic	Value for generic operator
Market share	1/N
Coverage	Based on the levels of actual coverage of the MNOs
Spectrum	2G: 2x5 MHz in the 900MHz band and 2x10 MHz in the 1800MHz band 3G: 2x20 MHz in the 2100MHz band
Busy hour profile	Average of actual MNO data
Traffic per subscriber	Average of actual MNO data
Backhaul transmission topology/technology	Choice of efficient technology
Core switching topology/technology	Choice of efficient technology
Core transmission topology/technology	Choice of efficient technology
Sharing of assets with a fixed operator	Not in the base case

The inclusion of *sharing of assets with a fixed operator* in the key operator differences does not necessarily mean that a Maltese MNO needs to be a quad play operator to be considered as an efficient operator.

4.4 FOOTPRINT OF THE MODEL

The MCA has not made any geographical differentiation of its regulation within the boundaries of Malta. The cost model therefore has a national footprint.

4.5 SERVICES MODELLED

In order to obtain a full understanding of network costs, all of the network services need to be modelled. This allows the economies of scale and scope in the delivery of voice and data traffic (and thus in the LRAIC+) to be understood. The services modelled are:

- voice traffic (incoming, outgoing, on-net; for incoming and outgoing, the traffic to/from domestic destinations and to/from international destinations are separate services; all voice services are also duplicated for 2G and 3G technologies);

- data traffic (GPRS, R99 and HSPA); and

- SMS traffic (though SMS is a very limited driver of network costs, is confined to the signalling channels, and is starting to decline as mobile email/IM becomes standard on smart phones).

It is worthwhile stressing here that notwithstanding the modelling of all the mobile services provisioned in Malta, the scope of this consultation is strictly to calculate the cost of mobile termination services based on a pure-LRIC approach as featured in the EC Recommendation.

5.0 NETWORK CONFIGURATION

This section summarises the key characteristics of the modelled network. In particular: the architecture of the modelled network (Section 5.1); and the configuration of the modelled network (Section5.2).

5.1 MODELLED MOBILE NETWORK ARCHITECTURE

The generic operator network has been modelled according to a modified scorched-node approach featuring three network levels; namely, core sites, aggregation sites and radio sites.

The generic operator is assumed to have two core sites where network equipment (MSS, MGW, etc.) is spread out (or duplicated, for redundancy) over these two nodes, with voice interconnect points also located at the two core sites.

MBUCM features 19 aggregation nodes (hubs), including the two core sites which also serve as aggregation nodes. Each aggregation node aggregates the traffic from BTS and NodeBs in its municipality (known as 'local councils' in Malta) and often also from defined adjacent municipalities (where a municipality does not have its own aggregation node). The connection between the aggregation site and the BTS and NodeB equipment comprises of microwave links.

The backhaul network comprises of 17 aggregation nodes[11]. These are organised in three rings all of which start/end at the two core sites. Dark fibre is used to connect the aggregation nodes thus setting up the rings. The main details of the rings are as follows:

- North ring – 8 nodes (in addition to the two core sites, similar for the other rings);
- West ring – 3 nodes; and
- South ring – 6 nodes.

[11] These aggregation notes exclude the two core sites

Figure 5.1 below shows the 68 municipalities in Malta aggregated by hub. Figure *5.2* shows the core sites, hubs and the three backhaul rings.

Figure 5.1: Municipalities aggregated by hub [Source: Analysys Mason, 2013]

