Mobile Termination Rates:
Draft Bottom Up Pure Long Run Incremental Cost Model

All responses to this consultation should be clearly marked: - "Reference: Submission re ComReg 14/29", and sent by post, facsimile or e-mail to arrive on or before 5p.m., 23 May 2014, to:

Ms. Claire Kelly
Commission for Communications Regulation
Irish Life Centre, Abbey Street,
Dublin 1, Ireland

Ph: + 353 – 1 804 9600 Fax: + 353 – 1 – 804 9680
Email: **wholesaleconsult@comreg.ie**

Please note ComReg will publish all respondents' submissions with the Response to this Consultation, subject to the provisions of ComReg's guidelines on the treatment of confidential information – ComReg 05/24

Consultation and Draft Decision

Reference: ComReg 14/29

Date: 11/04/2014

Legal Disclaimer

This consultation and draft decision is not a binding legal document and also does not contain legal, commercial, financial, technical or other advice. The Commission for Communications Regulation is not bound by it, nor does it necessarily set out the Commission's final or definitive position on particular matters. To the extent that there might be any inconsistency between the contents of this document and the due exercise by it of its functions and powers, and the carrying out by it of its duties and the achievement of relevant objectives under law, such contents are without prejudice to the legal position of the Commission for Communications Regulation. Inappropriate reliance ought not therefore to be placed on the contents of this document.

Content

Section Page

1 Introduction 6

2 Executive Summary 13

3 Costing Methodology and Draft BU Pure LRIC Model 21

3.1 Overview 21

3.2 The MTR draft modelling process 21

3.3 Costing methodology approach 22

3.4 Appropriate cost model 23

3.5 Operator-related parameters 24

3.5.1 Form of the modelled operator 24

3.5.2 Structural implementation 26

3.5.3 Market share 27

3.6 Service-related parameters 30

3.6.1 Sizing the market 32

3.6.2 Per subscriber usage and operator market share 33

3.6.3 Busy hour service demand 36

3.6.4 Services set – definition of increment 37

3.7 Technology-related parameters 38

3.7.1 Geotypes 39

3.7.2 Nodal layout methodology 41

3.7.3 Coverage network 43

3.7.4 Radio technology standards: 2G, 3G and LTE 46

3.7.5 Treatment of Spectrum 48

3.7.6 Spectrum costs 49

3.7.7 Minimum element requirements 51

3.7.8 Network dimensioning using busy hour traffic 51

3.7.9 Traffic conversion 53

3.7.10 Route-factored volumes 54

3.7.11 Planned element utilisation 55

3.7.12 Sharing of network elements between operators 56

3.7.13 Logical structure of modelled network 59

3.7.14 Radio Access Network 60
3.7.15 Transmission network 66
3.7.16 Other elements 68
3.8 Network costs 69
3.8.1 Unit costs 69
3.8.2 Indices 72
3.9 Implementation-Related Factors 74
3.9.1 Draft BU Pure LRIC Model Structure 74
3.9.2 Asset economic lifetime 76
3.9.3 Capex and opex calculation 77
3.9.4 Economic depreciation 78
3.9.5 Treatment of inter-temporal effects 80
3.9.6 Time-frame of the Draft BU Pure LRIC Model 82
3.9.7 Terminal value 83
3.9.8 Cost of capital 83
3.9.9 Nominal terms 84
4 Draft BU Pure LRIC Model Results 86
4.1 Overview 86
4.2 Pure LRIC calculation 86
4.3 Draft BU Pure LRIC Model results 89
4.4 Notification procedures and Statements of Compliance 92
5 Submitting comments 94

Annex

Section **Page**

Annex: 1 Draft Decision Instrument 95
Annex: 2 Legal Basis..... 104
Annex: 3 Deloitte Draft BU Pure LRIC Model Specification Document 106

Chapter 1

1 Introduction

1.1 This Consultation and Draft Decision Document entitled Mobile Termination Rates: Draft Bottom Up Pure Long Run Incremental Cost Model ComReg Document No. 14/29 ('**this Consultation Document**') sets out ComReg's proposed maximum Mobile Termination Rates ('**MTRs**') for Ireland. It is proposed that MTRs will be set using a bottom-up 'pure' long-run incremental cost ('**pure LRIC'**) model. ComReg considered the pure LRIC cost methodology as the most appropriate cost methodology to set MTRs in Ireland in Chapter 6 of ComReg Document No. 12/67 Voice Termination Rates in Ireland: Proposed Price Control for Fixed and Mobile Termination Rates[1] (the '**2012 Price Control Consultation Document**'). It then chose this methodology as the appropriate cost methodology to set MTRs in Ireland for the reasons given in Chapter 6 of the 2012 Price Control Decision D12/12 ComReg Document No. 12/125 Mobile and Fixed Voice Call Termination Rates in Ireland (the '**2012 Price Control Decision**')[2].

1.2 Termination Rates are the tariffs charged between Service Providers[3] for terminating phone calls (from a fixed or mobile phone) on their network. Termination Rates are regulated in all EU Member States. The European Commission on 7 May 2009 issued a Termination Rate Recommendation[4] (the '**2009 Termination Rate Recommendation'**) to National Regulatory Authorities ('**NRAs**') across Europe in light of the divergence between price control measures that prevailed across the Member States.

[1] Published on 28 June 2012 and which can be found at the following link: http://www.comreg.ie/_fileupload/publications/ComReg1267.pdf

[2] Published on 21 November 2012 and which can be found at the following link: http://www.comreg.ie/_fileupload/publications/ComReg12125.pdf.

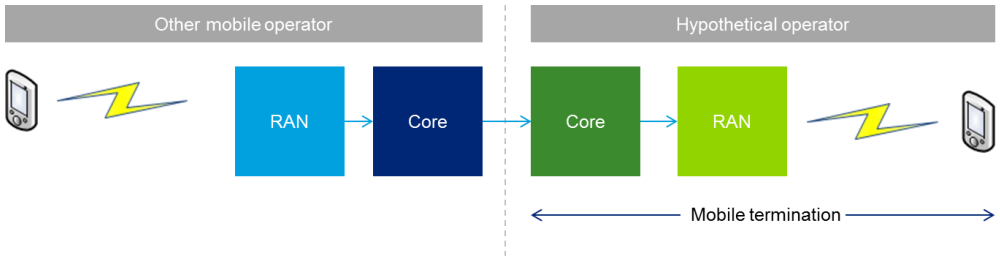
[3] Service Providers refers to fixed service providers (i.e. an undertaking providing end users with retail voice services from a fixed location) and mobile service providers (i.e. an undertaking providing end users with a land based / terrestrial publicly available mobile voice telephony services using a mobile network) collectively.

[4] European Commission Recommendation: "*The Regulatory Treatment of Fixed and Mobile Termination Rates in the EU"* (2009/396/EC), dated 7 May 2009.

1.3 The starting point for setting MTRs for Ireland was the designation of certain Mobile Service Providers ('**MSPs'**) with Significant Market Power ('**SMP**') in the wholesale mobile voice call termination ('**MVCT**') market and the consequent imposition of *ex ante* remedies[5] as a result of ComReg Decision D11/12, Document No. 12/124: Response to Consultation, Decision and Decision Instruments Market Review – Voice Call Termination Rates on Individual Mobile Networks ('**2012 MVCT Decision**'). This was followed by the choice in the 2012 Price Control Decision of pure LRIC as the relevant cost standard for the purpose of setting MTRs i.e. the increment is the wholesale voice call termination service and it excludes a mark up for any common costs which would not be avoided if the wholesale voice call termination service was no longer supplied (as set out in the 2012 Price Control Decision)[6]. The approach adopted by ComReg is also consistent with the 2009 Termination Rate Recommendation.

1.4 Mobile termination is a wholesale service provided by an MSP to the subscribers of other networks to terminate voice traffic on its network. A simple illustration is provided below. This terminating service may also have originated from another national or international mobile or fixed operator.

Figure 1: Simple illustration of a mobile originated termination service



1.5 While recognising that Termination Rates were on a downward trend due to NRA intervention, the European Commission was also of the view that they were too high, particularly for calls to mobile phones. The European Commission attributed the divergence between Termination Rate levels to the inconsistent approaches adopted by NRAs and expressed concern that inconsistent regulation would distort competition, impede investment and lead to higher tariffs for end-users. It was envisaged therefore that consistent regulation across the EU would provide legal certainty and a level playing field for all Service Providers.

[5] http://www.comreg.ie/_fileupload/publications/ComReg12124.pdf
[6] http://www.comreg.ie/_fileupload/publications/ComReg12125.pdf

1.6 In summary, the 2009 Termination Rate Recommendation recommends that by the end of 2012, NRAs should mandate symmetric MTRs for MSP. It recommends that such MTRs should be set in accordance with a cost orientation obligation based on the costs of an efficient operator using a bottom-up pure LRIC approach.

1.7 The approach favoured by the European Commission is referred to as a pure LRIC approach i.e. the increment is the wholesale termination service and it excludes a mark up for any common costs which would not be avoided if the wholesale voice call termination service was no longer supplied. In defining the relevant increment as the wholesale voice call termination service provided to third parties, pure LRIC allows for the recovery of all fixed and variable costs which are incremental to the supply of the wholesale voice call termination service, i.e., those costs that are incremental to terminating voice call traffic incoming from other Service Providers. This wholesale voice call termination increment can be calculated by identifying the total long-run cost of a Service Provider providing a full range of services and then identifying the long-run costs of this same Service Provider in the absence of the wholesale call termination service. The latter is then subtracted from the former to calculate the cost of the defined 'pure LRIC' voice call termination increment. ComReg is obliged by virtue of Article 19(2) of the Framework Directive[7], as transposed by Regulation 30(1) of the Framework Regulations[8], to take "utmost account" of the 2009 Termination Rate Recommendation

1.8 MTRs in Ireland are charged by the six MSPs[9] designated with SMP in Market 7[10] (also referred to in this Document as the wholesale MVCT market). The six SMP MSPs are Vodafone Ireland Limited ('**Vodafone**'), Telefónica Ireland Limited ('**O2**'), Meteor Mobile Communications Limited ('**Meteor**'), Hutchison 3G Ireland Limited ('**H3GI**'), Tesco Mobile Ireland Limited ('**TMI**') and Lycamobile Ireland Limited ('**Lycamobile**').

[7] Directive 2002/21/EC on a common regulatory framework for electronic communications networks and services, as amended by Directive 2009/140/EC (the '**Framework Directive'**).
[8] European Communities (Electronic Communications Networks and Services) (Framework) Regulations 2011 (S.I. No. 333 of 2011) (the '**Framework Regulations'**).
[9] Published on 21 November 2012, please refer to the following link: http://www.comreg.ie/_fileupload/publications/ComReg12124.pdf
[10] This corresponds to Market 7 listed in the Annex to the European Commission Recommendation dated 17 December 2007 on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services ('the 2007 Relevant Markets Recommendation').

1.9 The 2012 MVCT Decision imposes a price control obligation of cost orientation on all six MSPs who are designated with SMP pursuant to Regulation 13 of Access Regulations[11], which transposes Article 13 of the Access Directive[12] [13].

1.10 As a result of the 2012 MVCT Decision and after a separate consultation process, ComReg published the 2012 Price Control Decision. In the 2012 Price Control Decision, ComReg chose the pure LRIC approach as the most appropriate means of calculating the appropriate level of cost to be recovered when determining the fee to be charged by all Service Providers. ComReg also committed to building a bottom-up pure LRIC cost model for MTRs. This Consultation Document sets out the parameters for that Draft Bottom-Up Pure LRIC Model ('**Draft BU Pure LRIC Model**').

1.11 On 18 December 2012[14], Vodafone appealed to the High Court against ComReg's 2012 MVCT Decision as well as ComReg's 2012 Price Control Decision ('the **Vodafone Appeal'**). Pursuant to the Vodafone Appeal, the High Court found in part in its judgment of 14 August 2013 (the '**Judgment**') against ComReg, namely, in relation to the issue of benchmarking[15] but postponed any ruling on Vodafone's challenge to the validity of ComReg's choice of pure LRIC as the relevant cost standard, pending the adoption of the model, the subject of this Consultation Document. The Court's Order (the '**Order**') was perfected on 17 October 2013 and an interim maximum MTR of 2.6 cent per minute was imposed[16]. A further statement of reasons for the Judgment was provided by the High Court on 21 November 2013 and the Court explained therein why it had postponed the ruling on pure LRIC. The Court also clarified that the maximum MTR of 2.60 cent per minute imposed in its Order applied from 1 July 2013.[17]

[11] European Communities (Electronic Communications Networks and Services) (Access) Regulations 2011 (S.I. No. 334 of 2011) (the '**Access Regulations'**).
[12] Directive 2002/19/EC of the European Parliament and of the Council of 7 March 2002 on access to, and interconnection of, electronic communications networks and associated facilities, as amended by Directive 2009/140/EC on 25 November 2009 (the '**Access Directive'**).
[13] See also Chapter 3 of the 2012 Price Consultation Document which sets out the previous cost orientation obligations imposed respectively on SMP MSPs.
[14] ComReg Document No 12/139: Information Notice: Appeal of ComReg's Decision on Mobile Termination Rates; published on 20 December 2012.
[15] See ComReg Document No 13/80: Information Notice: High Court Judgement on Mobile Termination Rates; published on 16 August 2013. Please refer to the following link: http://www.comreg.ie/publications/high_court_judgment_on_mobile_termination_rates.583.104434.p.html
[16] ComReg Document No 13/97: Information Notice: High Court Order following its Judgment of 14 August 2013 on Mobile Termination Rates; published on 21 October 2013. Please refer to the following link: http://www.comreg.ie/_fileupload/publications/ComReg1397.pdf
[17] ComReg Document No 13/108: Information Notice: Mobile Termination Rates Case; published on 21 November 2013. Please refer to the following link: http://www.comreg.ie/_fileupload/publications/ComReg13108.pdf

1.12 The High Court has thus held over its decision relating to the choice of pure LRIC as the appropriate methodology until such time as a model is completed by ComReg. This Consultation Document is the preliminary stage to the completion of the model and a Decision on the model is planned for later in the year.

1.13 ComReg has appealed the High Court Order and Judgment to the Supreme Court.[18]

1.14 ComReg's process to date has been as follows. ComReg made contact with each of the six SMP MSPs and issued a draft data request to each of them on June 10th, 2013. Following engagement with the MSPs the data request was refined and finalised, taking account of feedback received, before being issued to each of the six SMP MSPs as a legally binding data request on July 9th, 2013. A two month time frame for completion was provided for, which was subsequently extended by two weeks at the request of industry (from September 9th, 2013 until September 23rd, 2013). Following the submission of data, ComReg issued each of the six SMP MSPs with an initial draft version of a BU Pure LRIC Model in addition to a draft MTR Model Specification Document[19] on December 19th, 2013. The six SMP MSPs were invited to attend a group workshop held by ComReg on January 20th, 2014, at which each of the six MSPs had representatives present. This was followed by an invitation from ComReg to hold bilateral workshops. Two SMP MSPs availed of this opportunity on January 20th and January 21st. Feedback to queries raised at both the group workshop and bilateral workshops were sent by ComReg to each of the six SMP MSPs. During this process, data received from operators was treated in complete confidence and the relevant MSPs indicated that confidential data should be treated accordingly and not divulged as part of the consultation process, or otherwise.

The Draft BU Pure LRIC Model is guided by actual operator data where this was made available by operators. As described below, ComReg's own estimates were used where operator data was not available.

[18] ComReg Document No 13/99: Information Notice: Supreme Court Appeal – Mobile Termination Rates Case; published on 6 November 2013. Please refer to the following link: http://www.comreg.ie/_fileupload/publications/ComReg1399.pdf

[19] "*The Draft MTR Model Specification Document for Ireland – A Draft Consultation Report for ComReg"* provides a description of the proposed approach to construct a BU pure LRIC MTR model for Ireland.

1.15 Where operator data was available for use it was important to maintain its confidentiality while at the same time maximising transparency. ComReg has overcome this issue by providing each of the six MSPs with a non-confidential Draft BU Pure LRIC Model that contains anonymised operator data (i.e. indicative numbers which are not reflective of any particular operator and which cannot be traced to any operator) in such instances where the modelled hypothetical efficient operator data is guided by actual operator data[20]. The non-confidential Draft BU Pure LRIC Model is provided only to the six SMP MSPs and is for illustrative purposes only as it contains anonymised figures that differ in certain instances (i.e. capital costs) from ComReg's confidential Draft BU Pure LRIC Model.

1.16 While the Draft BU Pure LRIC Model is a bottom-up model of a hypothetical efficient mobile operator and, therefore, is not intended to mirror the costs of a specific Irish operator, it has been based on data provided by the Irish MSPs using a modified scorched node methodology. This allows for the modelling of efficient costs and scale, whilst at the same time enabling costs and technology assumptions to be closely aligned with those actually faced by the mobile network operators ('**MNOs**') currently in the Irish market.

1.17 Where operator data was used in this way the inputs to the Draft BU Pure LRIC Model as currently proposed are in all cases within the range of the upper and lower bounds of the actual data provided by the Irish MSPs[21].

1.18 As noted above, in some cases operator data is not currently available; in others it is incomplete or insufficiently granular for the purposes of the Draft BU Pure LRIC Model. Where data is absent, unavailable or incomplete, it has been necessary for ComReg and its advisers to exercise complex judgements as well as an understanding of the relevant inputs and costs associated with them. Where appropriate, such judgement has also been exercised in the light of experience in other jurisdictions. In this paper ComReg provides a further opportunity for operators and interested parties to provide their own estimates of relevant cost inputs.

1.19 The key parameters of the Draft BU Pure LRIC Model are the subject of this Consultation Document.

- **Chapter 2: Executive Summary**: This section summarises the main points of the Consultation Document and ComReg's overall objectives.

[20] The non-confidential Draft BU Pure LRIC Model has been provided to each of the six MSPs with SMP on the same date of publication of this Consultation Document.
[21] However, the inputs to the illustrative model may not necessarily fall within this range due to data being anonymised for the purposes of the illustrative non-confidential Draft BU Pure LRIC Model.

- **Chapter 3**: **Costing Methodology and Draft BU Pure LRIC Model**: This Chapter is divided into three key sections.
    - The first section details the **operator- and service-specific parameters** of the Draft BU Pure LRIC Model including the form of the **modelled** operator and the market share and demand and traffic modelling assumptions.
    - The second section examines the **technological-related parameters** of the Draft BU Pure LRIC Model including the geotypes, network nodes, coverage, radio technology standards, cost and treatment of spectrum and network dimensioning.
    - The third section sets out the **implementation-related parameters** of the Draft BU Pure LRIC Model including the use of economic depreciation, the pure LRIC calculation and the relevant increment, cost trends and mark ups.
- **Chapter 4: Draft BU Pure LRIC Model Results:** This Chapter looks at the pure LRIC calculation, the draft model results and the notification procedures.
- **Annex 1** of this Consultation Document contains the draft Decision Instrument.
- **Annex 2** of this Consultation Document explains the legal basis for ComReg's decisions.
- **Annex 3** of this Consultation Document contains the Deloitte report titled "*MTR Model Specification Document for Ireland – A Draft for Consultation Report for ComReg 10 April 2014"* ('**Deloitte Model Specification Document**').[22]

[22] Deloitte: MTR Model Specification Document for Ireland – A Report for ComReg appended to this Consultation Document at Annex 3.

Chapter 2

2 Executive Summary

Background

2.1 This Consultation Document sets out the proposed maximum MTRs that the six MSPs designated with SMP in the MVCT market in Ireland should charge for wholesale voice call termination services. Termination Rates are the tariffs charged between Service Providers for terminating phone calls (from a fixed or mobile phone) on their networks. The 2009 Termination Rate Recommendation defined wholesale voice call termination as "*the service required in order to terminate calls to ....subscribers (in mobile networks*)" and recommended that the price for this service should be derived using *"a pure LRIC approach whereby the relevant increment is the wholesale call termination service and which includes only avoidable costs*." ComReg is obliged to take utmost account of the Recommendation pursuant to Regulation 31(1) of the Framework Regulations, which transposes Article 19 of the Framework Directive. ComReg has built a Draft BU Pure LRIC Model in line with the pure LRIC methodology described and evaluated in the 2012 Price Control Decision.

2.2 As outlined in paragraph 1.11, on 18 December 2012[23], Vodafone appealed to the High Court against ComReg's 2012 MVCT Decision as well as ComReg's 2012 Price Control Decision. The High Court held over its decision relating to the choice of pure LRIC as the appropriate methodology in the 2012 Price Control Decision until such time as a model is completed by ComReg[24]. This Consultation Document is the preliminary stage to the completion of a BU Pure LRIC Model for Ireland and a Decision is planned for later in the year.

2.3 The Draft BU Pure LRIC Model calculates the maximum MTR for Ireland on an annual basis. The draft MTRs based on the Draft BU Pure LRIC Model for 2014 – 2017 are listed below:

a. 0.64 Euro cent per minute for 2014,

b. 0.60 Euro cent per minute for 2015;

c. 0.57 Euro cent per minute for 2016; and

[23] ComReg Document No 12/139: Information Notice: Appeal of ComReg's Decision on Mobile Termination Rates; published on 20 December 2012.

[24] Note that the High Court Judgment is itself the subject of an appeal to the Supreme Court – please see ComReg Document No 13/99: Information Notice: Supreme Court Appeal – Mobile Termination Rates Case; published on 6 November 2013: http://www.comreg.ie/_fileupload/publications/ComReg1399.pdf

d. 0.53 Euro cent per minute for 2017.

2.4 The average MTR for the price control period (i.e. 2015 to 2017) is 0.57 Euro cent per minute, based on the weighted[25] average for 2015, 2016 and 2017. ComReg is of the preliminary view that 0.57 Euro cent per minute should be the maximum MTR for Ireland over the period of the price control and until such time as the next review is in place (as noted in the draft Decision Instrument in Annex 1 to this Consultation Document).

2.5 The aim of this Consultation Document is to set out the key parameters and methodologies considered by ComReg and its advisors in building a Draft BU Pure LRIC Model to calculate the most appropriate MTR for Ireland. This Consultation Document sets out ComReg's preliminary views in relation to each of the key parameters.

Key parameters

2.6 ComReg has divided the key parameters into:

- **operator-related parameters** – including the form of the modelled operator (hypothetical efficient), structural implementation (bottom-up model using scorched node approach reflecting actual operator data) and market share assumptions;
- **service-related parameters** – including the size of the market, the scale of the operator, traffic forecasts, operator traffic load and definition of the increment;
- **technology-related parameters** – including the scale of the coverage network, technology standards, degree of network sharing, use of spectrum, logical network structure, network design parameters, unit costs and price indices;
- **implementation-related parameters** – Draft BU Pure LRIC Model structure, asset lives, time frame of the Draft BU Pure LRIC Model, calculation of pure LRIC, economic depreciation methodology and the cost of capital, which in ComReg's preliminary view should be estimated on the basis of a Weighted Average Cost of Capital ('**WACC'**) using the Capital Asset Pricing Model ('**CAPM**') methodology. It is important to note that the cost of capital allows an operator a reasonable rate of return pursuant to Regulation 13(2) of the Access Regulations.

[25] Weightings are based on the wholesale termination call volumes forecasted for each year.

BU pure LRIC approach

2.7 A key objective for ComReg in developing a BU Pure LRIC Model for the Irish market is to calculate a MTR that allows for the recovery of the level of costs that would be efficiently incurred by a **MNO** in the Irish market which offers wholesale termination services over the lifetime of the price control. The form that the modelled operator takes is therefore an important conceptual aspect of the model design.

2.8 The Draft BU Pure LRIC Model has been developed on the basis of a hypothetical efficient existing operator in an Irish context. Regulation 13(3) of the Access Regulations specifies that ComReg should ensure that *"…any cost recovery mechanism or pricing methodology that it imposes under this Regulation serves to promote efficiency and sustainable competition and maximise consumer benefits."* This approach in this Consultation Document is also consistent with models developed by other European NRAs.

2.9 While the Draft BU Pure LRIC Model is a bottom-up model of a hypothetical efficient mobile operator and, therefore, is not intended to mirror the costs of a specific Irish MSP, it has been based on data provided by the Irish MSPs using a modified scorched node methodology. This allows for the modelling of efficient costs and scale, whilst at the same time enabling costs and technology assumptions to be closely aligned with those actually faced by the MSPs currently in the Irish market.

2.10 In developing the Draft BU Pure LRIC Model, ComReg has considered operator data from each of the six SMP MSP submissions and ensured that the model inputs actually used have adequately taken account of actual costs provided by operators after being adjusted for efficiencies. In some cases data is lacking entirely; in others it is incomplete or insufficiently granular for the purposes of the Draft BU Pure LRIC Model. Where data is absent, unavailable or incomplete, it has been necessary for ComReg and its advisers to exercise complex judgements as well as an understanding of the relevant inputs and costs associated with them. Where appropriate, such judgement has also been exercised in the light of experience in other jurisdictions.

2.11 The service demand volumes included in the Draft BU Pure LRIC Model are based on information provided by the six SMP MSPs currently active in the Irish market. This information is combined with population trends and mobile penetration statistics to derive historical and forecast traffic demands for all the various voice, message and data services to ensure that the modelled network is dimensioned with reference to all the traffic that is carried on Irish mobile networks.

Market share

2.12 The market share assumed for the hypothetical efficient operator is an important design principle as this determines the share of each traffic service that the hypothetical operator's network will be expected to carry.

2.13 Based on the Irish market at the beginning of 2014, this approach implies a 25% market share based on a market comprising six MSPs but only four MNOs. However, in its market share assessment, ComReg has also been cognisant that H3GI has made an offer to acquire O2, which could potentially reduce the number of MNOs in Ireland from four to three at a future date. Considerable uncertainty exists in this regard, not least because the transaction is subject to regulatory approval by the European Commission.

2.14 ComReg's assumption of a 25% market share in this Consultation Document is based on conditions at the time of writing. However, depending on the responses to this Consultation Document and the outcome of the proposed H3GI/O2 acquisition, ComReg will consider alternative market share assumptions. These include modelling a 33% market share from year 1 of the price control period on the basis of the H3GI/O2 merger proceeding or, alternatively, setting the MTR based on an initial 25% market share that evolves to a 33% market share over the period of the price control.

2.15 Increasing the assumed market share results in the traffic load of the modelled operator increasing, with consequent increases in the quantity and cost of network equipment. The spectrum holdings of the modelled operator would also increase in line with the market share assumption. ComReg has modelled both market share scenarios and estimated that the MTR would be marginally lower if the market share is assumed to be 33% rather than 25%.

Network technologies

2.16 The hypothetically efficient existing operator[26] is assumed to deploy both 2G and 3G technologies in its Radio Access Network ('**RAN**') and an all IP core[27]. ComReg considers that these technology standards comply with the Modern Equivalent Asset ('**MEA**') methodology for Irish MSPs and are consistent with international best practice and the 2009 Termination Rate Recommendation.

[26] Section 4.41 of this Consultation Document defines a hypothetical efficient existing operator as a hypothetical operator, who is assumed to have entered the Irish market and deployed its network in 2003, and to have since acquired its hypothetical market share.
[27] An all IP core refers to the transformation of formerly telephone-centric networks toward Next Generation Network ('NGN').

2.17 Long Term Evolution or 4G ('**LTE'**) technologies are still in the early years of deployment in Ireland and are assumed to be exclusively used for data during the time period of this price control. As the Draft BU Pure LRIC Model is focused on the cost of voice services, and with the experience from other jurisdictions indicating that the inclusion of LTE in a BU model does not impact the pure LRIC for MVCT, the model does not explicitly include LTE as a radio technology.

2.18 However, LTE traffic is implicitly considered in the Draft BU Pure LRIC Model by capping the volume of data carried over 2G and 3G in future years.

Spectrum

2.19 The spectrum holding is based on an average of Irish operator holdings and aligns with the assumed market share of the hypothetical existing operator. However, LTE network elements are not explicitly modelled, and while re-farming of some spectrum currently used for 2G is accounted for, bands dedicated to LTE are not included in the Draft BU Pure LRIC Model.

2.20 For modelling purposes, spectrum is treated as a fixed cost and only network equipment/infrastructure is allowed to vary in response to changes in traffic loads. This approach has also been adopted in bottom-up models developed in other jurisdictions on the principle that, for an efficient network operator, there is a trade-off between the opportunity costs of spectrum and additional network roll out.

Network sharing

2.21 The Draft BU Pure LRIC Model assumes some passive network sharing, where operators can share sites and the passive elements on sites such as the physical space and radio masts. However, active sharing, where operators agree to share active network elements in the RAN, is assumed not to take place.

2.22 While there is evidence of Irish MSPs entering into active sharing agreements, the Draft BU Pure LRIC Model is developed on the basis of a hypothetical efficient operator that has achieved significant market share. As such an operator would be less likely to enter into an active network sharing agreement, ComReg considers that it is reasonable to assume passive network sharing and no active network sharing.

Network dimensioning

2.23 An overview of the logical network structure for the modelled hypothetical efficient operator is presented in section 3.7.13 of this Consultation Document and further detail on the network structure and related network dimensioning rules can be found of in section 5 of the Deloitte Model Specification Document appended to this Consultation Document.

2.24 The dimensioning rules are a major factor in determining the extent to which the costs of each network element will be modelled as being avoidable in the context of the pure LRIC calculation. Avoidable costs are defined as only those costs that would not be incurred if the service in question (i.e. wholesale voice call termination) were no longer provided.

2.25 A review of the results of the Draft BU Pure LRIC Model indicates that the avoided costs relate to RAN network elements, including sites, equipment and the associated backhaul transmission links. No core network element costs or core transmission costs prove to be avoidable.

2.26 Common costs are defined as costs which are not directly attributable to specific services. Costs that arise from more than one increment are common or joint. The Draft BU Pure LRIC Model assumes that the costs arising from the following network elements are common with respect to the relevant increment (see section 3.6.4):

- signalling platform;
- number portability platform;
- spectrum fees; and
- wholesale billing platform.

Asset lives and the time period of the model

2.27 The asset lives used in the Draft BU Pure LRIC Model are intended to reflect the economic life of the network assets and so may differ from the statutory asset lives adopted by MNOs in their financial accounts. However, the proposed asset lives have been sense checked against the operator-provided data and those adopted in other bottom-up MTR models.

2.28 The Draft BU Pure LRIC Model covers a 30 year time period from 2003 (when the hypothetical efficient mobile operator in an Irish context is assumed to begin network roll out) to 2032. The Draft BU Pure LRIC Model commences in 2003 to reflect a pivotal time period in the Irish mobile sector when the existing MNOs would either have commenced network roll out or initiated major network upgrades. This period also coincides with a time in which Irish operators commenced rolling out 3G networks and services. This commencement date is also aligned to feedback from Irish MSPs.

2.29 The choice of a 30 year time period is in line with the time frames adopted in other European NRA models. The time periods covered by BU models of mobile networks tend to be significantly longer than the asset lives of the modelled network assets. The time period is also sufficiently long that by discounting the future years' costs and traffic, extending the time horizon further would have a negligible effect on current costs.

Network costs and economic depreciation

2.30 Where possible, the 2013 network unit costs are based on values submitted by the Irish MSPs. However, the Draft BU Pure LRIC Model estimates the network element requirements and consequent equipment purchasing profiles over a 30 year period. Therefore, it is necessary to identify an appropriate unit cost for each year of the Draft BU Pure LRIC Model and this is achieved by applying a series of capex and opex price indices to the 2013 values of the various network elements.

2.31 These indices reflect the implied price change for the MEA of each network element and are based on indices observed in BU LRIC models developed by other European NRAs.

2.32 Economic depreciation is used in the Draft BU Pure LRIC Model to ensure that the Pure LRIC for MVCT will represent the economic value of the network resources that the hypothetically efficient operator could avoid if it didn't have to provide MVCT. This approach considers service volumes and costs across the lifetime of the Draft BU Pure LRIC Model to ensure that the operator is able to recover all relevant costs in an economically efficient manner. In effect, this means that costs are depreciated more when the network and its elements are used more intensively and vice versa.

2.33 The economic depreciation algorithm assumes that the present values of expenditures equates to the present value of revenues over the time horizon of the Draft BU Pure LRIC Model. It does this by considering not just the trends in operating and capital expenditure associated with the assets, but also the levels of economic output that can be generated by those assets over the time horizon of the Draft BU Pure LRIC Model. This methodology therefore better aligns the attribution of cost over time in line with the usage of the network, particularly in the presence of large scale up-front investment in anticipation of future capacity needs.

2.34 ComReg consider that this method is appropriate as mobile networks are capital-intensive enterprises that continue to be subject to significant changes in asset prices and which are expected to experience considerable growth in service demand throughout the 30 year period of the Draft BU Pure LRIC Model. While data services in particular are expected to grow significantly in future years, it is assumed that future data growth will be carried on an LTE network, a service which is not considered as part of the Draft BU Pure LRIC Model. Conversely, 2G and 3G service volumes are projected to be more stable as the time period of the Draft BU Pure LRIC Model advances and this is related to LTE picking up much of the growth in data services.

2.35 The cost of capital in the form of a preliminary nominal pre-tax WACC proposed to be used in the Draft BU Pure LRIC Model is 8.66% on the basis of a separate ComReg Consultation Document published on April 11th, 2014 please see ComReg Document No. 14/28 entitled “Review of Cost of Capital”. The underlying rationale is that this provides mobile operators with a reasonable rate of return on investment. If this figure changes as a result of that consultation, the final BU Pure LRIC Model will be updated accordingly.

2.36 In summary, this Consultation Document sets out ComReg’s preliminary views in relation to the maximum MTR that MSPs should charge. It also explains the key parameters to build the BU Pure LRIC Model that calculates the maximum MTR proposed by ComReg.

Chapter 3

3 Costing Methodology and Draft BU Pure LRIC Model

3.1 Overview

3.1 This section details the cost methodology approach and key modelling parameters that are considered in determining MTRs in the Irish telecommunications market.

3.2 The MTR draft modelling process

3.2 In the second half of 2013, ComReg commenced the process of building a Draft BU Pure LRIC Model to set MTRs. ComReg, in its 2012 Price Control Decision and its preceding 2012 Price Control Consultation, set out the five possible regulatory approaches[28] that were considered by ComReg to set MTRs; the assessment criteria used by ComReg to evaluate these five different approaches; and ultimately the evaluation of the five approaches considered using the assessment criteria set out. ComReg's ultimate conclusion in the 2012 Price Control Decision was that MTRs should be based on a cost orientation obligation using a Pure LRIC cost methodology.

3.3 The objective of the Draft BU Pure LRIC Model is to establish the unit cost for voice termination of an efficient Irish MNO rather than operator-specific unit costs. The Irish MNOs have informed the values of the input parameters and the network dimensioning rules for the hypothetical efficient operator but they did not decide them.

3.4 In this Consultation Document, ComReg is describing the tool that it proposes will be used to calculate MTRs using the methodology chosen in the 2012 Price Control Decision and its preceding 2012 Price Control Consultation, namely Pure LRIC.

[28] The five regulatory approaches set out in the 2012 Price Control Consultation and Decision were 'no price control' approach, 'fair and reasonable' approach, 'bill & keep' approach, 'receiving party pays' approach and 'cost orientation'.

3.5 ComReg engaged external advisors, Deloitte LLP ('Deloitte'), to assist in building this Draft BU Pure LRIC Model. As part of the Draft BU Pure LRIC Model building process, ComReg engaged directly with the six MSPs that were designated with SMP as part of the MVCT market. This process of engagement included, amongst other engagement, extensive data requests, e-mails, the sharing of a Draft BU Pure LRIC Model with the six SMP MSPs, workshops and bilateral meetings.

3.6 Please refer to the remainder of this Chapter for ComReg's preliminary views in relation to the key parameters of the Draft BU Pure LRIC Model. Please refer also to Deloitte Model Specification Document appended to this Consultation Document at Annex 3.

3.3 Costing methodology approach

3.7 Pursuant to the 2012 MVCT Decision, ComReg imposed a cost orientation obligation on six MSPs (including TMI and Lycamobile). In the 2012 Price Control Decision, ComReg also adopted an approach of setting symmetric Termination Rates across Service Providers providing the same service (i.e., either fixed voice call termination ('**FVCT**') or MVCT respectively).[29]

3.8 The prices charged by the six SMP MSPs to any undertaking for wholesale mobile termination services are to be calculated using a pricing model based on LRIC. It should be noted that the LRIC approach chosen in the 2012 Price Control Decision does not allow for the recovery of fixed and common costs (that is, a Pure LRIC approach). This Pure LRIC approach determines that only the avoidable costs of the wholesale voice call termination service are recovered from the wholesale Termination Rate.

3.9 As decided in the 2012 Price Control Decision, Termination Rates set on the basis of a Pure LRIC approach are most appropriate at the current stage of market development.[30] ComReg also considered other, more expansive cost orientation approaches such as LRAIC, LRIC+ or LRAIC+ (collectively referred to as LR(A)IC+ approaches). These costing approaches take a broader interpretation of incremental costs than simply accounting for the wholesale voice call termination service by including what are by definition non-incremental, or non-avoidable costs, through an explicit mark-up or by considering a larger 'average' traffic increment.

[29] 2012 Price Control Decision, see Annex 1 and 2.
[30] 2012 Price Control Decision, see Chapters 2, 4, 5 and 6.

3.10 Setting Termination Rates on the basis of any of the LR(A)IC+ approaches would result in higher rates compared to under a Pure LRIC approach as they include an element of additional costs that are common or shared with other services.

3.11 ComReg's 2012 Price Control Decision established that a Pure LRIC approach is the most appropriate approach to setting Termination Rates in the Irish telecommunications market.

3.12 This choice of methodology is consistent with that of the European Commission in its 2009 Termination Rate Recommendation. It is also consistent with recent regulatory precedent in other EU Member States, as well as with recent comments issued by the European Commission via letters to other NRAs pursuant to Article 7 of the Framework Directive, and recent BEREC opinions.[31]

3.13 The inclusion of the cost of capital in the Draft BU Pure LRIC Model, ensures mobile operators receive a reasonable rate of return.

3.4 Appropriate cost model

3.14 The intention in developing a Draft BU Pure LRIC Model is to identify the incremental costs a mobile operator would avoid if it did not have to provide wholesale MVCT services in Ireland, i.e., the costs of a full mobile network (providing all services) minus the costs of a mobile network providing all services except wholesale MVCT.

3.15 The costs of wholesale MVCT cannot be considered to be independent of associated service provisions due to the large number of network elements required to support MVCT, which are also used by other services.

3.16 The modelled network under the Pure LRIC approach therefore assumes that a range of voice and data services are provided. The Draft BU Pure LRIC Model is dimensioned accordingly using data that is based upon information provided by the six SMP MSPs as part of a data gathering process conducted by ComReg in 2013.

3.17 When developing a Draft BU Pure LRIC Model for the purpose of setting MTRs a number of key parameters need to be taken into consideration. These can be grouped into the following categories:

[31] As of Q1 2014, there are 12 European Member States that set MTRs on the basis of a BU Pure LRIC Methodology, not including Ireland and Greece who intend on adopting this approach. The 12 Member States are as follows: Belgium, Czech Republic, Denmark, France, Italy, Malta, Poland, Portugal, Romania, Spain, Sweden and the United Kingdom. Further information on methodology applies http://stakeholders.ofcom.org.uk/binaries/consultations/mobilecallterm/MCT_slides.pdf Further information on European Commission letters: http://europa.eu/rapid/search-result.htm?locale=EN

- operator-related;
- service-related;
- technology-related; and
- implementation-related.

Each of these is explored in more detail in the following sections.

3.5 Operator-related parameters

3.5.1 Form of the modelled operator

3.18 A key objective for ComReg in developing a mobile operator Draft BU Pure LRIC Model for the Irish market is to calculate a MTR that allows for the recovery of the costs that would be efficiently incurred by an MNO in the Irish market which offers wholesale termination services over the lifetime of the price control. The form that the modelled operator takes is therefore an important conceptual aspect of the Draft BU Pure LRIC Model design, which can have a significant impact on the estimated cost profile.

3.19 There are four main choices in choosing an operator to be modelled as outlined below:

- ***Actual operator****:* the pure LRIC costs of an actual operator in the Irish market would be calculated and the MTR set accordingly;
- ***Average operator****:* under this approach, the Draft BU Pure LRIC Model parameters would be based on the averages of the volumes, costs and other inputs of actual operators;
- ***Hypothetical efficient new entrant****:* the pure LRIC costs of a hypothetical operator entering the market in 2013, deploying a network using today's modern technology and network architecture, would be calculated; and
- ***Hypothetical efficient existing operator****:* Calculation of the pure LRIC costs of a hypothetical operator, who is assumed to have entered the Irish market and deployed its network in 2003, and to have since acquired its hypothetical market share (discussed below).

3.20 Modelling an actual operator does not appear appropriate as this would require separate calculations for each of the four MNOs and it would be difficult to ensure consistency in the modelling principles applied to each MNO. The objective of the Draft BU Pure LRIC Model is not to identify operator-specific costs. Rather it is to establish the cost for MVCT of an efficient MNO operating in an Irish context so as to derive a maximum symmetric MTR that can be applied to all Irish MSPs.

3.21 Moreover, modelling an actual operator would not ensure that only efficiently incurred costs are included and ComReg believes that MTRs should only recover the efficient cost of providing wholesale MVCT services so as to minimise the scope for competitive distortions in the marketplace. In addition, the inclusion of inefficient costs would not be consistent with the 2009 Termination Rate Recommendation, which proposes:

"An incremental cost approach which allocates only efficiently incurred costs..."[32]

3.22 For similar reasons, the average operator approach is also not considered appropriate.

3.23 Modelling a hypothetical efficient new entrant would require an assumption about the most efficient technology that would be adopted by a new operator rolling out its network today (for example, it could be assumed that a new operator would not invest in 3G technology, but rather in LTE technology only.

3.24 This might however lead to network design and technology assumptions that are very different from those of the operators currently in the market. This, in turn, would lead to costs being significantly different from those actually incurred by the operators. Therefore, this approach has not been adopted in the Draft BU Pure LRIC Model.

3.25 For the reasons set out above, the Draft BU Pure LRIC Model has been designed assuming a hypothetical efficient existing operator in an Irish context. This approach is broadly consistent with models developed by other NRAs in the EU.[33] It allows for the modelling of efficient costs and scale, whilst at the same time enabling costs and technology assumptions to be closely aligned with those actually faced by the operators currently in the Irish market. It also allows for a reasonable rate of return on efficiently incurred costs by including the cost of capital in the Draft BU Pure LRIC Model.

[32] 2009 Termination Rate Recommendation, Recital 13.