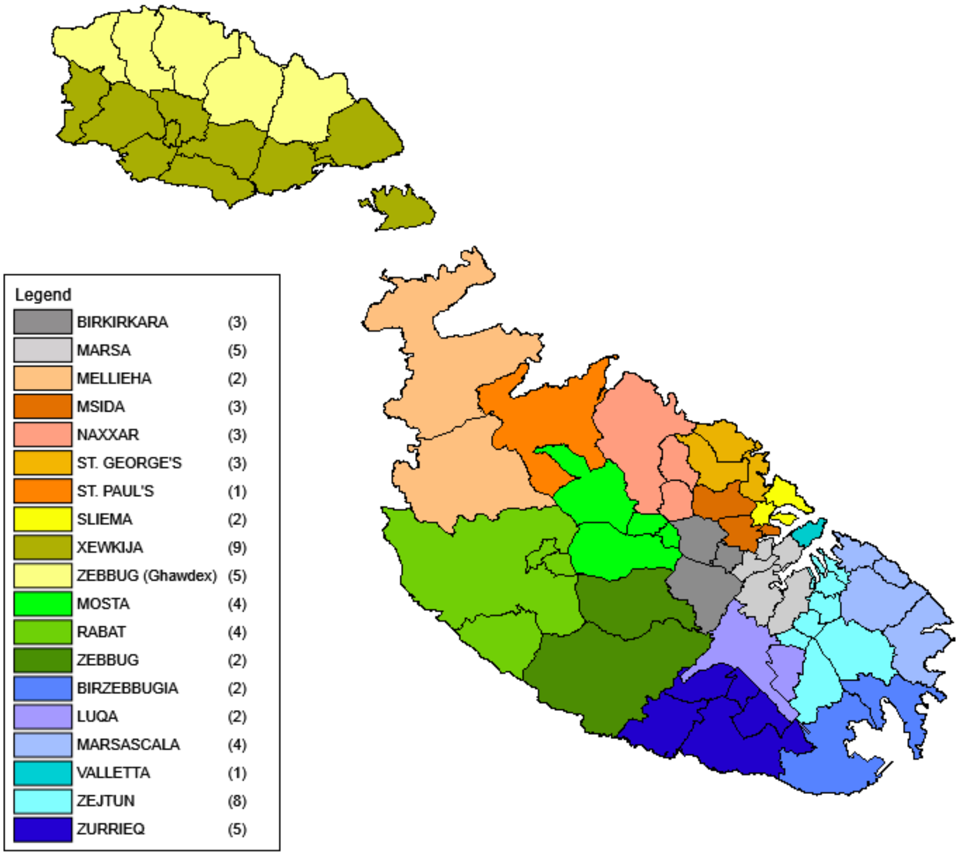
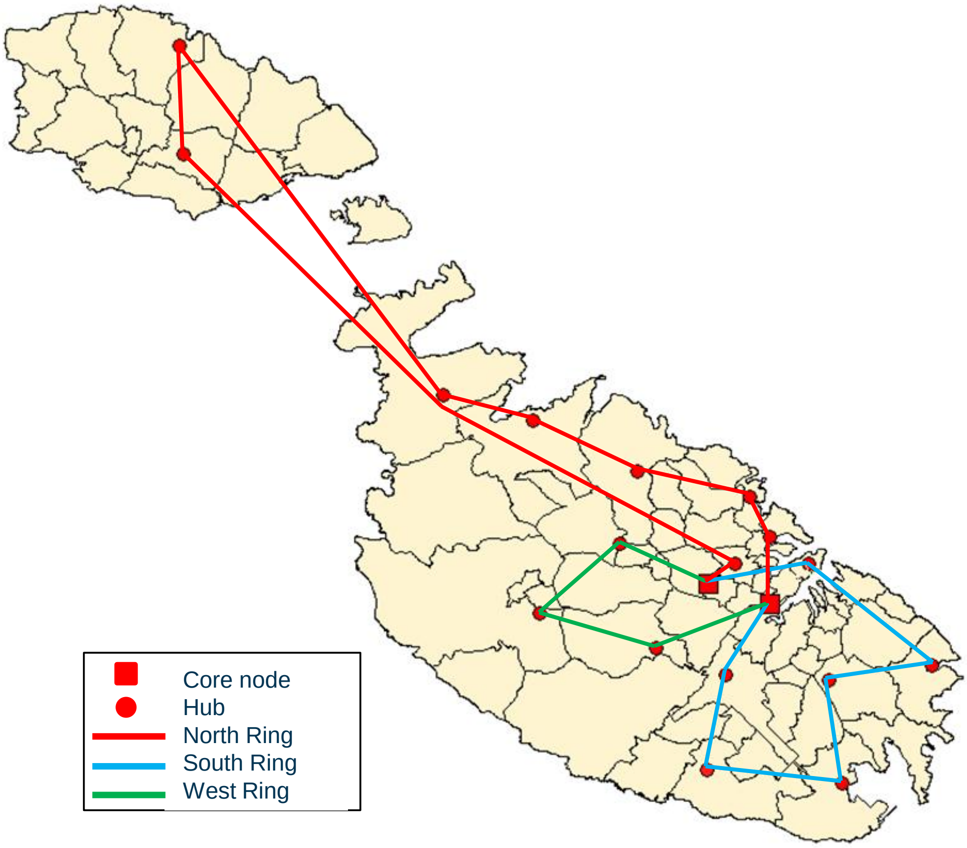


Figure 5.2: Backhaul rings [Source: Analysys Mason, 2013]

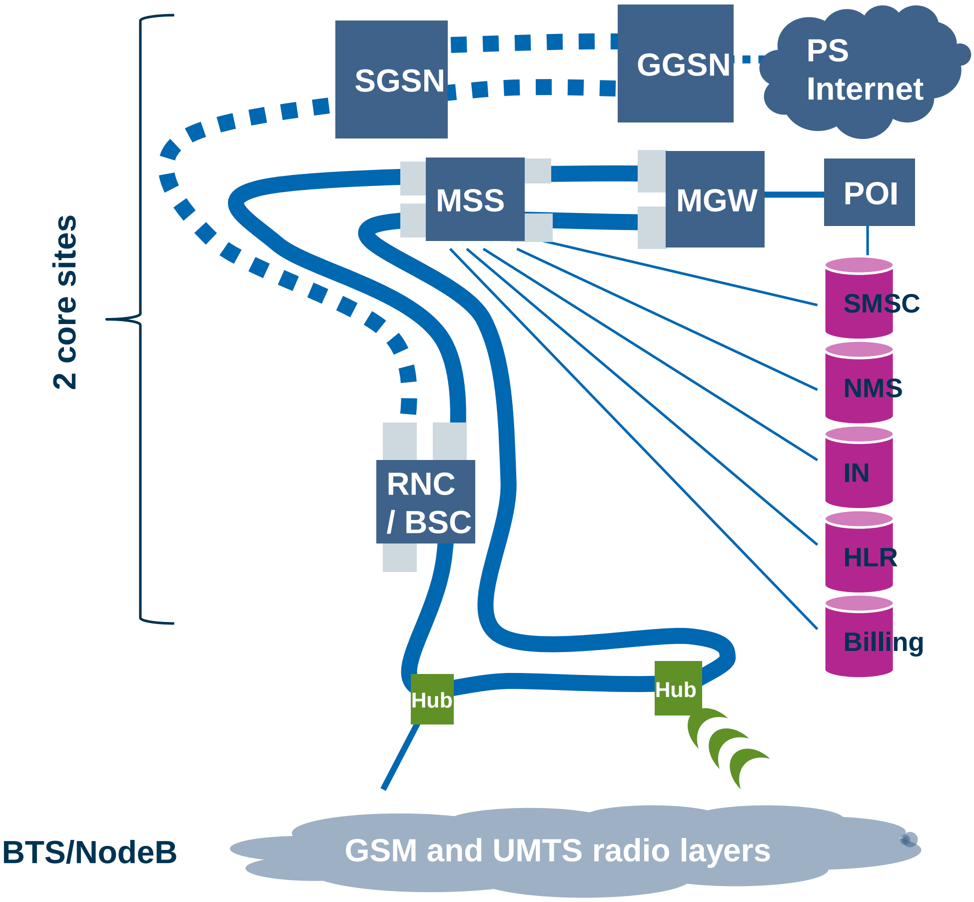


The number of BTS and NodeB required in the modelled network are dimensioned in the model, by municipality.

5.2 MOBILE NETWORK CONFIGURATION

An overview of the modelled mobile network, illustrating all three network levels is shown below in *Figure 5.3*.

Figure 5.3: Overview of the modelled generic operator mobile network [Source: Analysys Mason, 2013]



6.0 MARKET MODULE

MBUCM is configured for a given year although it offers the possibility to switch between several input years. The modelling of future years requires the development of market forecast for the various services modelled in order to take into account any anticipated changes in market conditions and the usage of specific services. The market module is designed to forecast the voice and data traffic of both the Maltese market and the modelled operator. The calculated load is used as an input to the subsequent modules of the model and is therefore used for the network dimensioning.