[33] The Portuguese Regulator ANACOM based its cost model on a hypothetical existing operator. It justified this choice on the basis that it "*enables the model to determine a cost consistent with the existing suppliers of mobile termination in Portugal, such that actual network characteristics over recent time can be taken into account*":
http://www.anacom.pt/streaming/ConceptualApproachMobileBU_LRICmodel.pdf?contentId=1079788&field=ATTACHED_FILE
Ofcom specified a hypothetical average efficient operator in 2011:
http://stakeholders.ofcom.org.uk/binaries/consultations/mtr/statement/MCT_statement_Annex_6-10.pdf

3.5.2 Structural implementation

3.26 Cost models developed for regulatory purposes can be constructed using top-down ('TD') or bottom-up ('BU') modelling approaches. Ofcom has described the general differences in both approaches as follows: "*In a top-down approach, relationships between outputs and costs are estimated from historical accounting information, and costs are projected forward on the basis of output forecasts. In a bottom-up approach, the components of cost are identified at a more granular level. Cost causation relationships are then defined to link the quantity of each of these cost components with output and other cost drivers, based on practical and theoretical evidence*.[34]"

3.27 As previously noted in ComReg's 2012 Price Control Consultation Document a TD model is not appropriate[35] when modelling the costs of a hypothetically efficient operator, as TD models can contain inefficient costs and other legacy issues and so do not necessarily represent the best modelling approach to determine the costs of an efficient operator in a regulatory context.

3.28 A main disadvantage of a TD model is that there may be insufficient detail available within the actual operator accounts[36] to separate out the relevant costs down to unit costs and there would be inconsistent data inputs across operators, in terms of the level of detail of data, the dimensions and the data structure.

3.29 Direct use of operator inputs would also lead to asymmetric costs with a unique cost attributable to each operator whereas the approach favoured in the 2009 Termination Rate Recommendation and chosen by ComReg in the 2012 Price Control Decision would mandate a symmetric rate for MTRs. The direct use of operator data, whether as an average or for each operator, also runs the risk of internalising operator inefficiencies into the cost calculations.

3.30 A BU model can more readily be constructed to reflect the choices of a hypothetically efficient operator from both a technical and an operational point of view when compared to a TD model.

[34] Please refer to section A7.1 in http://stakeholders.ofcom.org.uk/binaries/consultations/mtr/statement/MCT_statement_Annex_6-10.pdf

[35] Please refer to Chapter 4, section 4.3.6 and the related report appended from Analysys Mason and published on Comreg's website at http://www.comreg.ie/_fileupload/publications/ComReg1267a.pdf

[36] Regulatory cost accounting obligations have not been imposed on MSPs and there is no requirement for MSPs to maintain a cost accounting system capable of supporting regulatory cost models.

3.31 A BU model is a data intensive process of dimensioning the network assets under the assumption that the network was built to reflect the profiles of network deployment, subscriber take up and service demand – each of which are assumed to be achieved by the hypothetical efficient operator.

3.32 There is an associated risk however that some of the assumptions adopted in a BU model may prove to be unrealistic for an actual operator to achieve. For this reason, the 2009 Termination Rate Recommendation notes that:

"Given the fact that a bottom-up model is based largely on derived data.., regulators may wish to reconcile the results of a bottom-up model with the results of a top-down model in order to produce as robust results as possible and to avoid large discrepancies in operating cost, capital cost and cost allocation between a hypothetical and a real operator."[37]

3.33 However, mobile operators, unlike some incumbent fixed network operators, do not produce TD LRIC models so it is not possible to reconcile the results of a BU model for Irish mobile operators with the results of an equivalent TD model. ComReg has addressed this issue by constructing a Draft BU Pure LRIC Model based on information sourced from actual operators in the Irish market. Such information includes:

- demand, e.g. subscriber usage, traffic by geotype, busy hour profile;
- network design e.g. cell radii, mix of backhaul technologies, planned element utilisation values; and
- cost e.g. unit capex, asset lives.

3.34 Certain key outputs of the Draft BU Pure LRIC Model are subsequently calibrated with reference to the network and financial data of an actual operator(s). The Draft BU Pure LRIC Model calibration exercise, for example, compares the number of radio sites deployed by existing operators with the equivalent number estimated in the Draft BU Pure LRIC Model. Deloitte has included a comparison of the quantity of network elements dimensioned in the full traffic scenario in the Draft BU Pure LRIC Model with the equivalent figures provided by the Irish mobile operators in section 5.7 of the Deloitte MTR Model Specification document. A comparison of the aggregate financial costs in the Draft BU Pure LRIC Model has also been made with operator aggregate financial data and this is contained in section 6.1.1 of the [confidential version of the] same document.

3.5.3 Market share

3.35 The market share assumed for the hypothetical efficient operator is an important design principle as this determines the share of each traffic service that the hypothetical operator's network will be expected to carry.

[37] 2009 Termination Rate Recommendation, Recital 11.

3.36 The 2009 Termination Rate Recommendation states that the minimum efficient scale that can be assumed in the BU LRIC model is 20% and while it does not indicate a maximum market share, it accepts that Member States may deviate from the minimum efficient scale[38]. The Draft BU Pure LRIC Model developed for Ireland uses a "1/N" approach where N is the number of mobile network operators[39].

3.37 Based on four MNOs in the Irish market at the beginning of 2014, this approach implies a 25% market share. However, H3GI has made an offer to acquire O2, which could potentially reduce the number of MNOs to three in the future. Such a reduction would increase the market share of the hypothetical efficient mobile operator to 33.3%, in accordance with the 1/N methodology.

3.38 The decision of the European Commission regarding this proposed acquisition is expected later this year. In the event that the H3GI/O2 merger proceeds, it is probable that it will be a number of years before the two existing networks would be fully integrated. Therefore in the event that the merger is approved, the number of active mobile networks could justifiably be regarded as four for a considerable duration of the proposed price control period (2015-2017) which is proposed to be reviewed after 3 years in any event.

3.39 There is also the possibility that the European Commission may approve the H3GI/O2 merger on the basis that an element of the spectrum held by the merged entity is made available to allow another MNO to enter the market with the intention of retaining four competing MNOs in the market.

3.40 For these reasons, ComReg is of the preliminary view that maintaining a 25% market share on the basis of four competing network operators for the duration of the proposed price control period (2015-2017) may be a reasonable approach.

3.41 This approach to determining the appropriate market share of the efficient scale operator is broadly consistent with that adopted in other jurisdictions. The Dutch regulator ACM (formerly OPTA) recently modelled an efficient scale operator with a 33% market share on the basis of a 1/N approach and noted that:

- the Belgian regulator assumes a 33% market share for the modelled hypothetical operator;

[38] Minimum efficient scale is the point in the average total cost curve beyond which no significant economies of scale can be achieved, i.e., the minimum level of output at which average total costs are minimised. This measure is a widely used starting point for assumed efficient size based on a number of network operators active in the territory.
[39] This approach is consistent with the methodology applied by other European NRAs such as Ofcom in the United Kingdom and ACM (formerly OPTA) in the Netherlands.

- the Danish regulator has assumed a 33% market share at the radio layer and a 25% market share at the core (following the announcement of a joint venture in 2011 by Telenor and Telia);
- the Swedish regulator has assumed a 50% market share for the modelled GSM network, a 41% market share for the modelled UMTS network, and a 33% market share for the modelled LTE network (due to the various joint ventures operating in the country).[40]

3.42 The hypothetical efficient operator is assumed to have entered the market in 2003 (see paragraph 2.28) and to have reached the market share associated with minimum efficient scale within three to four years of entry, which is in line with 2009 Termination Rate Recommendation. The assumed progression of market share, which is a preliminary view of ComReg based on four mobile network operators, is presented in the table below[41.]

Table 1: Market share assumptions

	2003	2004	2005	2006	2007	2008	…	2032
Market share	0%	3.5%	12.5%	21.5	25%	25%	…	25%

Source: Table 6, page 22, Deloitte Model Specification Document.

3.43 ComReg has carried out further analysis on market share assumptions to consider three additional scenarios (presented in paragraphs 3.45 and 3.46 below) whereby the proposed H3GI/O2 merger proceeds and the number of mobile network operators in the Irish market is reduced from four to three.

3.44 Adjusting market share assumptions in the Draft BU Pure LRIC Model is not straightforward. Total annual mobile traffic and volume trends of per subscriber usage is based on the assumed market share composition which in turn impacts on network load parameters which support network dimensioning. Network coverage is also based on operator input data, pro-rated for the market share assumption. Similarly, the hypothetical existing operator's assumed spectrum holding is based on an average of operator holdings and aligns with its assumed market share.

3.45 As discussed, ComReg is of the preliminary view that it is reasonable to set the market share at 25% for the purposes of this Consultation, given the information available in the Draft BU Pure LRIC Model on the basis of the four existing MNOs. However, ComReg has also modelled a hypothetical efficient operator with a 33% market on the basis that the H3GI/O2 merger proceeds and the consultation responses favour an MTR based on a long-run efficient operator in a market comprising three MNOs.

[40] Analysys Mason: 2012 update of OPTA's fixed and mobile BU LRIC models, page 13.
[41] 2009 Termination Rates Recommendation, Recital 17.

3.46 Consequently it is possible to set the MTR on the basis of a scenario whereby the hypothetical efficient mobile operator has a 33% market share from the beginning of the price control period, or a market share that evolves from 25% to 33% over the period of the proposed price control and then remains constant at 33% until the end of the Draft BU Pure LRIC Model time frame. The pure LRIC results of the Draft BU Pure LRIC Model for both the 25% and 33% market share assumptions are presented for consideration in Chapter 4.

ComReg's Preliminary View

3.47 The hypothetical efficient existing operator, and associated network, in the Draft BU Pure LRIC Model is based on the following parameters:

- a BU model for a hypothetical efficient existing operator having entered the market in 2003 (see paragraph 2.28) and reached a stable market share of 25% since 2007;
- demand and cost data, which has been sourced from the actual MSPs active in the Irish market; and
- similar network design principles to the Irish mobile network operators.

Q. 1 Do you agree with ComReg's preliminary views regarding the appropriateness of the operator parameters and their application in the Draft BU Pure LRIC Model? Please provide reasons for your response, clearly indicating the relevant paragraph numbers to which your comments refer, along with relevant factual evidence supporting your views.

3.6 Service-related parameters

3.48 Volumes of traffic are a necessary input into a cost model that is used to calculate long-run costs so it is first necessary to gain an understanding of the aggregate historic and projected traffic in the Irish mobile market over the Draft BU Pure LRIC Model time horizon.

3.49 The services modelled include 2G and 3G voice, messaging and data services but the Draft BU Pure LRIC Model only calculates pure LRIC values for voice termination. The list of services contained in the Draft BU Pure LRIC Model is presented in Table 2, page 15 of the Deloitte Model Specification Document, along with their classification into traffic type and the default unit of measure for service traffic (before any conversion of units that that may be applied within the Draft BU Pure LRIC Model).

3.50 Traffic volumes are modelled by considering historic and forecast volume trends of all the different services carried on mobile networks and restating these in terms of per subscriber usage. For the purposes of the Draft BU Pure LRIC Model, a review of operator-supplied traffic data together with ComReg quarterly returns and Deloitte market analysis is used to quantify historical demands and to forecast the relevant traffic trends for each of the services.

3.51 The resulting traffic trends indicate the size of the mobile market across the time frame of the Draft BU Pure LRIC Model and these are then combined with population and mobile penetration data to derive average subscriber usage trends.

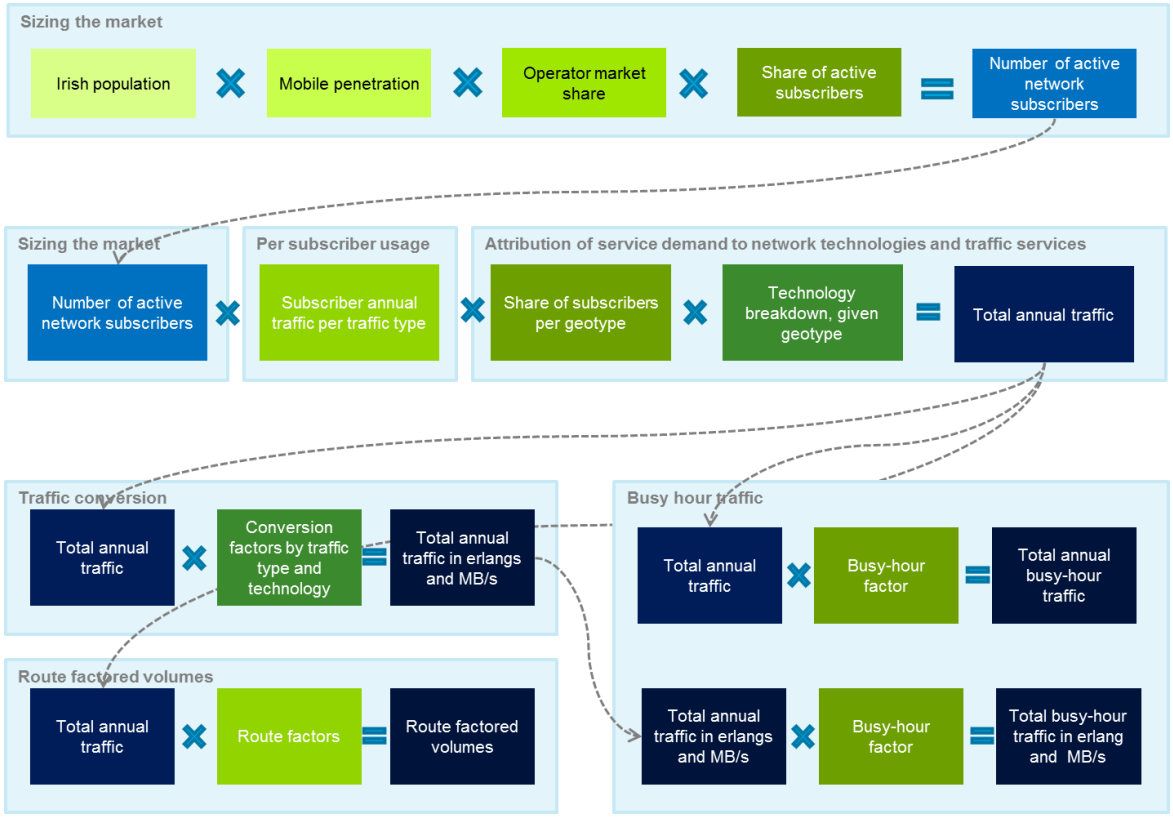
3.52 Average subscriber usage factors can then be combined with market share assumptions to estimate the total annual traffic to be carried by the hypothetical efficient operator which is further analysed in terms of geography, technology and network load parameters to support network dimensioning. This approach is similar to the approach adopted to date in other European jurisdictions. For example, in describing the 2011 model developed in the UK, Ofcom noted that:

"Traffic is modelled based on a forecast of subscribers, plus a forecast for the demand per subscriber. Demand for each service is based on past data combined with forecasts for future periods. The forecasts in the 2011 cost model were generated with reference to forecasts from the national MCPs, as well as Analysys Mason mobile market research.[42]*"*

3.53 The logical steps in this process are outlined in the following diagram and the sections that follow discuss these steps in further detail.

[42] Ofcom: Wholesale Mobile Voice Call Termination, Modelling Annexes, 2011, page 10. Please see the following link: http://stakeholders.ofcom.org.uk/binaries/consultations/mtr/statement/MCT_statement_Annex_6-10.pdf

Figure 1: Market, subscriber and operator demand



Source: Figure 7, page 19 of Deloitte Model Specification Document

3.6.1 Sizing the market

3.54 To size the market, ComReg has sought information on the historical and forecast traffic demands for all the various voice, message and data services from each of the six SMP MSPs currently active in the Irish market. This is to ensure that the modelled network is dimensioned with reference to all the traffic that is carried on Irish mobile networks.

3.55 Consequently, the market is sized so that it includes all traffic carried on the mobile operator networks. Voice traffic services include traffic due to each of the MNOs' retail customers as well as traffic due to MVNOs, national roaming and international roaming while, data traffic includes traffic due to data dongles, over-the-top content ('**OTT**')[43] and machine-to-machine communications ('**M2M**').

[43] Over-the-top content (OTT) refers to the delivery of media content over the internet, such as voice traffic over internet protocol (VoIP), which arrives to the end user via a third party.

3.6.2 Per subscriber usage and operator market share

3.56 Having used analysis of total historical and forecast traffic demands in terms of voice, message and data traffic to generate an estimate of the size of the Irish mobile market for each year modelled, the next stage in the process is to restate the overall market demands in terms of average per subscriber usage.

3.57 To do this, the number of mobile subscribers for each year is estimated from analysis of population and mobile penetration trends and this is then applied to the overall market demands to obtain an estimate of per subscriber usage over time for each service.[44]

3.58 The volume trends of per subscriber usage can then be linked to the market share assumptions to derive an estimate of the level of the network load for each relevant traffic service that the hypothetical operator provides.

3.59 As the market share of the hypothetical efficient operator is likely to differ from the market shares of the existing operators, the traffic profile in terms of off-net and on-net calls can also be expected to differ. This is because an operator with a higher market share is likely to experience a higher proportion of traffic on its own network than an operator with a lower market share.

3.60 Therefore the relationship between market share and the composition of on-net and off-net mobile minutes traffic needs to be reflected in the Draft BU Pure LRIC Model. The Draft BU Pure LRIC Model implements this by using analysis from a linear regression in which the independent variable market share determines the ratio of on-net minutes compared to what is off-net.

3.61 The following relationship is obtained from a simple linear regression from the four MNOs' responses to information requests based on 2013 values.

——— *;* with $R^2 = 0.74$[45]

3.62 This relationship is applied to the hypothetical operator's overall originating minutes to obtain the breakdown of on-net and off-net originating minutes.

3.63 The per subscriber annual usage for 2013 is summarised in the following table.

[44] This means that traffic volumes from, for example, M2M and international roaming are being assigned to domestic subscribers for modelling purposes.
[45] This is statistical significance at 1% level. (For three degrees of freedom, the 1% critical value is 4.032).

Table 2: Per subscriber annual usage for 2013

Service	2013
Voice	
Total outgoing annual voice minutes (excl. on-net)	1,145
Total incoming annual voice minutes	1,022
Total mobile on-net annual voice minutes	1,053
Data	
Annual 2G hypothetical data traffic (MB)	200
Annual 3G hypothetical data traffic (MB)	2,700

Source: ComReg and Table 7, page 22, Deloitte Model Specification Document.

3.64 Total outgoing annual voice minutes above comprise off-net to mobile, off-net to fixed, international outgoing and outbound roaming. Incoming annual voice minutes are made up of calls from other mobile networks and national fixed networks, international incoming and inbound roaming.

3.65 SMS and MMS traffic is also incorporated into the per subscriber annual usage figures split between on-net, incoming and outgoing (refer to Table 7 of the Deloitte Model Specification Document).

3.66 Regarding data usage per subscriber on the hypothetical efficient operator's network, 3G is expected to account for the vast majority of subscriber data usage with 2G accounting for a comparable small proportion. LTE data usage is included in the service set but is not used to dimension any network elements.

3.67 For modelling purposes, the service demands of the hypothetical efficient operator are also analysed in terms of technology (2G, 3G and LTE) and geography (urban, suburban and rural geotypes). The breakdown of service demands by technology and geotype is informed by data returns from operators on historic and expected forecast migration as well as the migration profiles as observed in other NRA models[46].

3.68 2G and 3G services are modelled to launch in 2004 and LTE data services in 2014, as no LTE traffic was reported in network operator data returns in 2013.

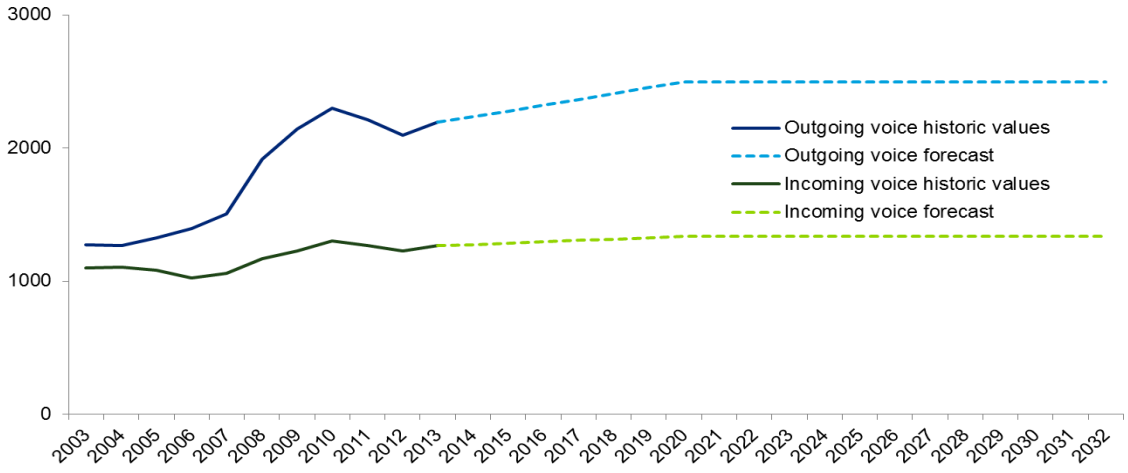
3.69 The geotype breakdown is defined for data and all other traffic separately as data profiles are dependent on LTE rollout and take-up.

[46] Further detail on the traffic profile across network technologies and geotypes can be found in section 4.1.3 of the Deloitte Model Specification Document.

3.70 A proportion of data traffic is assumed to migrate to LTE and the migration of voice from 2G to 3G is assumed to have begun in 2007 and stabilised at 40% of total voice traffic in 2020.