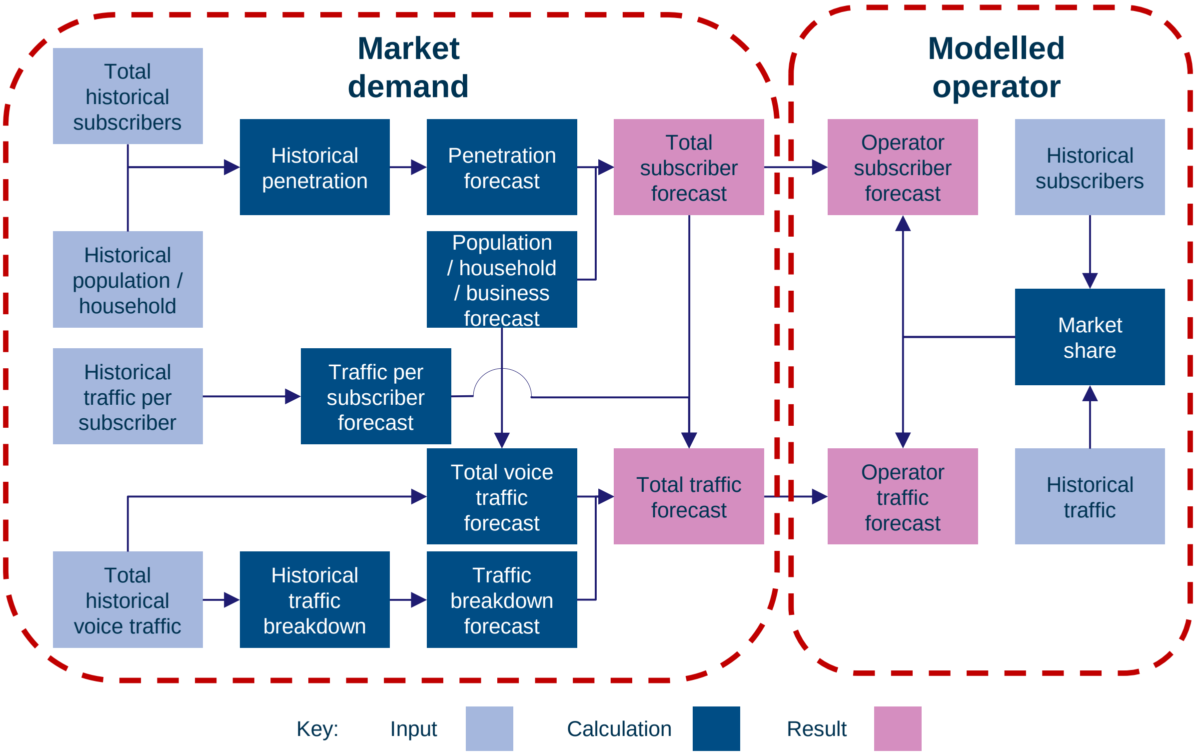
The Market module uses demand data for the Maltese market from various sources such as:

- MCA statistics: This includes data submitted by the Maltese operators to the MCA on a regular basis as part of the MCA's ongoing market monitoring activities and includes data for the following segments:
  - mobile voice traffic and subscribers;
  - mobile voice calls;
  - mobile SMS traffic; and
  - mobile data traffic.
- Data provided by operators specifically for this project.
- Population and international tourists (to determine the number of roamers) statistics sourced from the Maltese National Statistics Office and from Euromonitor.

Based on this data, a forecast for the development of the entire Maltese market has been devised covering the period up to 2025. The MCA took also into consideration the forecasts submitted by MNOs to inform its assumptions whenever these were made available.

The demand for the modelled operator is then derived from this total demand based on the market shares applied. Figure 6.1 shows an overview of the logical flow in the Market module.

Figure 6.1: Logical flow of the Market module



The methodology used for the market demand depends on the forecast unit:

- Subscribers' forecasts are typically based on penetration rates and then multiplied by extrapolations of population or household numbers.
- Voice traffic is forecasted separately (and then cross-checked against subscriber usage).
- Data traffic is forecasted on a per-subscriber basis. Total traffic is then derived by multiplying by the number of subscribers of the given service.