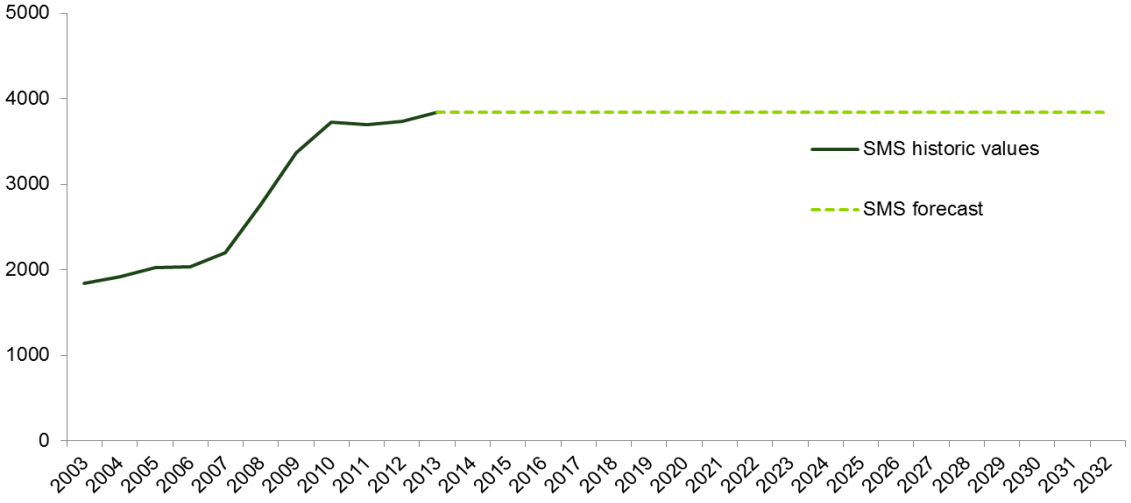
3.71 The following charts highlight the traffic profiles for voice, SMS and data services used in the Draft BU Pure LRIC Model. The historical data is in blue and forecasts in green. Forecast trends are informed by inputs provided by operators. The overall trend is one of slow, but positive, growth in voice traffic, and continued rapid growth in mobile data usage. One network operator, which provided forecast inputs through to 2020, implied continued growth in per subscriber SMS volumes throughout the time period to 2020. Other operators, that provided a one-year forecast, anticipated a decline in per subscriber SMS usage. Discussions with operators have led the forecast to be set to imply no further growth in SMS from current per subscriber levels. Further detail on the underlying traffic demand assumptions is contained in sections 4.1 and 4.2 of the Deloitte Model Specification Document (appended to this Consultation Document).

Figure 2; Outgoing and incoming annual minutes per subscriber



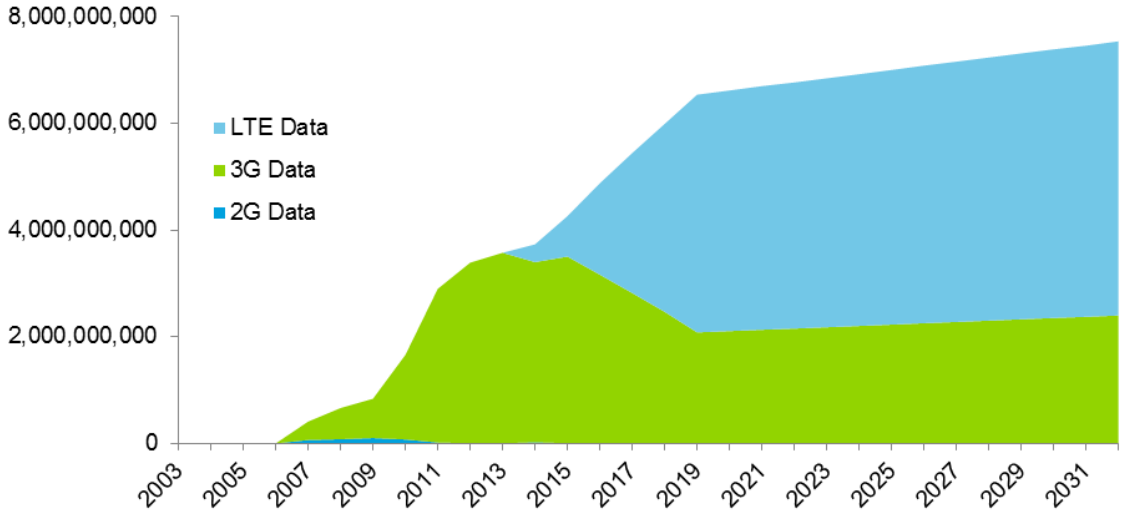
Source: Figure 10, page 25, Deloitte Model Specification Document.

Figure 3; Annual total SMS per average subscriber



Source: Figure 11, page 25, Deloitte Model Specification Document.

Figure 4; Total data traffic by technology



Source: Figure 12, page 26, Deloitte Model Specification Document.

3.6.3 Busy hour service demand

3.72 Service demand is calculated on an annual basis but, for network dimensioning purposes, the busy hour load for each service also has to be considered. Busy hours are derived based on data returns provided by the four MNOs.

3.73 The operator data request specified traffic profile data on the basis of technology, service group and geotype, potentially allowing operators to provide up to 21 separate busy hours to apply to subsets of services, e.g. the 24 hour traffic profile for 3G data usage in urban areas.

3.74 It is notable from operator returns that the busy hour occurs in a different part of the day for each service, for example, the use of data peaks later in the day than voice. Also, a higher percentage of voice traffic occurs in the busy days[47] compared to data traffic due to a smoother weekly data traffic profile.

3.75 The busy hour profile is assumed to be constant over the time horizon of the Draft BU Pure LRIC Model. This is based on the weighted average of the four MNOs' data request responses.

3.76 The number of calls in a busy hour is also calculated by dividing the busy hour minutes by the average duration of a call (in minutes), by service. The calculation of busy hour minutes is based on inputs from operators. This calculation also incorporates an assumed additional average ring time per call of 10 seconds. When considering the number of busy hour call attempts ('**BHCA'**) in network element dimensioning, a further uplift factor of 30% is applied to this value to reflect unsuccessful calls.

3.77 Further details of the basis determining the service volumes that the modelled operator is expected to carry, both on an annual basis and at peak times, can be found in section 4.3 of the Deloitte Model Specification Document appended to this document.

3.6.4 Services set – definition of increment

3.78 The requirement to calculate a pure LRIC for the purposes of setting MTR prices necessitates the wholesale termination increment to be defined.

3.79 To this end the Draft BU Pure LRIC Model defines the increment for the wholesale MVCT service to include the following services:

- 2G off-net minute to mobile (incoming)
- 2G fixed to mobile (incoming)
- 2G international to mobile (incoming)
- 2G inbound roaming
- 3G off-net minute to mobile (incoming)
- 3G fixed to mobile (incoming)
- 3G international to mobile (incoming)
- 3G inbound roaming

[47] Busy days in the year are calculated as 244 based on 253 weekdays less 9 bank holidays.

3.80 This service set is consistent with 2009 Termination Rate Recommendation which states that:

"*Within the LRIC model, the relevant increment should be defined as the wholesale voice call termination service provided to third parties*[48]".

ComReg's Preliminary View

3.81 ComReg is of the preliminary view that the service demands modelled in the Draft BU Pure LRIC Model are appropriate as:

- The services modelled relate to 2G and 3G voice, messaging and data services;
- The historic and forecast volumes included in the Draft BU Pure LRIC Model are appropriate for a hypothetical operator with a 25% market share of the Irish mobile market;
- The busy hour levels of demand are in line with Irish mobile operators' experience; and
- The services included in the increments for wholesale service termination services are consistent with the 2009 Termination Rate Recommendation.

Q. 2 Do you agree with ComReg's preliminary views regarding the appropriateness of the service parameters and their application in the Draft BU Pure LRIC Model? Please provide reasons for your response clearly indicating the relevant paragraph numbers to which your comments refer, along with relevant factual evidence supporting your views.

3.7 Technology-related parameters

3.82 Having determined the level of voice and data services pertaining to the hypothetical network operator it is then necessary to consider the key cost drivers that will be used to dimension the network and so determine the cost of network equipment that will be required to deliver those services to end users.

3.83 For network dimensioning purposes, the Draft BU Pure LRIC Model considers the following key cost drivers:

- the level of coverage required (defined by geographic coverage);
- total traffic (service demand determined on a per-subscriber basis);
- the traffic load at the busy hour; and
- quality of service.

[48] 2009 Termination Rate Recommendation, Recommendation 6.

3.84 Service demand from all traffic services is combined to form aggregated cost drivers to capture the relative usage of each network element by each unit of service demand.

3.85 Accordingly, the Draft BU Pure LRIC Model can calculate the required deployment of appropriate network elements in order to meet the demands for capacity and coverage.

3.86 However, as capacity and coverage requirements are not uniform across the country it is also necessary to consider the extent to which geographical factors can influence the costs of delivering services to end users.

3.7.1 Geotypes

3.87 'Geotypes' are a means of classifying different geographical segments of a region according to the factors that might influence relative costs and demand.

3.88 Geotype disaggregation allows the Draft BU Pure LRIC Model to consider traffic load and network dimensioning parameters that vary because of factors that include population density, network design and topological / civil planning variation. For example, the average cost of providing mobile services in densely populated city centres would be expected to differ from rural areas.

3.89 In reality, networks contain a continuum of sites from the most dense to the least dense areas of the country (in terms of population and traffic loads).

3.90 Voice and data traffic loads are also not necessarily correlated (some cells have significant voice but little data traffic, and vice versa).

3.91 For modelling purposes there are several criteria that can guide the definition of geotypes:

- availability of geographical data: a dataset containing both the area and population of each geographical unit is needed, ideally from the national statistics office or other reliable source;
- number of geotypes: this is a decision of judgement. Some models contain three to five geotypes; others can contain more, or can even do a real national network simulation (if the technicalities can be modelled). More geotypes increase the granularity but may not assist with accuracy if better operator data is not available (e.g. operator data on traffic densities in each geotype, population data to estimate geotype parameters);
- typical clutter types, reflecting the type of buildings in the city and rural areas of the country; and

- in addition to population density, geographic criteria can be used to define geotypes.[49]

3.92 In the UK, Ofcom considered density of traffic and building clutter as factors that would influence the average cost of mobile services noting that:

"*These factors have a direct influence on the number of sites that are required to provide: (a) network coverage and (b) sufficient network capacity to carry all of the traffic in the busy hour. The geotype definitions used within the model are an attempt to capture these geographical factors, and are defined on the basis of population density (as a proxy for variations in traffic density and building clutter)*[50]*."*

3.93 In the 2011 mobile cost model Ofcom defined nine geotypes, including highways and railways.

3.94 The Draft BU Pure LRIC Model uses a geotype definition based on the specificities of the Irish geography and population density, while ensuring the criteria are consistent with geotype definitions used in regulatory models built by other NRAs.

3.95 Geotype data returns from the Irish mobile operators have been aligned to demographic data from the Central Statistics Office to determine the geotype breakdown.

3.96 This data is then combined with coverage area, traffic loads and percentage coverage parameters to indicate the appropriate number of geotypes that can effectively capture the range of radio environments in Ireland.

3.97 As a result of this analysis the land area of Ireland has been classified into urban, suburban and rural.[51] The mapping of geotype classifications is presented in the following table.

[49] Both the new and previous French models make a distinction between "rural" and "rural mountainous" geotypes based on the average altitude of municipalities, but both are within the same population density thresholds.
[50] Ofcom: Wholesale Mobile Voice Call Termination, Market Review Annexes, 2010, page 88.
[51] OPTA has also used three geotypes in the Dutch mobile cost model; the Portuguese model has four while the Norwegian NRA, in comparison, has effectively modelled each of the 20 regional Fylkes as a separate geotype.

Table 3: Geo-type mapping

CSO classification	Geo-type mapping
City	Urban
Top ten town	Urban
Towns > 10,000	Suburban
Town > 5,000< 10,000	Suburban
Town > 3,000 < 5,000	Suburban
Town > 1,000 < 3,000	Suburban
Town > 1,000 < 1,500	Rural
Rural	Rural

Source: Table 10, page 34, Deloitte Model Specification Document.

3.98 The resulting implied land area breakdown by geotype is as presented below and is generated based on total land area in Ireland and geographic network coverage. To the extent that operator inputs are disaggregated across geotypes and demonstrate a differential network design, traffic load or cost, these are reflected in the inputs, calculations and outputs of the Draft BU Pure LRIC Model.

Table 4: Land area classification[52]

Geo-type	Area (km2)	Area (%)
Urban	1,142	1.6%
Suburban	5,691	8.2%
Rural	62,964	90.2%
Total	**69,797**	**100%**

Source: Table 11, page 34, Deloitte Model Specification Document.

3.7.2 Nodal layout methodology

3.99 BU models estimate the costs of building an operator's network using modern technology. If a BU methodology is adopted, it can be approached on either a "scorched-earth" basis or a "scorched-node" basis.

3.100 A scorched-earth approach is one which assumes that the required equipment quantities can be deployed at locations optimal to the overall network design, as if the network was being designed on a green-field site. The methodology makes no reference to existing network layouts and so applies no constraints on the number, location or configuration of nodes to be dimensioned. As such, the results are driven purely by the defined dimensioning rule set and the area to be covered.

[52] This includes all areas, including areas under inland water, such as rivers and lakes. There are no exclusions for uninhabited areas. CSO census datasets do not provide combined land area breakdown and geotype classification to directly reconcile.

3.101 The Draft BU Pure LRIC Model designs the network layout, configuration and technologies in the most efficient way that is feasible for a given traffic profile and any changes in what it is required to carry, based on technical constraints of available technologies. If network load or other characteristics change, the network would be designed in an alternative way based on the characteristics of the scenario.

3.102 The resulting dimensioning would imply the most theoretically efficient network design to an extent that it may not closely resemble the actual network layout that even an efficient operator would be practically capable of deploying.

3.103 With the range of technology solutions available, a scorched earth algorithm may imply the use of technologies or configurations that are not consistent with those seen in the Irish market. Therefore a scorched-earth deployment runs the risk of modelling a network with an unrealistic level of efficiency.

3.104 Conversely, a scorched-node approach is one that recognises the historical evolution of the networks that have been deployed by the existing operators. This method uses the historic location of network nodes, but allows the Draft BU Pure LRIC Model rule set to deploy the appropriate technology and network configuration to make efficient use of these nodes.

3.105 As an operator rolls out a network the location of network nodes will be dictated mainly by factors such as the known location of customers and forecasts of demand for services; but it will also, to some extent, be constrained by the availability of suitable sites and topological constraints such as the geographical terrain the network is going to serve.

3.106 Consequently, as the operator develops a network over time there are a number of real world factors that often limit the extent that an existing network can be considered truly optimal for the current or anticipated conditions in the market.

3.107 To ensure that the network of the hypothetical efficient operator is reasonably consistent with such real world factors, ComReg has incorporated a modified scorched node methodology in the Draft BU Pure LRIC Model that has been developed for Ireland.

3.108 The modified scorched node methodology provides the flexibility of selecting the appropriate efficient network specification and technologies whilst also maintaining the linkage with actual nodal information provided by operators. Therefore, Deloitte has been able to align the modelled network for the hypothetical operator to the network design parameters provided by operators whilst ensuring the hypothetical operator network design is modern and efficient. Consequently, the network dimensioning algorithms in the Draft BU Pure LRIC Model are able to respond dynamically to the scenarios on traffic load and market share, within the constraints of network parameters and input data provided by operators.

3.109 Please refer to section 2.3.5 of the Deloitte Model Specification Document appended to this document for further details.

3.7.3 Coverage network

3.110 Coverage is considered a central aspect of mobile network deployment and of the radio network in particular. However, the coverage network that is considered for the purposes of a LRIC model may not be the same as that understood in other contexts. For example, spectrum licences may contain a coverage requirement which operators have to achieve after the award of the licence.

3.111 The calculation of coverage can be complicated due to factors such as the coverage of inland and coastal waters and the fact that operators often deploy coverage further and 'deeper indoor' than the regulatory requirement.

3.112 Different operators and regulators can also use different clutter and propagation models/tools which can give different answers for coverage, and, in the case of 3G networks, 'pilot' coverage during night-time (when the cells are not loaded) is much wider than busy-hour coverage, when there is heavy cell-breathing 'noise'.

3.113 Consequently the specification of the coverage network has been a key concern of operators when reviewing the different mobile costs models developed across Europe.

3.114 For example, one operator reviewing the 2012 OPTA model noted:

"By taking into account the actual operator coverage, rather than the coverage of a 'single call' network, Analysys Mason and OPTA will draw an incorrect demarcation line between coverage and capacity. Such a demarcation line will be strongly biased towards coverage, in the sense that it will consider much more costs as coverage-driven than justified. This will lead to the model

underestimating the incremental costs of each service, including the termination service.[53]"

3.115 Regarding the interpretation of the coverage network as it should apply in a LRIC model, the 2009 Termination Rate Recommendation states that:

"*coverage can best be described as the capability or option to make a single call from any point in the network at a point in time, and capacity represents the additional network costs which are necessary to carry increasing levels of traffic*[54]."

3.116 This distinction between coverage and capacity particularly affects the pure LRIC result because required coverage will not be traffic sensitive, while additional capacity may be incremental to traffic in the long-run and so form part of the pure LRIC cost of wholesale termination.

3.117 Therefore, the approach taken in the Irish model is to calculate the cost of the required coverage network on the basis of a minimum specified network capable of carrying a minimum volume of traffic[55]. This is in line with the 2009 Termination Rate Recommendation.

3.118 The hypothetical operator is assumed to have achieved a designated percentage of geographic coverage to match the average coverage actually achieved by the operators and this is determined using a weighted, blended network coverage percentage based on operator input data, pro-rated for the market share assumption.

3.119 Operator data on geotypes has been used to determine the geotype breakdown based on mapping urban, suburban and rural geotypes to CSO classifications of the landmass of Ireland. As a result the total land area of the country is split between urban, suburban and rural as per the following table:

Table 5: Land Area Classification

Geotype	Area (km^2)	Area (%)
Urban	1,142	1.6%
Suburban	5,691	8.2%
Rural	62,964	90.2%
Total	**69,797**	**100%**

Source: Table 11, page 34, Deloitte Model Specification Document.

[53] Conceptual specification for the update of the fixed and mobile BULRIC models, 2012, page 7.
[54] 2009 Termination Rates Recommendation, page 7.
[55] 1 Erlang (representing the continuous use of one voice path) of traffic on the basis of the capability of making or receiving a call anywhere in the network.

3.120 The coverage of the hypothetical operator can then be specified with regard to:

- The coverage percentage;
- The technology used for coverage; and
- The spectrum used for technology.

3.121 The coverage percentages used in the Draft BU Pure LRIC Model are based on data provided by Irish operators[56]. The following table contains the 2G coverage areas by geotypes:

Table 6: 2G Coverage Area

Geo-type	2G Coverage Area (km^2)	2G Coverage Area (%)
Urban	1,119	98%
Suburban	5,122	90%
Rural	52,913	84%
Total	**59,153**	**85%**

Source: Table 12, page 35, Deloitte Model Specification Document.

3.122 For the coverage requirement network, the hypothetical operator is assumed to reserve 2x9MHz of 900MHz spectrum to provide a basic "one-call" 2G network.

3.123 It is assumed that the hypothetical operator providing this coverage network would seek to minimise costs to the greatest extent possible and this would be achieved by maximising the radius of cells for which there is a minimal/notional traffic load of one-call. ComReg believes that deploying a 2G network using the lower spectrum frequency for the required coverage-only network is reasonable as the modelled operator can benefit from the inverse relationship between frequency and propagation and so fulfil the coverage requirement with fewer sites by exploiting a larger cell radius.

3.124 As a result, the maximum[57] feasible cell radius for each geotype is used to calculate the cell area on the basis of the modelled hexagon (the shape typically used to model a cell area), to which the tessellation factor is applied to reflect the fact that the effective cell area will be less due to the need to overlap cells to allow for radio propagation and to ensure call-handover.

[56] Coverage requirements for licence purposes are determined on population figures as opposed to geographic considerations.

[57] Operators provided data on the maximum feasible cell radii for each radio technology and spectrum band in each geotype as part of the data collection process. Practically, within the model, the maximum radii values are only a binding constraint in the dimensioning algorithm in the coverage network calculations and in the traffic scenarios the calculated radii are well below the maximum.

Table 7: Maximum feasible cell radius by geotype

Geo-type	Hexagonal parameter (*H*)	Max Cell Radius (r)	Site Area (Hr^2) km^2	Tessellation Factor	Effective Site Area km^2
Urban	2.6	4	42	33%	28
Suburban	2.6	8	166	33%	111
Rural	2.6	35	3,185	33%	2,134

3.125 The effective cell area is then used to estimate the minimum number of sites required to serve the defined coverage area in each geotype:

Table 8: Minimum number of sites to serve coverage area

Geo-type	2G Coverage Area (km^2)	Effective Site Area (km^2)	Minimum Site Numbers
Urban	1,119	28	40
Suburban	5,122	111	46
Rural	52,913	2,134	25
Total	**59,153**		**111**

3.126 The minimum site numbers informs the minimum equipment requirements for a one-call coverage network. Please refer to sections 5.1.1 and 5.1.2 of the Deloitte Model Specification Document appended to this document for further details

3.7.4 Radio technology standards: 2G, 3G and LTE

3.127 For modelling purposes the hypothetical efficient mobile operator's network needs to be designed and dimensioned on the basis of a specified modern technology. This can comprise a combination of 2G (GSM), 3G (UMTS) and 4G (LTE) technologies in its radio network and NGN (or legacy) in its core network.

3.128 ComReg has developed a Draft BU Pure LRIC Model for the hypothetical efficient mobile operator who is assumed to operate 2G and 3G networks throughout the model time horizon. This is consistent with the 2009 Termination Rate Recommendation, which states that "*the bottom-up model for mobile networks should be based on a combination of 2G and 3G employed in the access part of the network*.[58]"

[58] 2009 Termination Rates Recommendation , Recital 12.