6.1 MARKET FORECASTS

The Market module generates forecasts at the market level for the following services:

Figure 6.2: Mobile market services modelled

Subscribers and connections

Mobile subscribers
- Domestic voice only subscribers
- Domestic voice + data subscribers
- Roaming in Malta voice only subscribers
- Roaming in Malta voice + data subscribers

Service usage

Mobile voice traffic
- mobile to mobile (on-net, outgoing, incoming)
- mobile-to-fixed/fixed-to-mobile
- mobile-to-international /international-to-mobile

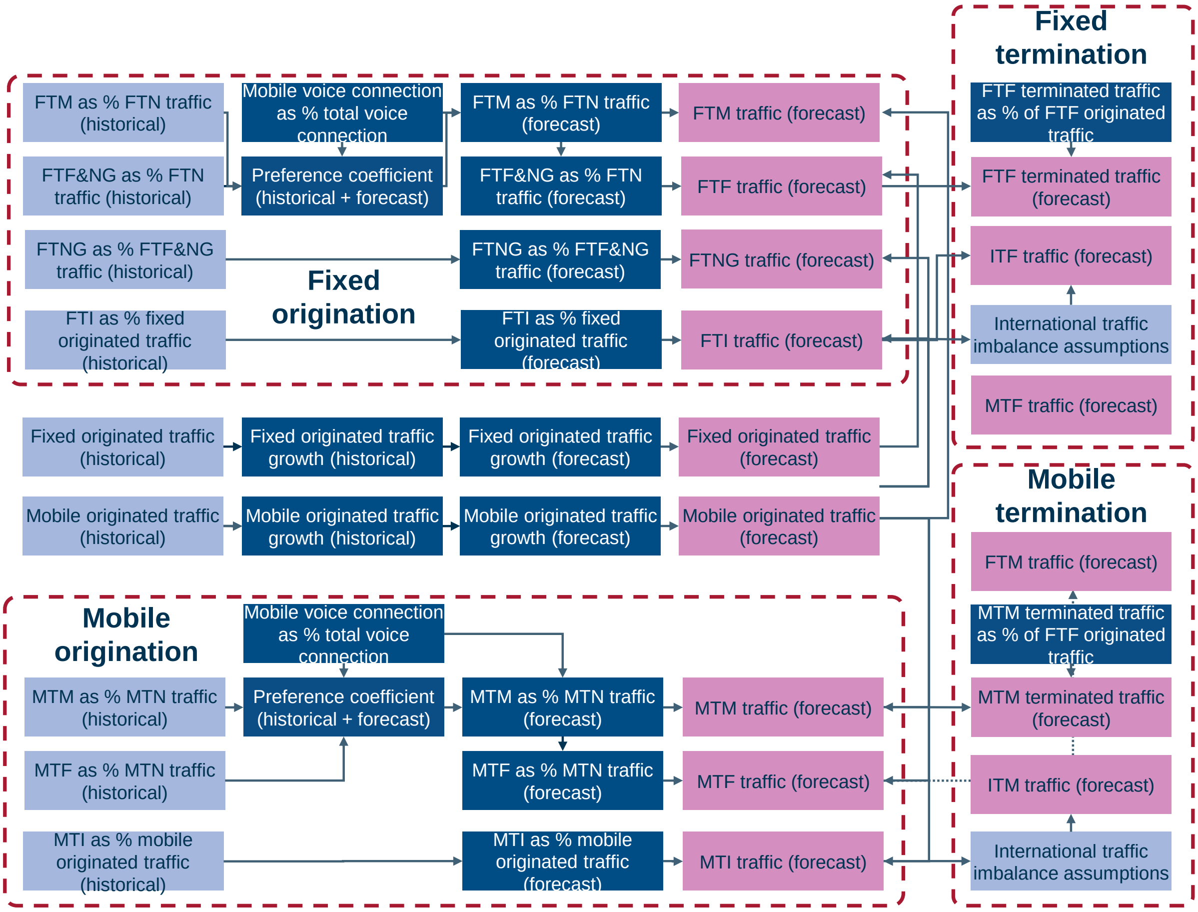
SMS traffic
- on-net, outgoing, incoming (mobile to mobile)

Data traffic
- total traffic

Mobile subscribers and traffic are included in order to estimate traffic from mobile to fixed networks and vice versa.