3.129 LTE network technology is at the early stages of deployment in Ireland, and the hypothetical operator is assumed to deploy LTE during the time horizon of the Draft BU Pure LRIC Model. However, ComReg has assumed that LTE will be used exclusively during the period of the price control to carry data traffic and the modelled operator will use Circuit Switch Fall Back (CSFB) to continue to carry voice and SMS on the 2G/3G networks.

3.130 Therefore, with the focus of the Draft BU Pure LRIC Model being on call termination, ComReg has not explicitly modelled LTE as a radio technology and consequently LTE spectrum usage is not considered.[59] The Draft BU Pure LRIC Model does however implicitly consider LTE by diverting data traffic from 2G and 3G in line with the roll out of the more advanced technology. In essence, the Draft BU Pure LRIC Model caps the volume of data carried over 2G and 3G in later years.[60] This has been incorporated into the Draft BU Pure LRIC Model by diverting a proportion of data traffic from 3G for dimensioning and service costing purposes.

3.131 The extent of LTE network coverage and the extent of service migration have been assumed based on LTE deployments internationally.

3.132 To date, other jurisdictions appear to have adopted a similar approach to that adopted by ComReg. Analysys Mason, for example, commented on the draft BU Pure LRIC model it developed for the Dutch regulator in the Netherlands in 2012:

> *"There are economies of scope through deploying an LTE overlay with the 2G/3G networks, due to asset sharing. For example, LTE base stations can be co-located at existing radio network sites and can also share the use of the core transmission networks. However, based on our experience in other jurisdictions, the inclusion of LTE technologies in a mobile cost model has little impact on the pure BULRIC of wholesale mobile termination and only a relatively small downwards impact on the BULRAIC of wholesale mobile termination, until such time as a significant proportion of voice termination might be carried as voice-over-LTE.*
>
> *Therefore, given the current mobile data traffic usage on LTE networks in the Netherlands, the current uncertainties of eventual usage and roll-out, and the fact that it would add complexity to the BULRIC model for little impact, we will therefore continue to exclude LTE.*[61]*"*

[59] Except to the extent that a portion of the 1800MHz holding is refarmed for LTE use.
[60] The majority of data migrating to 4G is assumed to come from 3G technology with voice traffic being primarily carried by 2G in future years of the model. Please refer to Figure 9 in the Deloitte Model Specification Document (page 23) for a visual representation of this effect.
[61] Conceptual specification for the update of the fixed and mobile BULRIC models, 2012, page 20.

3.133 Analysys Mason also did not directly model the costs of LTE services for the 2013 model developed for the Norwegian regulator, noting that work carried out in the Swedish mobile LRIC model indicates:

> *"that the considerable additional complexity of implementing LTE network design, in addition to the existing 2G/3G network designs, is not proportionate to the impact of LTE networks. Therefore, we do not explicitly model the network design for LTE, though we do consider its share of voice, SMS and data services.*[62]*"*

3.134 ComReg acknowledges that future technological advances could result in higher quality services, a reduced unit cost, or a combination of both over the 30 year time frame modelled. Notwithstanding this, the conservative assumption of a MEA based on existing 2G and 3G technologies is considered appropriate due to the reduction in materiality of such an assumption as the years being modelled move away from the three year period subject to the price control.

3.135 ComReg will continuously monitor the evolution of mobile technology, such as expected trends of 2G use and LTE deployment, and will amend the network design parameters for changes in technology as appropriate in future revisions of the model.

3.7.5 Treatment of Spectrum

3.136 ComReg has not dimensioned LTE network elements nor has it included spectrum holdings for LTE in its analysis, despite the underlying assumption that the hypothetical efficient operator deploys and operates a LTE network within the time horizon of the Draft BU Pure LRIC Model.

3.137 The hypothetical existing operator's assumed spectrum holding is based on an average of operator holdings and aligns with its assumed market share. Its holdings are assumed to have frequency bands of 900MHz, 1800MHz and 2100MHz. The respective 2013 values equate to 2x9MHz, 2x15MHz and 2x15MHz as per Table 16 at page 38 of the Deloitte Model Specification Document.

[62] Model documentation for the Norwegian Posts and Telecommunications Authority, page 27.

3.138 The quantity of assumed spectrum holding is derived on the basis of a "1/number of operators" approach, consistent with the calculation for the assumed market share of the hypothetical efficient mobile operator. While this approach to estimating the spectrum holding of a hypothetical operator with 25% market does not align with the block sizes available in the most recent spectrum auction[63], crucially, it is aligned with calculating the cost of providing mobile services for an operator in the Irish market whose market share has been estimated under the approach "1/number of operators".

3.139 This notional spectrum holding is not assumed to differ in the modelled scenario of full traffic and the modelled scenario of traffic without mobile termination.

3.7.6 Spectrum costs

The cost of spectrum for the modelled operator has been estimated taking guidance from the recent prices paid by operators in Ireland at the Multi Band Spectrum Auction[64]. The price ratio for each of these bands is also included in this analysis, as provided by OfCom in 2013[65]. The model estimates the spectrum costs as follows:

Table 9 Spectrum fees

Band	Present value of 5MHz of paired spectrum (EUR)	Annuity of 5MHz of paired spectrum (EUR)
900MHz	1,982,977	3,859,911
1800MHz	1,267,805	2,404,910
2100MHz	1,960,000	3,574,441

Source: ComReg, Ofcom, and Deloitte internal calculation.

3.140 The spectrum holding of the hypothetical operator for basic coverage requirements is also specified for the coverage-only network. As noted in paragraph 3.123, the hypothetical efficient operator is assumed to hold 2x9MHz of 900MHz spectrum to provide a basic "one-call" 2G network to deliver the required coverage.

3.141 While it is possible in theory that spectrum holdings could be considered incremental to the termination increment this is not the approach adopted in the Draft BU Pure LRIC Model.

[63] See Table 16 in Deloitte Model Specification Document.
[64] ComReg Document No. 12/123.
[65] See Figure 4.2: http://stakeholders.ofcom.org.uk/binaries/consultations/900-1800-mhz-fees/summary/900-1800-fees.pdf

3.142 ComReg has considered that mobile operators can alter their spectrum usage to meet changing levels of traffic on their network. So for a given size of network (i.e. a fixed number of base stations and quantity of network equipment), more capacity can be provided if more spectrum is deployed by adding frequencies to the air interface. However, an operator can also provide the additional capacity by increasing the size of the network (i.e. deploying more base stations and/or traffic-handling capacity at base stations) while not changing its use of spectrum.

3.143 Consequently, in the long run, the decision for an efficient operator to invest in additional spectrum in order to deliver an increased amount of traffic should be determined by the cost of the alternative option of deploying more network equipment to provide the same level of additional capacity. The cost an efficient operator is willing to pay for additional spectrum to provide additional capacity will therefore be no more than the network costs of the additional network infrastructure and/or equipment that could also be used to provide the same capacity.

3.144 This implies that, for cost modelling purposes, it is reasonable to hold the quantity of spectrum deployed by the modelled operator constant and instead measure the change in network costs due to changes in traffic volumes by altering the size of the network.

3.145 The approach taken in the Draft BU Pure LRIC Model follows this principle of a trade-off between the opportunity cost of spectrum and additional network roll out by treating spectrum as a fixed cost and only allowing network equipment/infrastructure to vary in response to traffic loads.

3.146 The pure LRIC of termination should only include the incremental cost that is incurred by the modelled operator when the service of wholesale termination is provided to third parties, assuming all other services, including internal call termination, are unchanged.

3.147 On this basis, the pure LRIC for wholesale MVCT is determined as the difference in costs when running the Draft BU Pure LRIC Model with and without termination volumes while allowing the network costs to change and holding the cost of spectrum constant. The cost models developed in a number of other jurisdictions have adopted a similar approach and do not include an allocation of spectrum to the pure LRIC for wholesale termination. The mobile model developed in the UK for Ofcom, for example, assumes that the spectrum cost has no impact on the unit cost of termination under pure LRIC.[66]

[66] See Ofcom Wholesale Mobile Voice Call Termination Market Review, section 9.65: http://stakeholders.ofcom.org.uk/binaries/consultations/wmctr/summary/wmvct_consultation.pdf

3.148 The model developed to cost mobile termination in the Netherlands also excludes spectrum from the pure LRIC calculation for similar reasons as those outlined above:

"*Avoiding spectrum will require more sites in the modelling state without terminated traffic as a result of this spectral sensitivity, which will lead to an increase in network costs that will compensate the reduction in spectrum fees. By not avoiding spectrum, the network design will now avoid GSM base stations, which will appear in the avoidable cost base.*[67]*"*

3.7.7 Minimum element requirements

3.149 A minimum quantity of elements is specified in the Draft BU Pure LRIC Model. This defines the quantity of elements required for the one-call coverage network. The minimum quantity of elements also accounts for network dimensioning rules that in practice may be driven by factors other than traffic/subscriber-based metrics by dimensioning a minimum number of network elements that a mobile operator would reasonably be expected to deploy. For example, a minimum requirement above one for many core network elements is typically driven by considerations such as diversity, redundancy and resilience.

3.150 Values used are implied by the underlying network design, the characteristics of the Irish market and data returns from operators on the minimum number of elements. Minimum 3G equipment quantities have been included as part of the minimum equipment requirement to be consistent with the assumption that 2G and 3G technologies are rolled out in 2003, when the operator enters the market.

3.151 The minimum elements defined to be required in 2013 are listed in Table 19 on page 40 of the Deloitte Model Specification Document and the dimensioning considerations are discussed in section 5.1.2 of that document.

3.7.8 Network dimensioning using busy hour traffic

3.152 As noted in section 3.6.3 on service busy hours, networks are designed to cater for peak demands to ensure sufficient network capacity is provided to enable the different service demands placed on the network to be catered for at the appropriate standard of service.

[67] See "2012 update of OPTA's fixed and mobile BULRIC models" page 24 Similar)

3.153 Therefore, the hypothetical efficient operator is modelled to deploy a network capable of servicing peaks in its annual traffic. Typically BU cost modelling analysis considers this peak-capacity dimensioning in the form of a busy hour load; where the network load used to dimension the required network elements is based on traffic levels at the busiest times.

3.154 As previously discussed in section 3.6.3, service demand is calculated on an annual traffic basis and busy hour traffic load by service is determined by attributing a proportion of this traffic to the busy hour, based on traffic load statistics provided by operators.

3.155 The traffic profiles provided by the Irish operators indicate that the busy hour occurs in a different part of the day for each service. For example, the use of data peaks later in the day than voice. The network is dimensioned on the basis of the busy hours for all services in order to account for the random occurrence in traffic peaks and therefore to protect against the Draft BU Pure LRIC Model under-dimensioning the network when considering busy hour traffic loads.

3.156 The busy hour percentages derived from the Irish operators' data are in the range of 6% to 9% and are presented in Table 8 on page 28 of the Deloitte Model Specification Document.

3.157 The peak in traffic is modelled by the average busy hour uplifted by a factor of 10%. This uplift is included to capture variance across daily busy hours and to account for fluctuations in network load, for example highly localised cell loads at particular times of the day. This assumption implies that the network is able to deliver services with a 10% higher busy hour than on average. Further uplifts to account for peak-to-mean and cell-specific load factors are also included, alongside the busy hour uplift.

3.158 Compared to NRA precedent, the data returned by Irish operators indicate lower proportions of traffic per service in the busy hour. However, when the uplift factor is included, the estimated busy hour traffic percentage is closer to that observed in other jurisdictions.[68]

3.159 It should be noted that the inclusion of an uplift to the average busy hour to reflect such issues as the distribution of traffic demand across cells in a geotype have been considered in other jurisdictions. For example, an operator reviewing the 2012 OPTA model noted the following factors that indicated the need for an uplift to be applied to the busy hour percentage:

[68] The following busy hour percentage values are present in the reviewed public MTR models: Portugal (8.6%), Norway (10%), Romania (8.5%), France (8.0%), and Sweden (8.5%). Each refers to overall proportion of network traffic in the busy hour, except for Sweden where the value specifically relates to voice traffic.

"*The "busy hour percentage" figure used by Analysys Mason represents the average annual network busy hour. However, we consider there to be three factors which may suggest that this figure, as a basis for network dimensioning, understates the network requirements – and hence costs – for a given level of aggregate demand:*

- *Demand on a cell-by-cell basis will be "peakier", i.e., the percentage of traffic in the busy hour will be higher for an individual cell than the national average, as a consequence of different cells experiencing peaks at different times of day. It is therefore appropriate to reflect this in the network dimensioning within the model, as this "peakiness" will, to some extent, be "dampened" when traffic across all cells is averaged over a 24 hour period and, to the extent this effect exists, will risk understating the network equipment required (and hence cost incurred) to meet total traffic.*
- *Relatedly, we understand … that network dimensioning is also designed to reflect the fact that operators will seek to meet a measure of the peak demand in the busy hour, rather than the average during busy hour, and hence a larger network than implied by the current model input.*
- *Monthly variability should also be considered, to ensure that the busy period of the year is taken when identifying the busy hour load on the network.*[69]"

3.160 Please refer to section 4.3 of the Deloitte Model Specification Document appended to this document for further details.

3.7.9 Traffic conversion

3.161 While busy hour dimensioning is a key parameter in dimensioning the level of network equipment the modelled operator should deploy, further traffic conversion is required when dimensioning elements that support more than one type of service. For example, voice traffic will provide a different traffic load than either data or messages so a common unit of measure is required for equipment that carries different traffic types.

3.162 This means that it is necessary to consider what the traffic load of an SMS is in relation to voice minutes and what the M/bit/s load of a voice call compared to data traffic is.

3.163 As the large majority of 2G network traffic load is voice, busy hour loading calculations and network dimensioning for 2G elements is undertaken in the unit of Erlang. In contrast, data traffic comprises the large majority of 3G traffic load and consequently MB/s traffic load is used for 3G elements.

[69] Analysys Mason: 2012 update of OPTA's fixed and mobile BULRIC models, page 18-19:

3.164 An additional complexity is that even when converted into a common unit of measure, the load of one type of traffic may not be equivalent to another. The fact that data service can be operated on a best effort basis and, as a consequence, may imply a lower network load for a given unit of traffic, as compared to voice, is accounted for in the differential load factors and payload factors for voice and data that are applied in the network dimensioning algorithms.

3.165 The following table shows the assumptions made when converting the different units into MB and Erlangs.

Table 10: Conversion factors assumptions

Assumptions	
2G - speech minute in Erlangs	1/60
2G - speech rate (bit/s)	12,200
3G - speech rate (bit/s)	9,600
LTE - speech rate (bit/s)	9,600
Average characters per SMS	80
Bits per character in SMS	7
Bits in a byte	8
Bytes in a kB	1,024
kB in a MB	1,024

Source: Table 9, page 30, Deloitte Model Specification Document.

3.166 The conversion factors into MB are based on Deloitte internal analysis. To calculate Erlang equivalents, one Erlang is assumed to be equivalent to 60 minutes of traffic. Given this assumption, the remaining factors are calculated from the MB equivalent based traffic.

3.167 Please refer to section 4.3 of the Deloitte Model Specification Document appended to this document for further details

3.7.10 Route-factored volumes

3.168 Another issue to consider when using service volume information to dimension a network is the extent to which the different network elements are used by the different services. To this end, routing factors (also called service usage factors) capture the relative consumption of resources of each network element by each unit of service demand.

3.169 A factor of two is used when an element is used twice for a given service; for instance, a site is used twice in an on-net call as it includes two subscribers connecting through two sites (or the same site twice). Similarly, a factor of one indicates that an element is used once in a service; for instance a terminating call uses one site only, since the origination of the call is carried over a site from another operator.

3.170 Route factors are commonly expressed in the form of a matrix, with numerical factors against each element-service combination that reflect the intensity of element usage by each service in the provision of a unit of output of that service. The route factors used in the Draft BU Pure LRIC Model are shown in the table in Appendix A of the Deloitte Model Specification Document appended to this document.

3.171 Route factored volumes are used to calculate the traffic load on each of the network elements due to the services carried on the network. They are calculated by matrix multiplication of route factors and the related service volumes and are used in the Draft BU Pure LRIC Model in a number of ways.

3.172 As many network elements are sensitive (either directly or indirectly) to changes in traffic volumes, applying route factors to the busy hour demands is a key input into determining the quantity of network elements required to support the given level of demand when dimensioning the network.

3.173 Once all network elements have been dimensioned and the total cost of each element is established, the total service volumes can also be multiplied by route factors to generate route-factored volumes. These serve as the basis for apportioning the costs of the network elements to the services they support in proportion to the relative usage by each service.

3.174 The conversion of aggregate traffic demands for the purposes of network dimensioning and cost allocation is discussed in more detail in section 4.3 of the Deloitte Model Specification Document appended to this document.

3.7.11 Planned element utilisation

3.175 An allowance is made against each of the specified technical capacities of each element, to take account of the maximum loading factors that apply for each network component relative to the theoretical design capacity of the element. This adjustment also takes account of the fact that network capacity upgrades have to occur in advance of the network reaching capacity limits.

3.176 Planned element utilisation figures are derived with reference to the data returns provided by operators and the utilisation values used in the Draft BU Pure LRIC Model are presented in Table 20 on page 42 of the Deloitte Model Specification Document.

3.177 Utilisation by element is assumed to be constant over the time horizon of the Draft BU Pure LRIC Model and elements that do not represent logical groups of network equipment, such as spectrum fees, are included in the utilisation table and attributed an utilisation value of 100%, to allow a consistent calculation methodology across elements.

3.7.12 Sharing of network elements between operators

3.178 Network sharing agreements have become a popular method amongst operators globally to manage costs and are accepted by NRAs to the extent they do not degrade competition substantively.

3.179 Sharing arrangements can take a variety of forms and the depth and extent of network sharing varies across, usually bilateral, operator agreements. In all cases, the capital and operational cost savings are maximised and capacity concerns are minimised in underutilised areas of the network, typically in rural areas.

3.180 Mobile operators often share access sites which can lead to a reduction in land acquisition and site maintenance costs and allow for site consolidation so that sharing operators can benefit from 'optimum' site locations in a given area, providing some improvement to quality of service.

3.181 Passive network element sharing can also include the sharing of the passive elements on sites such as the physical space and radio masts (and sometimes including related facilities like power or air-conditioning) and this can provide further opportunities for reductions in capital and operating costs with minimal operator impact.

3.182 There is also evidence of operators in Ireland agreeing to share active network elements such as BSC/Node B equipment as well as site and passive equipment that essentially creates a shared RAN that terminates at the backhaul link.

3.183 National roaming also exists in Ireland whereby the host operator provides part of the RAN for the guest operator. The host operator is usually an established operator and benefits from increased wholesale revenues and higher utilisation of under-utilised parts of their network. The guest operator is usually at a relatively early stage of network roll out and can benefit by delaying capital investment whilst still gaining coverage with reduced lead time.

3.184 In the Draft BU Pure LRIC Model, the hypothetical operator is assumed to have passive sharing, specified by geotype with a corresponding proportionate capital and operating cost saving. The extent of this sharing and the cost savings per site have been derived from data supplied by the Irish MSPs with capital and operating savings being determined from operator returns and international precedent.

3.185 Whilst national roaming exist in Ireland (for example, H3GI's arrangement with Vodafone for 2G rural coverage), national roaming has not been explicitly included as part of this analysis as the hypothetical market being modelled is assumed to contain four mature network operators and therefore includes no specific national roaming traffic.

3.186 While there is evidence of active network sharing agreements between operators in Ireland, ComReg is of the view that the Draft BU Pure LRIC Model for the hypothetical efficient operator should not include any cost savings deriving from active sharing at this stage.

3.187 The incentive to enter into active sharing agreements tend to be greater for smaller MNOs that are in the process of building up market share and which consequently do not enjoy sufficient economies of scale in certain parts of their network. However, the Draft BU Pure LRIC Model is for a hypothetical efficient existing network operator that is assumed to have achieved a significant market share across all geotypes. Such an operator, having already achieved efficient scale, would not have the same incentive to exploit active sharing agreements. Therefore, ComReg believe that it is appropriate to assume no active sharing in the Draft BU Pure LRIC Model.

3.188 The approach to network sharing adopted in the Draft BU Pure LRIC Model, with some passive sharing but no active sharing, is similar to approaches adopted in another jurisdictions, namely the UK.

3.189 For example, in the 2011 Ofcom model the issue of network sharing between operators was addressed as follows;

> *"All of the mobile operators in the UK currently use passive network element sharing to some extent (known as 'site sharing'), and we believe that an efficient operator would continue to extend the amount of site sharing in its network. Functionality has therefore been added to the model to assess the effects of a move by operators to increase the amount of site sharing. This action leads to a reduction in operating costs, though it is also accompanied by the additional one-off costs of moving from dedicated sites to shared sites. These costs cover decommissioning old sites, moving equipment and any necessary upgrades to the shared sites.*
>
> *Mobile operators are also able to share active network elements. This is commonly referred to as active RAN sharing, and has the potential to deliver greater cost savings than site sharing. However, there are significant technical and operational challenges with active RAN sharing, and only one pair of UK mobile operators (EE and H3G) are currently deploying active RAN sharing.*

We have therefore modelled a hypothetical average efficient operator with passive site sharing but without active RAN sharing[70]."