The methodology for forecasting mobile (and fixed) wholesale termination traffic is shown in Figure 6.3.

Figure 6.3: Methodology for forecast of mobile (and fixed) wholesale termination traffic[12]



Fixed originated and mobile originated traffic is split and forecasted separately, with, both types of traffic being divided into subcategories in order to allow a more granular forecast. The relevant traffic types are then summed up in order to calculate the mobile termination traffic, which include mobile-to-mobile (MTM) and fixed-to-mobile (FTM) activity.

International-to-mobile (ITM) and mobile-to-international (MTI) traffic are correlated since people who frequently make international calls are also more likely to receive calls from foreign destinations. Hence, an 'international traffic imbalance' factor, defined as the ratio of ITM-to-MTI traffic, is assumed to estimate ITM traffic from the MTI traffic determined earlier.

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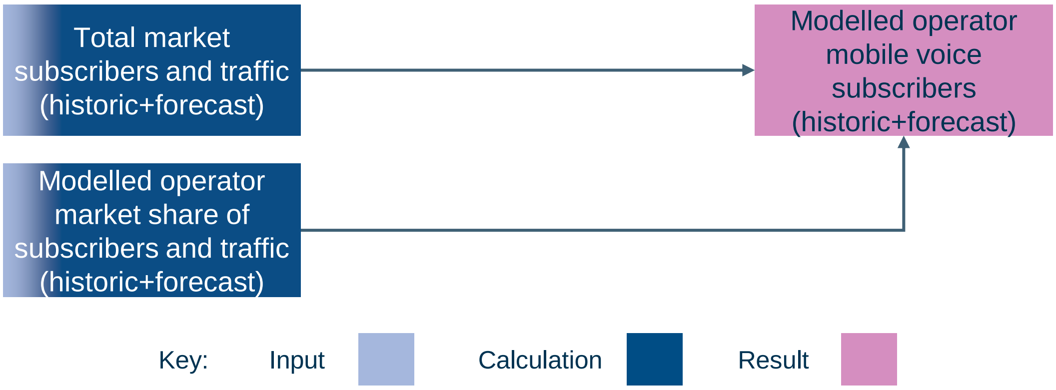
[12] FTI = fixed to international, FTN = fixed to national, FTM = fixed to mobile, FTF&NG = fixed to fixed and non-geographic numbers, FTF = fixed to fixed, FTNG = fixed to non-geographic numbers, MTI = mobile to international, MTN = mobile to national, MTM = mobile to mobile, MTF = mobile to fixed, ITF = international to fixed

6.2 OPERATOR FORECASTS

The model has been structured to reflect a hypothetical efficient mobile operator. The market share of this generic operator, based on the 1/N approach, is set as 33.33% as there are three MNOs in Malta.

In order to derive operator demand, the total number of mobile subscriptions needed to be split into the subscriptions to the modelled operator and to other operators based on the market share of the modelled operator as shown in Figure 6.4 below.

Figure 6.4: Methodology for split of mobile voice subscribers between the modelled operator and other operators in the mobile market [Source: Analysys Mason, 2013]



7.0 COMMON INPUTS

This section introduces a number of inputs that are common across all modules.

7.1 WEIGHTED AVERAGE COST OF CAPITAL

The weighted average cost of capital (WACC) is an input to the model derived from the MCA's WACC Decision published in November 2012[13]. In line with this decision the WACC rate is set in MBUCM at 10.80% (nominal).

7.2 VALUATION METHOD FEATURED IN MBUCM

The model is built around the concept of **Gross replacement cost** i.e. what it would cost to replace the whole network asset base according to the current price of assets 'today'. The gross replacement cost (GRC) may also consider modifications for the relevant *modern-equivalent* assets.

The GRC is calculated by taking the number of network elements active in the network (in each year) and multiplying by the unit cost of the network element (in each year). The unit cost in each year changes with inflation and real-terms price trends.

7.3 DEPRECIATION METHOD FEATURED IN MBUCM

Having established the capital value of assets to be considered, the model is capable of calculating four different depreciation methods for recovering those values with a discount factor for the cost of capital employed:

- **standard annuities** described in Section 7.3.1;
- '**traditional' tilted annuities**, which are described in Section 7.3.2;
- **modified tilted annuities**, which are described in Section 7.3.3;
- **straight-line depreciation** with the assumption that the assets are on average 50% (or some other estimated percentage to be defined) depreciated. The methodology is included in the model but is not applied for any element.

The lifetime of the depreciation method is also important, as it establishes the rate of cost recovery. The lifetimes adopted in the model are economic lifetimes.

[13] http://www.mca.org.mt/service-providers/decisions/estimating-cost-capital-response-consultation-and-decision

7.3.1 Standard annuity

The standard annuity methodology calculates a fixed annual value including both capital charges and asset depreciation / amortisation using the formula shown below:

$$Annuity = GRC \times \frac{WACC}{1-\left(\frac{1}{1+WACC}\right)^{lifetime}}$$ Where: GRC = gross replacement cost of asset WACC = weighted average cost of capital lifetime = useful lifetime of asset	*Figure 7.1: Formula used to calculate 'standard' annuity*

7.3.2 Traditional tilted annuity

For traditional tilted annuity calculations, a starting value for assets in the network is used. An annualised cost is then calculated using the formula shown in Figure 7.2.

$$Tilted\ Annuity = GRC \times \frac{WACC - tilt}{1-\left(\frac{1+tilt}{1+WACC}\right)^{lifetime}}$$ Where: GRC = gross replacement cost of asset tilt = annual change of annuity WACC = weighted average cost of capital lifetime = useful lifetime of asset	*Figure 7.2: Formula used to calculate tilted annuity*

This traditional tilted annuity method only factors into the tilt the asset price changes over time, allowing an increase or decrease in depreciation in the early years of an asset's lifetime.

This method is commonly used in electronic communications cost models, and is favoured in contestable markets, where an operator has to reduce its prices based on the cost of its inputs in order to remain competitive with (potential) new entrants to the market.

7.3.3 Modified tilted annuity

The traditional approach to tilted annuity does not, however, factor in changes in demand. For this reason, MBUCM features a forward-looking 'modified' tilted annuity calculation, which factors both usage and price trends into the tilt. With this methodology, the asset price trend and the increase in asset utilisation are combined into the tilt using the formula set out in Figure 7.3.

$Tilt = (1+i)\times(1+p)\times {}^{1}\!/_{1+i\times z} - 1$ Where: i = projected increase in asset utilisation p = asset price trend z = share of fixed costs as a proportion of total asset costs[14]	*Figure 7.3: Formula used to calculate the tilt [Source: Agcom15]*

7.4 VALUATION AND DEPRECIATION METHODOLOGIES CHOSEN IN MBUCM TO CALCULATE THE MALTESE MTR

The MCA is proposing to set MBUCM to use modified tilted annuities as the depreciation methodology for all modelled assets in its base case and the GRC approach for asset valuation.

Although the MCA is proposing a GRC / modified tilted annuity approach, it reserves the right to revert to other valuation/depreciation methods if market conditions require so in the future. This will in any case be done following consultation with interested parties.

7.5 GEOGRAPHIC ANALYSIS

The network design of a mobile network is dependent on a number of geographic factors including, but not limited to:

- the topography of the territory in which the network will be deployed;
- the distribution of the population and its mobility during the day;
- the distribution of the population and its mobility throughout the year;
- if the territory experiences seasonal population shifts in the territory modelled; and
- the traffic catered for by the network due to roaming needs.

14 The z-value in the formula has been set to zero throughout our model as we consider the costs of all assets to be volume-dependent, even if they are sunk costs.

15 Published by Agcom e.g. in Delibera n. 251/08/CONS from 14 May 2008.

At the same time, the density of population, topology and usage of mobile networks in Malta is highly unique (such as a high population density, buildings made of thick stone walls in parts of the island and fairly low monthly minutes of usage compared to other European countries). There is also a regular influx of tourists, which may have an effect on network demand. These have an impact of highly seasonal traffic effects on the network.