ComReg's Preliminary View

3.190 ComReg is of the preliminary view that the technological parameters adopted for modelling the hypothetical efficient mobile network for the purposes of calculating the costs of MTRs in Ireland are reasonable on the basis that:

- the classification of Ireland into urban, suburban and rural geotypes approximates the network economies faced by Irish mobile networks;
- the modified scorched node approach reflects a modern efficient network capable of being deployed by an Irish mobile operator;
- the coverage network is consistent with the actual coverage obtained by Irish mobile operators and is determined on a basis consistent with the 2009 Termination Rate Recommendation and international best practice;
- the assumptions regarding technology standards (2G and 3G in the access network and an IP core) represent appropriate MEAs for a hypothetical efficient Irish operator supplying MVCT and are also consistent with the 2009 Recommendation and international best practice;
- the parameters used to dimension the network (including busy hour percentages, routing factors, traffic conversion factors, utilisation factors and spectrum holdings) are appropriate for an efficient Irish MNO; and
- the degree of network sharing assumed in the Draft BU Pure LRIC Model is appropriate for setting an MTR price which will be reviewed after three years.

[70] Ofcom Wholesale Mobile Voice Call Termination, Modelling Annexes, page 5-6: http://stakeholders.ofcom.org.uk/binaries/consultations/mtr/statement/MCT_statement_Annex_6-10.pdf

3.7.13 Logical structure of modelled network

3.191 Having determined the relevant technological parameters to inform the Draft BU Pure LRIC Model, the next consideration is the logical structure of the modelled mobile network. The Draft BU Pure LRIC Model considers the pure LRIC incremental cost of MVCT therefore the Draft BU Pure LRIC Model includes the relevant elements that are used by voice services. Any elements dedicated, for example, to data services are not included on the basis that they do not contribute to the pure LRIC of voice services. This avoids introducing unnecessary calculations in the dimensioning, purchasing profile and cost attribution, for elements which are not related to MVCT and which cannot be considered as contributors to the pure LRIC of this service. Examples of data elements that are not modelled include the Gateway GPRS Support Node (GGSN) which allows the 2G and 3G networks to interface with the internet.

3.192 To be capable of deriving the pure LRIC for wholesale MVCT, the Draft BU Pure LRIC Model needs to be capable of determining the quantity of network elements that are required to meet the assumed levels of traffic load in both the full traffic scenario (including all mobile services) and in the traffic scenario for all mobile services excluding wholesale call termination.

3.193 To this end, the Draft BU Pure LRIC Model calculates the deployment of network equipment in terms of the following element groups:

- RAN;
- Core;
- Transmission; and
- Other.

3.194 The list of network elements contained in the Draft BU Pure LRIC Model is presented below with their corresponding classification into element groups and the classification of elements into cost apportionment groups.

Table 11: Network elements

Element code	Element name	Element group name
E01_001	Site	RAN
E01_002	BTS	RAN
E01_003	TRX	RAN
E01_004	BSC	RAN
E01_005	Node B	RAN
E01_006	3G radio	RAN
E01_007	RNC	RAN
E02_001	MSC-S	Core
E02_002	GMSC	Core
E02_003	MGW	Core

Element code	Element name	Element group name
E02_004	HLR	Core
E02_005	EIR	Core
E02_006	AuC	Core
E02_007	SMSC	Core
E02_008	MMSC	Core
E02_009	IN	Core
E02_010	NMC	Core
E02_011	Signalling platform	Core
E02_012	Number portability platform	Core
E03_001	Abis (BTS_BSC)	Tx (backhaul)
E03_002	IuCS (RNC_MGW)	Tx (backhaul)
E03_003	IuCS (RNC_MSC/VLR)	Tx (backhaul)
E03_004	Iur (RNC_RNC)	Tx (backhaul)
E03_005	Iub (NB_RNC)	Tx (backhaul)
E03_006	Nb (MGW_MGW)	Tx (core)
E03_007	E (MSC/VLR_GMSC)	Tx (core)
E03_008	A (BSC_MGW)	Tx (backhaul)
E03_009	Mc (MSS/VLR_MGW)	Tx (core)
E04_002	900MHz spectrum fees	Other
E04_003	1800MHz spectrum fees	Other
E04_004	2100MHz spectrum fees	Other
E04_005	Wholesale billing platform	Other
E04_006	VMS	Other

Source: Table 4, page 17, Deloitte Model Specification Document. Refer to Appendix D of Deloitte Model Specification Document for Glossary.

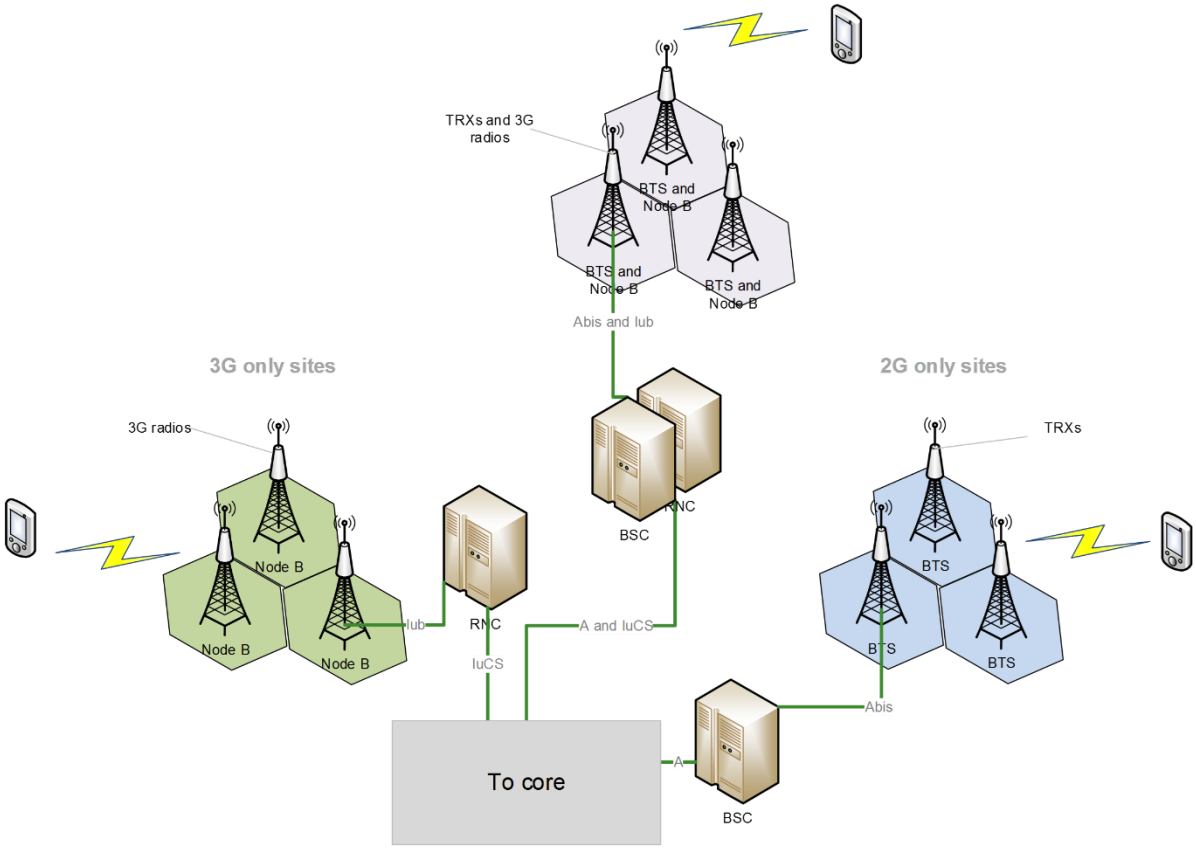
3.195 The following paragraphs provide a brief description of each of these network elements and outline the dimensioning rules and design parameters adopted in the Draft BU Pure LRIC Model. Further information is contained in section 5 of the Deloitte Model Specification Document.

3.7.14 Radio Access Network

3.196 The first element group considered is the RAN comprising the base station sites and equipment required to implement a radio access technology connecting the end user to the mobile core network.

3.197 The RAN network diagram is presented below.

Figure 5 – Logical RAN elements of the hypothetical efficient operator



Source: Figure 16, page 45, Deloitte Model Specification Document.

3.198 The RAN is modelled to include the following network elements:

- *Sites* – Sites are the physical premises and ancillary equipment at which a network node is located. The site may take a variety of forms including a rooftop location, or a plot of land. The site costs include towers and antennas, equipment shelters, power provision, security fencing etc.
- *BTS and TRX* - The Base Transceiver Station (BTS) is electronics equipment and antennae that together comprise a 2G access site. The Transceiver (TRX) is active network equipment that transmits (TX) and receives (RX) communication signals between user equipment and the mobile network. TRXs are part of the BTS, but as the number of TRX required can vary independently of the number of BTS, they are considered separately for this analysis.
- *Node B and 3G Radio* – This is the access node of the 3G network that transmits and receives communication signals from user equipment and the rest of the mobile network. The 3G radio serves the same purpose in the 3G network as the 2G TRX.
- *BSC* – The Base Station Controller (BSC) manages the BTS, assigning and controlling radio resources. The BSC also acts as a concentrator/switch between BTS and MSC. BSCs may be co-located with the MSC, or remote.

- RNC – The Radio Network Controller is the 3G counterpart to the BSC. It manages the Node Bs connected to it and carries out radio resource management and some of the mobility management functions.

3.199 In line with the market share assumptions outlined in section 3.5.3, the hypothetical operator is assumed to hold 900MHz and 1800MHz frequency blocks for 2G network provision and 2100MHz frequency blocks for 3G.

3.200 Although the hypothetical operator is assumed to deploy and operate an LTE network within the time horizon of the Draft BU Pure LRIC Model, for the reasons outlined in section 3.7.4, LTE network elements are not dimensioned, and spectrum holdings for LTE are also not included in this analysis.

3.201 A number of technical parameters and engineering rules are used to dimension the RAN for coverage 2G and 3G networks and capacity 2G and 3G network loads with the radio network being dimensioned for whichever is the greater of coverage or capacity requirements within each geotype and technology.

3.202 Network coverage area by geotype is defined for 2G and 3G separately based on operator-presented coverage areas. It is assumed that a 2G network remains active throughout the time horizon of the Draft BU Pure LRIC Model.

3.203 The main parameters that inform the dimensioning of the RAN are discussed in section 5 of the Deloitte Model Specification Document and include:

- land area and breakdown – the land area of Ireland is classified into urban, suburban and rural geotypes;
- network coverage – defined for 2G and 3G separately with assumed coverage areas based on operator's reported coverage areas;
- cell radii – calculated using operator parameters based on traffic load, the available spectrum, the re-use factor, the cell traffic capacity and the grade of service;
- traffic demand per cell – based on the average busy hour load per unit for each geotype, based on the served area and the split of total traffic per geotype;
- grade of service – for the 2G network calculated on the basis of an Erlang[71] B calculation for the number of available timeslots at a given busy hour grade of service; and
- equipment capacities – based on Irish operator data provided in response to ComReg's information request and including utilisation factors to take account of the maximum load factors that can be achieved relative to the theoretical design capacity of the element.

[71] An Erlang is a measurement of traffic - A 2G minute is assumed to be 1/60 of an Erlang.

3.204 As discussed in section 3.7.3, the costs of the coverage network are assumed to be fixed in relation to changes in traffic volumes and therefore will not be relevant to the pure LRIC cost for wholesale termination services. Nevertheless, a number of capacity-related RAN network elements including sites and equipment are sensitive to changes in traffic volumes and do contribute to the pure LRIC of termination.

Core network

3.205 The core network comprises the nodes and equipment necessary to provide the various services such as call routing, message transfer and internet access to the subscribers connected through the RAN.

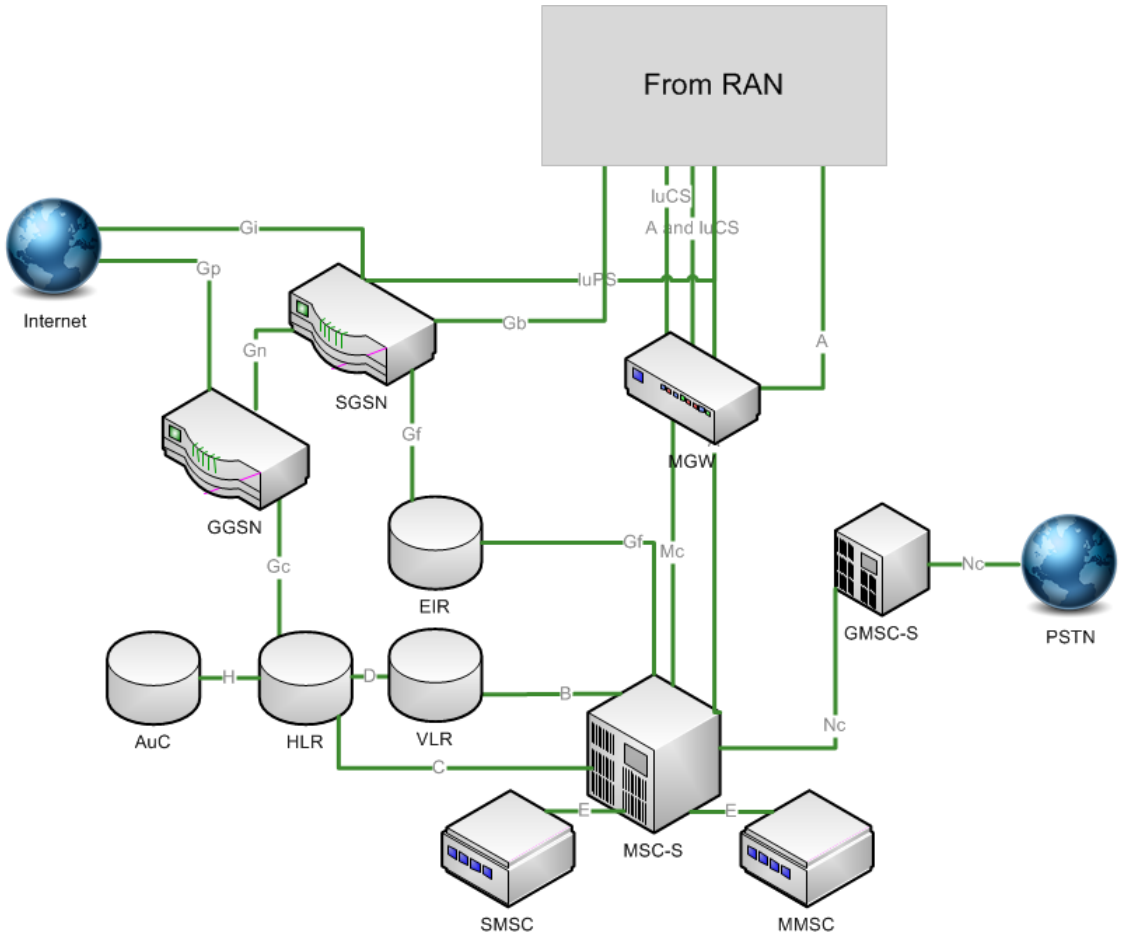
3.206 The 2009 Termination Rate Recommendation stipulates that the core network should be specified as NGN-based for the purposes of BU LRIC modelling of MTR costs.

3.207 As Irish operators have modern networks, an all IP-core appears to be a reasonable assumption for the hypothetical operator to deploy.

3.208 Moreover, it is assumed that a hypothetical network operator starting to roll out both 2G and 3G networks simultaneously in 2003 would have deployed core switches and transmission that are fully integrated and specified as being capable of switching both voice and data traffic.

On this basis the core network is modelled to include the network elements depicted in the following network diagram.

Figure 6 – Logical core elements of the hypothetical efficient operator



Source: Figure 17, page 46, Deloitte Model Specification Document.

- *MSC-S* – the mobile switch centre server co-ordinates traffic and routing across both 2G and 3G networks (assuming the core network is all IP), providing a range of subscriber-related services including location updates and call-related processing functions;
- *GMSC* – the gateway mobile switch centre provides switching functionality for traffic onto or off the network to other mobile networks or to fixed networks[72]
- *MGW* – the media gateway acts as a bridge between different networks (2G, 3G IP, etc.). It contains the switching matrix;
- *AuC* – the authentication centre validates network-attached SIM cards and holds the encryption key used to access the network;
- *HLR* – the home location register includes the hardware and software that manages the database of registered subscribers;
- *EIR* – the equipment identity register provides IMEI verification services;

[72] The number of GMSCs is determined on the basis of MSCs. It is entirely feasible that an operator would purchase MSCs with GMSC functionality built into the physical unit.

- *SMSC* – the short message switch centre receives and stores short messages sent to subscribers on the network;
- *MMSC* – the multimedia switch centre receives and stores multimedia messages sent to subscribers on the network;
- *NMC* – the network management centre is a central network monitoring location, to manage and analyse network performance and notify operators in case of major faults;
- *IN* – the intelligent network platform provides value-added traffic services, primarily related to voice calls. It works alongside the signalling platform and delivers services such as call screening, reverse charges and premium rate number provision;
- *Signalling platform* – this element includes equipment required to maintain the signalling network layer, providing network service functions such as routing, call set-up/tear down and transmitting call-related information;
- *Number portability platform* – this element includes the equipment and systems necessary to allow subscribers switch between operators while retaining the same number.

3.209 The various parameters that inform the dimensioning of core network elements are described in section 5 of the Deloitte Model Specification Document. In the case of a number of network elements such as the IN, Number Portability Platform, signalling platform and the NMC, it is assumed that one element of each is required over the time horizon of the Draft BU Pure LRIC Model and so the costs are not sensitive to changes in service volumes.

3.210 In the case of other network elements the quantities required are dimensioned on the basis of specific service volumes. For example, element quantities for the SMSC are the SMS throughput capacity per second while element quantities for the MMSC are the MMS throughput capacity per second.

3.211 In the case of the AuC, HLR and EIR network elements the dimensioning rule is informed by subscriber capacity while the MSC-S is dimensioned on the basis of busy hour call attempts and corresponding capacity with subscriber capacity included as a further dimensioning constraint.

3.212 Element quantities for the MGW are also dimensioned on the basis of busy hour call attempts and corresponding capacity. Busy hour call attempts are calculated in the Load Module on the basis of operator data and included with the addition of an uplift factor of 30% to capture the additional network load due to unsuccessful calls that are either busy or unanswered.

3.213 In the case of the core network, the network design parameters and dimensioning rules described above are such that core network elements are not showing any sensitivity to the changes in traffic volumes due to the removal of the wholesale call termination increment.

3.7.15 Transmission network

3.214 Transmission infrastructure connects the active equipment to ensure the transport of voice, message and data traffic between the different network equipment nodes.

3.215 The transmission in a mobile network can be further classified in terms of the backhaul and core transmission networks.

3.216 Backhaul links provide the transmission links in the access network and between the access and core networks and present a significant cost to the mobile operator.

3.217 Costs of backhaul can vary substantially depending on the network topology, traffic load and geographic conditions.

3.218 Backhaul links can be provisioned using a variety of technologies such as:

- self supply or leased line Ethernet links (via dark fibre or otherwise);
- self supply or leased line microwave radio i.e. wireless point-to-point or point-to-multipoint configuration; or
- self supply or leased line copper-based links

3.219 In modelling the backhaul network of the hypothetical efficient operator, actual operator data returns are used to inform the proportion of sites backhauled using the various media with microwave links and fibre links predominating.

3.220 The number of backhaul links is determined based on the number of sites and the proportion of these sites that are linked by microwave or fibre, in line with operator submissions. The relative mix of microwave and fibre backhaul in use is applied in the cost module to derive the average cost of backhaul.

3.221 The core network links are assumed to be operated on a national ring and to be entirely fibre-based. The Draft BU Pure LRIC Model assumes that there are seven nodes on the fibre ring, distributed across major Irish population centres and that the majority of core elements are collocated at these sites. Additional sites can be considered, dependent on the number of elements dimensioned for each logical link.

3.222 The extent of the transmission network will be determined by the number of nodes in the network, the capacity required to link these nodes and network management decisions such as the degree of redundancy and protection of the network.

3.223 As a consequence, transmission element dimensioning in the Draft BU Pure LRIC Model is undertaken using a combination of traffic demand assumptions and the results of network element dimensioning rules.

3.224 In determining the transmission requirements for the hypothetical operator the Draft BU Pure LRIC Model first calculates the 'downstream' network element throughput by estimating the port and link capacities required to serve the backhaul network by considering:

- the number and type of links required to serve the number and capacity of RAN network elements modelled (BTS, Node B, RNC, BSC, etc);
- the throughput capacities of the links required to serve the busy hour traffic profile; and
- the mix of transmission methodologies used to provision these links.

3.225 Once the 'downstream' network element throughput, port and link capacities are calculated it is then possible to calculate the next level of throughput for dimensioning the 'upstream' core transmission network requirements.

3.226 This methodology for determining the throughput requirement and capacity of transmission technologies is similar to those used in all other NRA models.[73]

3.227 The assumed dimensioning rules mean that the sensitivity of transmission costs to any changes in traffic demands will depend on the extent that the number of nodes in the different parts of the network and the capacity required to link those nodes is impacted by that change in demand.

3.228 For example, in the scenario where the hypothetical operator is not required to supply wholesale termination services, the RAN dimensioning rules could result in the Draft BU Pure LRIC Model estimating fewer sites and a reduction in the RAN equipment and capacity requirements. This will, in turn, lead to a reduction in the transmission requirements in the backhaul network with the associated changes in the costs of backhaul links contributing to the pure LRIC of wholesale termination.

[73] Various NRA models define differentiated transmission media mixes based on network technology and geotype classifications when dimensioning backhaul links. Examples include Portugal (ANACOM) and Romania (ANCOM).

3.229 Consequently the backhaul network elements in the RAN are the only transmission network elements that make a contribution to the pure LRIC of wholesale call termination.