This geographic analysis is performed in MBUCM by:

- using the site information and coverage data obtained by MNOs to calculate the geographic inputs required for the modelling of the radio network;
- basing on simple map-based calculations for the efficient core and backhaul networks in combination with calculations defined previously for the fixed model;
- representing Malta's geography at the level of the 68 municipalities with the network load divided into the 68 municipalities of Malta based on their population share.

7.6 WORKING CAPITAL ALLOWANCE

Although working capital has not been modelled explicitly in MBUCM, an allowance is included, defined as a fraction of yearly opex. This is estimated to be equivalent to 30 days of opex expenditure multiplied by the WACC.

7.7 OVERHEADS

The model uses a common cost mark-up that is calibrated to allow costs such as administrative fees, business overheads. This is informed by the opex validation exercise the MCA carried out, whereby the total opex, including overheads, as accounted in operators' 2011 Regulatory Accounts was compared with the total opex of each of the corresponding operator as modelled in the MBUCM in its respective scenario. These scenarios reflect the key characteristics of the modelled operator in 2011 with common costs set to zero. The difference identifies the estimated common costs of the network and is kept constant for future modelled years.

8.0 PROPOSED MOBILE TERMINATION RATES

8.1 PRIVATE CONSULTATION WITH MNOS

As already stated, in order to develop this model, MCA engaged GO Mobile, Vodafone Malta and Melita Mobile in two distinct technical consultation phases. The first private consultation covered the concepts of the model and the other focused in detail on the specific modelling parameters of the draft model. These were complemented with individual technical meetings with all three MNOs to explain further the model and its concepts. An extensive data request was also sent to the three MNOs in order to reflect as much as possible the local characteristics and service costs of mobile networks. At an early stage of this process the three MNOs were informed that commercial confidentiality of information would be respected. The draft model was in turn revised where appropriate to reflect the feedback sent by MNOs.

8.2 PROPOSED MOBILE TERMINATION RATES

The pure LRIC cost has been calculated based on 2012 market data and the equipment prices of the incremental assets featured above. **This resulted in an average calculated cost for the wholesale mobile termination service of 0.40 Euro cents per minute.**

It is the MCA's intention that revised mobile termination rates will come into force starting from 1 December 2013.

9.0 CONSULTATION QUESTIONS

The MCA invites comments from interested parties on this consultation document. Comments which are not specifically dealt with in this Consultation but are directly related to the subject matter under this review are also welcome.

Interested Parties are invited to comment on specific aspects covered throughout this Consultation Document.

Interested parties are also invited to comment on the date of the coming into force of the proposed MTR.

For the sake of clarity and ease of understanding, the MCA encourages stakeholders to structure their comments in order and in line with the section numbers and sub-section numbers used throughout this document.

10.0 SUBMISSION OF RESPONSES

In accordance with its obligations under Article 4A of the Malta Communications Authority Act [Cap. 418 of the Laws of Malta], the Authority welcomes written comments and representations from interested parties and stakeholders during the national consultation period which shall run from the 16/08/2013 to the 06/09/2013.

The Authority appreciates that respondents may provide confidential information in their feedback to this consultation document. This information is to be included in a separate annex and should be clearly marked as confidential. Respondents are also requested to state the reasons why the information should be treated as confidential.

For the sake of openness and transparency, the MCA will publish a list of all respondents to this consultation on its website, up to three days following the deadline for responses. The Authority will take the necessary steps to protect the confidentiality of all such material as soon as it is received at the MCA offices in accordance with the MCA's confidentiality guidelines and procedures[16]. Respondents are however encouraged to avoid confidential markings wherever possible.

All responses should be submitted to the Authority, in writing by no later than 12.00hrs on 06/09/2013 and addressed to:

Ian Agius,
Chief of Operations

Malta Communications Authority
Valletta Waterfront, Pinto Wharf,
Floriana, FRN1913
Malta.
Tel: +356 21 336 840 Fax: +356 21 336 846
Email: coo.mca@mca.org.mt

Extensions to the consultation deadline will only be permitted in exceptional circumstances and where the Authority deems fit. The MCA reserves the right to grant or refuse any such request at its discretion. Requests for extensions are to be made in writing within the first ten (10) working days of the consultation period.

[16] http://www.mca.org.mt/sites/default/files/articles/confidentialityguidelinesFINAL_0.pdf