3.7.16 Other elements

3.230 A number of other elements are also modelled including:

- *spectrum* – spectrum license fees represent the annual costs of a 2x1Mhz block of spectrum in the corresponding frequency;
- *wholesale billing platform* – the wholesale billing platform represents the costs associated with running billing systems associated with wholesale transactions; and
- *VMS* – Voice Mail System includes costs associated with maintaining the voicemail system.

3.231 As discussed in section 3.7.6 on the treatment of spectrum costs, the quantities of spectrum are defined for the hypothetical operator and assumed to be static across the Draft BU Pure LRIC Model time horizon[74]

3.232 The dimensioning outputs of the RAN elements are dependent, either directly or indirectly, on the quantity of spectrum held by the hypothetical operator. A reduction in the quantity of spectrum held by the hypothetical operator would, all else being equal, lead to a countervailing dampening in the quantity of active network elements required.

3.233 One billing platform is also assumed to be in place throughout the time horizon of the Draft BU Pure LRIC Model and billing costs are not assumed to vary in response to changes in traffic volumes.

3.234 VMS is dimensioned on the basis of subscriber capacity and the minimum elements required. Therefore it is not assumed to be sensitive to changes in traffic volumes.

3.235 The network design parameters together with the network dimensioning algorithm rules for the entire network elements included in the Draft BU Pure LRIC Model are outlined in more detail in section 5 of the Deloitte Model Specification Document.

ComReg's Preliminary View

3.236 ComReg is of the preliminary view that the network structure adopted in the Draft BU Pure LRIC Model is appropriate on the basis that:

[74] Except to the extent that a portion of the 1800MHz holding is refarmed for LTE use.

- the form of the Draft BU Pure LRIC Model comprising RAN, core, transmission and other network elements is consistent with the logical structure of a mobile network that would be deployed by a hypothetical efficient operator offering wholesale call termination services in Ireland;

- the design parameters and modelling algorithms are compatible with the demand and technological assumptions discussed in sections 3.7.1 to 3.7.16 above;

- the range and modularity of the network elements modelled is sufficient to estimate the pure LRIC of wholesale call termination on a mobile network using 2G and 3G technologies; and

- the dimensioning rules and network design parameters are appropriate for determining the quantity of elements that are required to be deployed each year in both the full traffic and without wholesale call termination traffic scenarios.

Q. 3 Do you agree with ComReg's preliminary views regarding the appropriateness of the technological parameters and the network structure (including network design parameters and dimensioning rules) used to model the hypothetical efficient operator's mobile network? Please provide reasons for your response, clearly indicating the relevant paragraph numbers to which your comments refer, along with relevant factual evidence supporting your views.

3.8 Network costs

3.8.1 Unit costs

3.237 Network element unit capex and opex costs need to reflect the costs that a mobile operator in Ireland would incur. For this reason the values used in the Draft BU Pure LRIC Model have been based on data collected from the Irish mobile network operators.

3.238 However, there are limitations in the data provided by operators. In some cases data is lacking entirely; in others it is incomplete or insufficiently granular for purposes of the Draft BU Pure LRIC Model. Where data is absent, unavailable, or incomplete, it has been necessary for ComReg and its advisers to exercise complex judgments and appreciation as to the relevant inputs and costs associated with them. Where appropriate, such judgment has also been exercised in the light of experience in other jurisdictions. The following table identifies those network elements for which ComReg and its advisors used data provided by the Irish mobile operators to guide its estimate of unit capex costs. A line item without a tick mark indicates that ComReg used its own estimates - having regard to the views of its advisors.

Table 12: Derivation of network element unit capex costs

Element code	Element name	Operator data used
E01_001	Site	✓
E01_002	BTS	✓
E01_003	TRX	✓
E01_004	BSC	✓
E01_005	Node B	✓
E01_006	3G radio	✓
E01_007	RNC	✓
E02_001	MSC-S	✓
E02_002	GMSC	
E02_003	MGW	✓
E02_004	HLR	✓
E02_005	EIR	
E02_006	AuC	
E02_007	SMSC	
E02_008	MMSC	
E02_009	IN	✓
E02_010	NMC	✓
E02_011	Signalling platform	
E02_012	Number portability platform	
E03_001	Abis (BTS_BSC)	✓
E03_002	luCS (RNC_MGW)	✓
E03_003	luCS (RNC_MSC/VLR)	✓
E03_004	lur (RNC_RNC)	✓
E03_005	lub (NB_RNC)	✓
E03_006	Nb (MGW_MGW)	✓
E03_007	E (MSC/VLR_GMSC)	✓
E03_008	A (BSC_MGW)	✓
E03_009	Mc (MSS/VLR_MGW)	✓
E04_002	900MHz spectrum fees	N/A

Element code	Element name	Operator data used
E04_003	1800MHz spectrum fees	N/A
E04_004	2100MHz spectrum fees	N/A
E04_005 E04_006	Wholesale billing platform VMS	

Source: ComReg and Deloitte

3.239 Where Irish mobile operators were able to provide element unit capex cost data, the average costs used by ComReg in the Draft BU Pure LRIC Model are within the upper and lower bounds of the actual averages of the Irish mobile operators. The Irish mobile operators provided very limited data on the unit opex costs of network equipment and, as a consequence, a ratio has been specified to estimate unit opex costs as a proportion of the unit capex for the various network elements, with the ratio set at 20%.

3.240 The unit capex site costs used in the Draft BU Pure LRIC Model are a weighted combination of macro and micro sites types as provided in the operator data request. As Irish mobile operators share sites and the Draft BU Pure LRIC Model allows for passive sharing, the average site costs were adjusted to reflect the effective cost saving available to Irish mobile operators due to site sharing[75].

3.241 The average unit costs used in the Draft BU Pure LRIC Model, together with the range of values provided by operators and the international comparisons have been included in Table 25 (Capex) and Table 26 (Opex) in section 6.1 of the Deloitte Model Specification Document. These unit costs represent the direct capex and opex costs associated with the network equipment. Mark-ups are subsequently applied to capture the costs of additional network support functions that are required to install, operate and maintain the equipment.

3.242 The indirect mark-ups represent costs such as power consumption, device cooling and maintenance tools and costs incurred in provisioning the network elements modelled and supporting the network.

3.243 As the mobile operators typically provided limited data on the appropriate level of mark-ups to apply to network equipment, an aggregate mark-up value was applied. For capex, this value is set at 40% and for opex the value is set at 20%.

[75] See section 6.1.2 of the Deloitte specification document for further information on the site costs used in the model.

3.244 As noted in section 6.1.1 of the Deloitte Model Specification Document, BU models developed by other European NRAs typically include an aggregate mark-up value across network elements.[76]

3.8.2 Indices

3.245 The unit capex and opex data provided by the network operators were for their most recent period of financial statements (typically 2012/13). As the Draft BU Pure LRIC Model determines the network equipment requirements and purchasing profiles over a 30-year period, it is necessary to identify an appropriate unit cost to apply to each year that is modelled.

3.246 Therefore, in order to obtain nominal capex and opex values by element, per year, capex and opex nominal price indices are applied to the 2013 values. These indices are intended to reflect the implied price index for the MEA of each element modelled.

3.247 For each element, the annual MEA price change is taken as constant over the time horizon of the Draft BU Pure LRIC Model, thus resulting in compound growth or decrease in nominal prices. These price trends, presented in Table 29 and Table 30 of the Deloitte Model Specification Document (page 70-71), display the annual percentage changes applied to each categorised group of elements and are based on indices observed in BU LRIC models developed by other European NRAs.

3.248 Most NRA models use a constant compounding growth of price indices for opex and capex. The tables below provide comparison to two other NRA models' price indices. The Draft BU Pure LRIC Model uses nominal price indices, as in Romania, as opposed to taken by ANACOM in Portugal which uses real price indices. This is in line with core calculations in the Draft BU Pure LRIC Model and presentation of preliminary MTRs in Nominal Terms. Further information on the use of price indices is contained in section 6.1.4 of the Deloitte Model Specification Document.

Romania (ANCOM), nominal rates

	Capex	**Opex**
Data servers	-6%	6%
Tx and switches	-6%	6%
Core	-6%	6%
Sites	11%	6%
3G radio and TRX	-6%	6%

[76] Examples include ANACOM, which uses indirect opex and capex mark-ups and Romania which specifies an opex mark-up.

Portugal (ANACOM), real rates		
	Capex	**Opex**
Data servers	-10%	-2% to 0%
Tx and switches	-8% to -4%	-15%
Core	-1%	-15%
Sites	1%	0%
3G radio and TRX	-6%	-5%

Table 13 Nominal Price Indices

Element index category	Nominal price indices CAPEX Annual Charge	OPEX
Data servers	-4%	-4%
Tx and switches	-3%	-2%
Core	-1%	-1%
Constant	0%	0%
Sites	2%	2%

Source: Table 29 and 30, page 70-71, Deloitte Model Specification Document

ComReg's Preliminary View

3.249 ComReg is of the preliminary view that the network elements costs included in the Draft BU Pure LRIC Model are appropriate on the basis that:

- the direct capex costs for each element are, as much as possible, based on information supplied by Irish MNOs and reflect the costs that would be incurred by a hypothetical efficient Irish operator;
- direct opex unit costs are a reasonable approximation of the efficient unit costs that would be incurred by an Irish MNO in 2013;
- the level of indirect mark-ups are appropriate for use in a BU pure LRIC model;
- the nominal indices applied in the Draft BU Pure LRIC Model for each element category reflect the implied price index for the MEA of each element; and
- the elements modelled have been correctly classified in each of the element categories.

Q. 4 Do you agree with ComReg's preliminary views regarding the appropriateness of the network element costs used to cost the hypothetical efficient operator's mobile network? Please provide reasons for your response, clearly indicating the relevant paragraph numbers to which your comments refer, along with relevant factual evidence supporting your views.

3.9 Implementation-Related Factors

3.9.1 Draft BU Pure LRIC Model Structure

3.250 One of the key issues to consider when implementing a Draft BU Pure LRIC Model is the model structure. The Draft BU Pure LRIC Model is required to estimate the costs of a hypothetical efficient operator in Ireland based on the technologies and spectrum bands actually used by Irish mobile operators.

3.251 To this end, the Draft BU Pure LRIC Model is composed of three distinct, but interlinked, calculation modules: the load module; the network module; and the cost module. Each module has a distinct set of inputs and the outputs from some of the modules serve as inputs to other modules.

Load module

3.252 This module includes actual historic demand levels for the period 2003 to 2013 and derives forecast demand projections for future years. It is used to determine the relevant network load for the modelled operator, on the basis of the operator market share, per subscriber traffic usage and the busy hour profile of traffic.

3.253 The load module calculates demand on the basis of annual traffic and busy hour as well as in original units, MB/s and for Erlangs.

3.254 The “Meta” worksheet in the load module is where the majority of the metamodel parameters are inputted. These include the definition of services, logical network elements, model time period, geotypes, common unit conversion factors and metadata of all model elements such as units of measure, hierarchy relationships, classifications/groupings and reference codes used as part of the model operation.

3.255 The load module is described in further detail in section 4 of the Deloitte Model Specification Document and the outputs of the load module are used in the remaining two modules.

Network module

3.256 This module uses network design parameters to dimension the number of logical network elements required to cater for the calculated network load and determines the replacement cycle of these elements, given the asset lives applied.

3.257 The number of required elements per year is then passed through a purchasing algorithm to determine the quantity of elements to be purchased each year to cater for the calculated network load. The number of elements required and the purchasing profile will depend on the traffic scenario as defined in the Draft BU Pure LRIC Model, e.g. total traffic or total traffic less the termination increment.

3.258 The network module is described in further detail in section 5 of the Deloitte Model Specification Document and the outputs of the load module are used in the cost module.

Cost module

3.259 This module takes the load outputs of service volumes and route factors as well as the network purchasing profile from the network module to calculate the long-run costs of relevant increments.

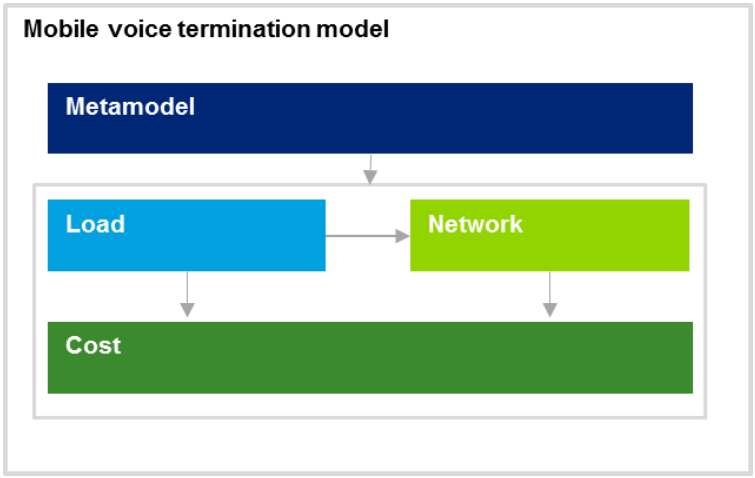
3.260 Outputs from the load and network modules are combined with unit capex prices, indirect mark-ups and prices indices to determine the annual expenditure associated with installing and maintaining the network dimensioned to support the specified network load.

3.261 These costs are profiled over the time horizon of the Draft BU Pure LRIC Model using an economic depreciation algorithm and apportioned to services. This module also contains the controls for the modelling functionality to run the Draft BU Pure LRIC Model with and without the termination increment, to determine the pure LRIC cost.

3.262 The Draft BU Pure LRIC Model structure together with the lists of modelled objects is described in section 3 of the Deloitte Model Specification Document and the load, network and cost modules are described in further detail in sections 4, 5 and 6 respectively.

3.263 A high-level representation of the flow of the Draft BU Pure LRIC Model is presented in the figure below.

Figure 7: High-level model logical flow



Source: Figure 6, page 14, Deloitte Model Specification Document.

3.9.2 Asset economic lifetime

3.264 Asset lives are used in the MTR cost model to inform when assets need to be replaced and so play a significant role in determining the overall level of capital expenditure incurred over the time period of the Draft BU Pure LRIC Model. The provision of mobile telecommunication services is a capital intensive exercise requiring significant levels of investment, upon which mobile network operators will seek to earn an economic return.

3.265 Assets are purchased to serve traffic load, and over time will need to be retired and replaced with new assets in the appropriate quantity as they reach the end of their economic life.

3.266 For this reason it is the economic life of the asset that needs to be considered when developing the Draft BU Pure LRIC Model. The economic life is a different concept of an asset life to that used by an operator for statutory accounting purposes.

3.267 Estimating the economic lifetime is complicated by the fact that the reasons for asset replacement are not always clear and can be influenced by a number of factors such as the end of vendor support, the availability of new technologies or changes to the level of service demand.

3.268 ComReg has estimated the asset lifetimes used in the Draft BU Pure LRIC Model following an analysis of operator data where a complete view of costs, utilisation and dimensioning parameters are available, and cross referencing these with asset lives used by other European NRAs.

3.269 Asset lives then serve as an input into the network purchasing algorithm in the network module to determine the quantity of assets that are required to be purchased each year to satisfy network load and to ensure the element purchasing profile aligns with major investment cycles.

3.270 It should be noted that the network elements listed in the Draft BU Pure LRIC Model are not directly comparable with the categories of asset lives considered by ComReg when reviewing Eircom's fixed network asset lives in Decision D03/09[77]. Decision D03/09 considered individual assets in a fixed network such as duct, poles, fibre/ copper cables and network equipment, while the Draft BU Pure LRIC Model considers network elements such as logical transmission links in a mobile network, which are an aggregate of cables, duct, and network equipment. However, in that Decision ComReg did direct an asset life of eight years for active equipment in exchanges or other conditioned areas and this is consistent with the asset lives adopted for similar categories of elements such as BTS and RNCs in the Draft BU Pure LIC Model.

3.271 The estimated asset lives and the associated assumptions in deriving them can be found in section 5.1.4 of the Deloitte Model Specification Document. The element purchasing algorithm is discussed in further detail in section 5.5 of the Deloitte Model Specification Document.

3.9.3 Capex and opex calculation

3.272 The element purchasing profile and element requirements determine the number of elements needed for the hypothetical mobile operator's network to provide the services demanded in both the full traffic and without wholesale termination scenarios.

3.273 The capital expenditures for each network element are calculated by taking the number of elements purchased in a given year and multiplying it by that year's unit price. The network element unit capex price is obtained from the 2013 value and indexed against the respective category, as discussed in section 3.8.1 above.

3.274 The model takes a similar approach in calculating operating expenditures. The annual opex value is derived by multiplying the required number of elements in operation each year by the relevant opex nominal unit price for that year. The formulas used in the capex and opex calculations can be found in section 6.1.5 of the Deloitte Model Specification Document.

[77] http://www.comreg.ie/_fileupload/publications/ComReg0965.pdf

3.275 Aggregating capital expenditures with operating expenditures provides the total nominal costs incurred by the network in a given year. Along with the service volumes, these are primary inputs to the economic depreciation calculation that is used to determine the pure LRIC MTR for each year.

3.9.4 Economic depreciation

3.276 Costs can be recovered over the lifetime of a model in numerous different ways. It is however impractical to consider a highly fluctuating recovery profile or one that is arbitrary in nature. ComReg has therefore adopted a cost recovery path that is in line with the revenues generated by the hypothetical efficient mobile operator over the time-frame of the Draft BU Pure LRIC Model.

3.277 The depreciation method is a key implementation tool in the MTR costing methodology. Depreciation methods can be classified into two categories, accounting and economic, shown below:

Accounting depreciation methods

3.278 Accounting depreciation methods (historic cost accounting (HCA) and current cost accounting (CCA)) distribute the costs of an investment in a systematic manner over the life of an asset.

3.279 Annuities do not evolve in a smooth way under accounting depreciation methods. The annuity faced by a late entrant would be very different from the annuity faced by an earlier entrant. This could cause significant issues for the development of competition if operators were basing their retail prices on the basis of these costs, an issue which is exacerbated when asset prices evolve over time.

Economic depreciation methods

3.280 Economic depreciation methods calculate annuities that evolve with expected income generated by the asset over the asset's useful life. These methods include (i) standard annuity, (ii) tilted annuity, (incl. modified tilted annuity) and (iv) economic depreciation.

Table 14 Depreciation methods used in regulatory cost models

	HCA	CCA	Tilted Annuity	Economic Depreciation
MEA cost today	✔	✔	✔	✔
Forecast MEA cost			✔	✔
Output of network over time				✔
Financial asset lifetime	✔	✔	✔	✔
Economic asset lifetime			✔	✔

Source: Analysys Mason Final Report for ANACOM, "Conceptual Approach for a mobile BU-LRIC model" 22nd September 2011[78].

3.281 The economic depreciation algorithm is implemented by discounting total costs, to obtain present value costs in 2013 values.[79] These are then divided by discounted traffic volumes, in order to obtain the cost per unit of traffic. It is then possible to derive nominal costs per unit of traffic in 2013 values for each modelled year. The costs in 2013 values are then multiplied by total volumes to obtain the full recovery of present value costs.

3.282 Economic depreciation assumes that the present value of the revenue stream from a service, such as the provision of mobile termination, equates to the present value of expenses incurred by the operator.

3.283 The economic depreciation approach in the Draft BU Pure LRIC Model needs to ensure that all efficiently incurred costs are recovered in an economically rational way. However the tilted annuity approach is not considered optimal as the mobile telecommunications market is considered to be a more dynamic one which is rapidly evolving.[80]

3.284 This facilitates estimation of the total revenues generated across the lifetime of the business in line with the efficiently incurred costs, which includes the cost of capital, all of which can be calculated in present value terms. The economic depreciation calculation is carried out at the network element level for aggregates of asset classes, and in line with this, the asset class specific price trends and element outputs are reflected in the components of total cost.

3.285 This methodology enables cost recovery to follow a smooth progression, via the use of economic depreciation, as traffic volumes and price indices (both of which determine the shape of the cost recovery process) have a smooth progression profile over time.

[78] http://www.anacom.pt/streaming/anexo3.pdf?contentId=1122402&field=ATTACHED_FILE
[79] These costs are discounted on the basis of the WACC, whereby costs for previous years are uplifted to reflect the increase in value in present value terms. Conversely, projections for costs in the future are worth less in present value terms, and are discounted accordingly.
[80] Evidently, there has been significant growth in the first ten years of the 30-year model, according to data submitted by Irish operators.

3.286 The Draft BU Pure LRIC Model then accumulates cost recovery on an annual basis, via economic depreciation, to achieve full cost recovery over the 30-year lifetime of the Draft BU Pure LRIC Model. The economic depreciation algorithm spreads the annualised expenditures in accordance with the following key components:

i. underlying equipment price trends;
ii. volume of termination traffic (variations in network output); and
iii. discount factor (ensuring cost of capital is accounted for).

3.287 Economic depreciation is ComReg's preferred approach as it is the only method that considers all of the following depreciation factors;

- ✓ MEA cost today;
- ✓ Forecast MEA cost;
- ✓ Financial asset lifetime[81];
- ✓ Economic asset lifetime; and
- ✓ Output of network over time.

3.288 Prior to the 2009 Termination Rate Recommendation, four other depreciation methods were under consideration for defining cost recovery, which were as follows: (1) historical cost accounting depreciation; (2) current cost accounting depreciation; (3) tilted annuities; and (4) economic depreciation.

3.289 Economic depreciation is the recommended approach by the European Commission for regulatory costing. ComReg is of the preliminary view that this is appropriate for the Draft BU Pure LRIC Model.

3.9.5 Treatment of inter-temporal effects

3.290 The use of economic depreciation in a pure LRIC model can encounter difficulty if the avoidable increment of demand is not uniformly proportionate over time.

3.291 Due to the potential for increased inter-temporal effects, cost recovery can reflect the profile of demand without wholesale termination applying to each network element.

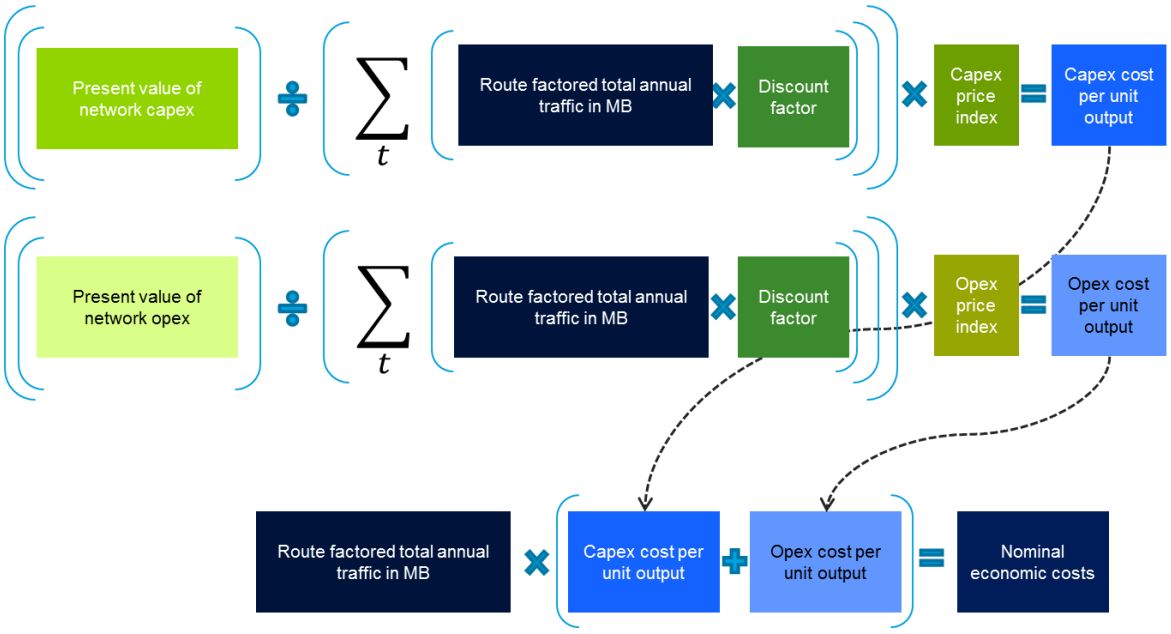
3.292 The above issue is avoided however by calculating the pure LRIC MTR from the present value difference in network expenditures that arise from the removal of the wholesale termination volume. These costs are then constrained over time so that the underlying equipment price trends can apply to the pure LRIC components of cost. In other words, the calculated MTR, based on a pure LRIC methodology, is directly constrained by the underlying equipment price trend over the time-frame of the Draft BU Pure LRIC Model.

[81] Economic depreciation can use financial asset lifetimes although economic lifetimes are preferred.

3.293 This ensures the elimination of the aforementioned inter-temporal effects by smoothing the cost recovery, while also ensuring the incremental costs are fully recovered.

3.294 The appropriateness of this methodology is also illustrated by the following example. In the initial years of network roll out there will be significant expenditure on sites but relatively little traffic carried on those sites as the operator works to build up its market share. Using the example of a site as a specific network element, this is resolved as follows: The effective discount for the site expenditure will be more heavily weighted towards the discounts that apply in the initial years of the Draft BU Pure LRIC Model while the effective discount for site service volumes will be more heavily weighted towards the discounts that apply in the later years.

Figure 7: High-level model logical flow



3.295 Figure 7 presents a stylised representation of the calculation procedure for the economic depreciation in the Draft BU Pure LRIC Model, which makes use of matrix multiplication.[82] Uppercase sigma indicates a sum across the time horizon (i.e. *t* stands for each year of calculation).

[82] It is appropriate to have the discount factor in both the numerator and denominator as the matrix is calculating the discounted value of total expenditure (numerator) and total service volumes (denominator) for each network element across the lifetime of the cost model. Even though the discount applied is the same in each particular year the effective discount in the matrix calculation will be different as the discount applied to the numerator will be weighted by the profile of expenditure against the network element across the lifetime of the model while the effective discount for the denominator will depend on the related profile of network service volumes across the lifetime of the model.

3.296 This calculation is performed for each individual network element. The total economic costs are thereby reflected by element outputs and asset-class-specific price trends.

3.297 An important assumption with economic depreciation in the context of a 30-year MTR model is that the hypothetical efficient mobile operator is assumed to be operating in perpetuity, with investment decisions made accordingly.

3.298 This implies that it is necessary to recover the costs over the lifetime of the business, rather than within a particular time frame.

3.299 The present value of the Euro in the final year of the Draft BU Pure LRIC 30-year model is considered to be minimal and therefore any perpetuity value beyond 30 years is regarded as immaterial to the calculated MTR.

3.300 The economic depreciation profile of network costs is designed to allow these costs to match the profile of total asset utilisation in the provision of services over the period of the Draft BU Pure LRIC Model.

3.301 In calculating the exhaustion of value (i.e. economic depreciation of network costs in the Draft BU Pure LRIC Model should match the profile of utilisation of the assets in the provision of services), network costs are thus depreciated more when network elements are used more intensively. Costs are therefore attributed in line with the usage profile of the network, which also incorporates future investments in line with expectations of changing network capacity. [83]

3.9.6 Time-frame of the Draft BU Pure LRIC Model

3.302 The Draft BU Pure LRIC Model, which is based on a hypothetical efficient existing Irish mobile operator, will use a time-frame of 30 years, specifically the period 2003-2032.

3.303 Typically, a Draft BU Pure LRIC Model should extend over a time-frame that is at least as long as the network element with the longest asset life. This is the rationale for MTR models often spanning a time-frame of 20-40 years in order to account for assets with a particularly long life i.e. sites, switch buildings and fibre infrastructure.

[83] This is consistent with the approach taken by the Portuguese NRA, ANACOM, which modelled economic depreciation expressed in real EUR and for discounted full time series over 45 years in real 2008 EUR. This is the same functional form of economic depreciation that has been applied in similar regulatory cost models such as Denmark, Norway and Belgium. This method was also satisfactorily tested by Ofcom during its economic depreciation considerations. Refer to ANACOM presentation: http://www.anacom.pt/streaming/Anexo2_Analysys_Mason.pdf?contentId=1099733&field=ATTACHED_FILE

3.304 Modelling over a time-frame beyond 40 years is also quite common in order to reflect at a minimum one full period of an asset with a long life. The majority of assets modelled will however be based on much shorter lifetimes. This Draft BU Pure LRIC Model time-frame also has the benefit of including more than one spectrum licence period.

3.305 The Draft BU Pure LRIC Model commences in 2003 to reflect a pivotal time period in the Irish mobile sector when the existing MNOs would either have commenced network roll out or initiated major network upgrades. This commencement date is also aligned to feedback from Irish MSPs.

3.306 In such instances that Irish operator-specific data is available back to 2003, these are considered in order to reflect the Draft BU Pure LRIC Model being based on a hypothetical efficient existing mobile operator who has gradually built up a market share of 25% over time.

3.307 While the MTR price control will be reviewed after 3 years, it is fundamentally important that the Draft BU Pure LRIC Model extends over a long time-frame in order to ensure full recovery of all costs, including those network elements which have a relatively long asset life.

3.9.7 Terminal value

3.308 The extended time-frame of the Draft BU Pure LRIC Model also has the benefit of addressing the issue of terminal values.

3.309 Terminal costs have a negligible impact on current costs in a similar way to extending the 30-year time horizon and are therefore not considered as part of the MTR calculation.

3.310 The inclusion of a terminal value would require further assumptions on revenue and cost growth rates.

3.311 To model the full recovery of costs within a short period of say 15 years would be an overly conservative assessment and would not reflect long-term investor incentives in the market.

3.9.8 Cost of capital

3.312 The Draft BU Pure LRIC Model requires a mobile-sector-specific cost of capital as an input parameter to the economic depreciation methodology. The underlying rationale is that this provides mobile operators with a reasonable rate of return on their investment. The cost of capital has been estimated in the form of a WACC using CAPM methodology.

3.313 ComReg is consulting separately on the mobile-sector-specific WACC, which is preliminarily estimated to be 8.66% (which figure has been used in the Draft BU Pure LRIC Model accordingly). This figure represents a nominal pre-tax WACC and incorporates an element of aiming up to reflect the asymmetries in consequences of underestimating the WACC. If this figure changes as a result of that WACC consultation, the final model will be updated accordingly.

3.314 ComReg proposes the cost of capital in the form of a nominal pre-tax "aimed-up" WACC of 8.66% in a separate consultation document published on the same date as this Consultation Document. As noted above, if this figure changes as a result of the separate WACC consultation, the final model will be updated accordingly.

3.315 The objective of including the WACC is to allow a sufficient return to investors and to provide an incentive for current or potential investment. In essence, it provides MSPs with a reasonable rate of return on investment at a rate that is specific to the mobile telecommunications sector.

3.316 The methodology is based on standard best practice and the preliminary WACC is subsequently implemented into the Draft BU Pure LRIC Model. As with the pure LRIC MTR, one single WACC is estimated for the mobile sector as it is based on a hypothetical efficient mobile operator in the Irish market, which is in turn applicable to each of the six SMP MSPs via the preliminary MTRs.

3.317 The WACC will be revised in line with future revisions of the Draft BU Pure LRIC Model, which will be subject to a further public consultation, estimated to be in 2017. There is, however, scope to reopen the public consultation process in the intervening period if there is believed to be good reason to review the parameters.

3.9.9 Nominal terms

3.318 The Draft BU Pure LRIC Model operates in nominal terms throughout the core calculations. Similarly, a nominal pre-tax WACC is incorporated into the calculations, with outputs also produced in nominal terms.[84]

3.319 The inherent inflation assumption ensures the MTR price control in nominal terms is easily understood and applied in an *ex ante* manner.

[84] This approach is consistent with approaches taken by other NRAs in countries such as France, Romania and Malta.

3.320 The alternative approach involves calculating MTRs in real terms, an approach taken by some European models[85], and subsequently adjusting the rate *ex post* to reflect actual inflation rates.

ComReg Preliminary View

3.321 ComReg is of the preliminary view that what is proposed is the optimal approach with regard to the following:

- The designated asset lives, based on its analysis of feedback from Irish market players on asset lives and cross referencing these with European averages.
- Its proposed approach to calculating the pure LRIC rate which is based on the relevant mobile services to be included in the increment.
- Its proposed treatment of terminal values in the Draft BU Pure LRIC Model is reasonable in light of the proposed 30-year model time-frame.
- This time-frame is considerably in excess of each of the asset lives, thereby facilitating an appropriate level of cost recovery.
- The presentation of MTRs in nominal terms, thereby avoiding the need for *ex post* inflation adjustments.

Q. 5 Do you agree with ComReg's preliminary views regarding the appropriate implementation approach in the Draft BU Pure LRIC Model? Please provide reasons for your response, clearly indicating the relevant paragraph numbers to which your comments refer, along with relevant supporting factual evidence.

[85] 2009 Termination Rates Recommendation, Recital 12.
For instance, Sweden (PTS), Norway (NPT), Portugal (ANACOM), and the UK (Ofcom) calculate the MTR in real terms and use a real WACC for discounting.

Chapter 4

4 Draft BU Pure LRIC Model Results

4.1 Overview

4.1 This section discusses the pure LRIC calculation, provides an overview of the Draft BU Pure LRIC Model results and outlines how the results will be used to inform the level of MTRs to be charged by Irish MSPs during the price control period.

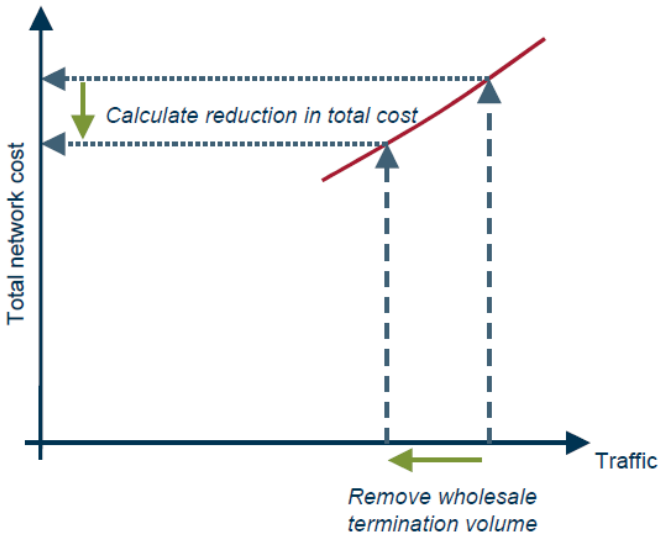
4.2 Pure LRIC calculation

4.2 In order to calculate the cost of a mobile termination call, the Draft BU Pure LRIC Model takes guidance from the 2009 Termination Rate Recommendation which states that "*it is justified to apply a pure LRIC approach whereby the relevant increment is the wholesale call termination service and which only includes avoidable costs*".

4.3 Pure LRIC allows the recovery of the costs incurred solely due to provision of the services in the wholesale termination increment but no common costs or overheads. On this basis, the Draft BU Pure LRIC Model thus derives the pure LRIC of the voice termination increment by incorporating a Visual Basics for Applications ('**VBA'**) macro to run the same cost model twice; once under the scenario of all service volumes and once under the scenario of all service volumes excluding voice termination traffic. The Draft BU Pure LRIC Model then calculates the difference as the pure LRIC output.

4.4 The impact on total network costs as a result of removing the wholesale traffic increment is represented in the following diagram.

Figure 8: Pure LRIC of wholesale termination



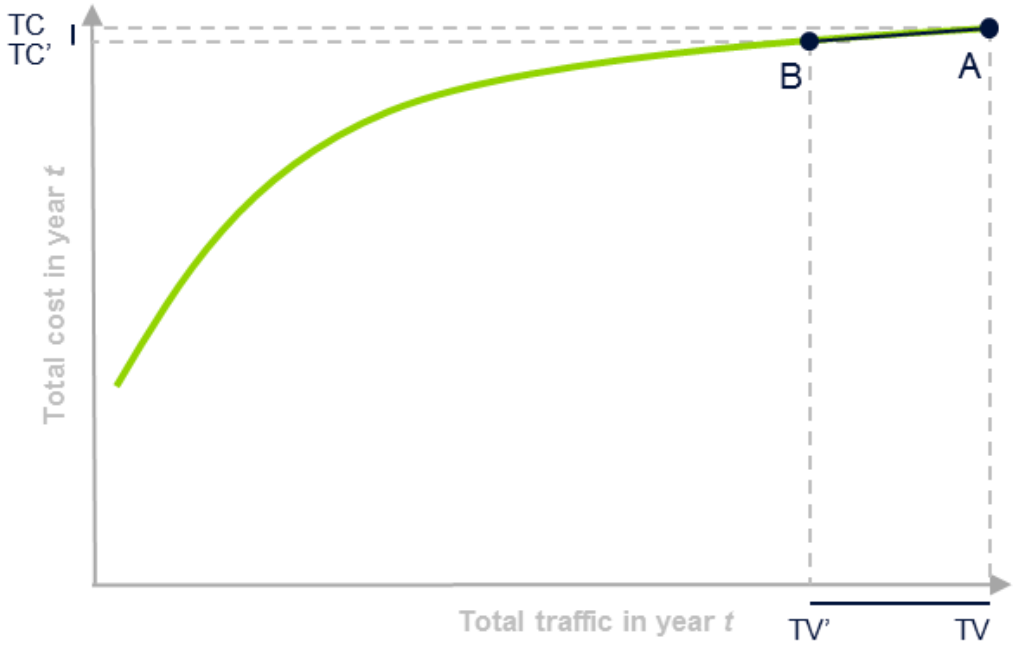
Source: ComReg[86]

4.5 The pure LRIC output therefore comprises both the service volumes associated with the wholesale termination increment and the network costs that are avoided if the wholesale termination increment is not provided by the operator. For this reason, pure LRIC costs are also referred to as the avoidable costs. The avoidable costs will be informed by the network dimensioning parameters, as these play a key role in determining to what extent, if any, the costs of a particular network element will change in response to a change in the service volumes supported by that element.

4.6 Figure 9 below portrays the definition of the pure LRIC on a diagram of total cost and volumes as they might apply for a network element that is dimensioned, either directly or indirectly, on the basis of service volumes. The difference between TV and TV' and between TC and TC' are the increment's volumes and costs. The gradient between points B and A represents the pure LRIC for year 't' as it quantifies the cost-volume relationship of the increment. It is the average cost of the additional increment.

[86] 2012 Price Control Decision, Chapter 7, Figure 7.6, page 180.

Figure 9 – Illustrative cost-volume relationship and pure LRIC



Source: Figure 4, page 12, Deloitte Model Specification Document

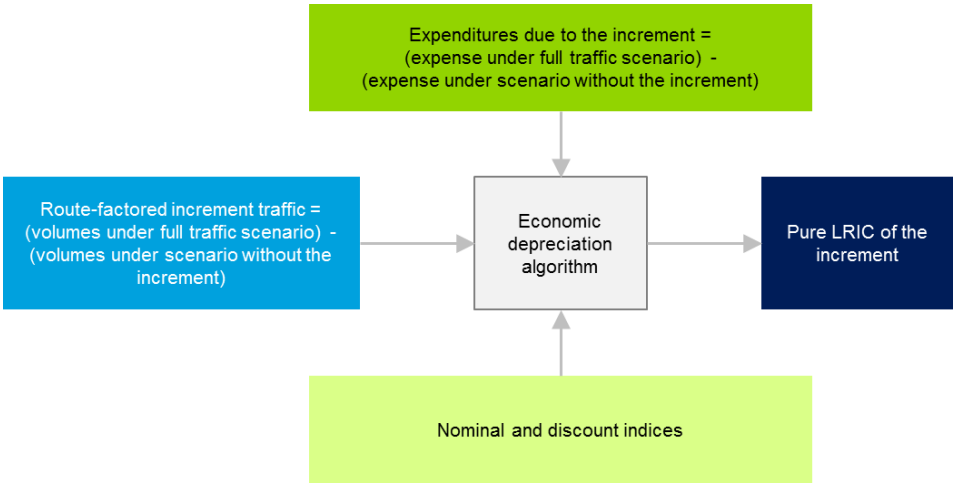
4.7 The Draft BU Pure LRIC Model estimates the cost per unit of the increment of interest. To do so the calculations in the Draft BU Pure LRIC Model estimate the volumes of all modelled services over the appropriate time period, dimension the appropriate network to support these volumes and attribute the costs of the resulting network to the underlying services that are supported. This calculation effectively corresponds to point A in the illustration of Figure 9.

4.8 To determine the pure LRIC, the Draft BU Pure LRIC Model is then re-run, without the increment of interest, effectively corresponding to point B of Figure 9. The difference in resulting costs is considered purely incremental to the increment of interest.

4.9 After the costs and volumes attributable to the increment are obtained for each network element, the economic depreciation algorithm is applied to obtain the pure LRIC of the increment over the time horizon of the Draft BU Pure LRIC Model. Dividing this value by the incremental volume yields the pure LRIC per unit of traffic (i.e. minutes in the case of the increment of interest in this Draft BU Pure LRIC Model).

4.10 This calculation is summarised in the figure that follows:

Figure 10 – Pure LRIC of voice termination calculation



Source: Figure 5, page 13, Deloitte Model Specification Document.

4.3 Draft BU Pure LRIC Model results

The following table contains a breakdown of the pure LRIC results produced by the Draft BU Pure LRIC Model for the years pertaining to the price control period.

Table 15 – Analysis of pure LRIC costs (Euro) by network element

Element	2014	2015	2016	2017	Average (2015-17)
Sites	0.0015	0.0015	0.0016	0.0016	
BTS – base transceiver station	0.0024	0.0022	0.0020	0.0018	
TRX - transceiver	0.0009	0.0008	0.0007	0.0006	
BSC – base station controller	0.0004	0.0004	0.0004	0.0003	
Node B - 3G equivalent of BTS	0.0001	0.0001	0.0002	0.0002	
3G radio - 3G equivalent of TRX	0.0002	0.0002	0.0003	0.0003	
RNC – radio network controller	-	-	-	-	
MSC-S – mobile switch centre	-	-	-	-	
GMSC – gateway mobile switch centre	-	-	-	-	
MGW – media gateway	-	-	-	-	

Element	2014	2015	2016	2017	Average (2015-17)
HLR – home location register	-	-	-	-	
EIR – equipment identity register	-	-	-	-	
MMSC – multimedia centre	-	-	-	-	
IN – intelligent network	-	-	-	-	
NMC – network management centre	-	-	-	-	
Signalling platform	-	-	-	-	
Number portability platform	-	-	-	-	
Transmission – backhaul links	0.0008	0.0008	0.0007	0.0007	
Transmission – core links	-	-	-	-	
Spectrum Fees	-	-	-	-	
Wholesale billing platform	-	-	-	-	
VMS - Voicemail system	-	-	-	-	
Total pure LRIC	**0.0064**	**0.0060**	**0.0057**	**0.0053**	**0.0057**
Wholesale termination minutes (m)	1,424.19	1,458.78	1,491.73	1,523.70	

Source: Deloitte Confidential Draft BU Pure LRIC Model

4.11 The Draft BU Pure LRIC Model results indicate that, based on a 25% market share assumption, the pure LRIC for MTR is declining year on year over the 3-year life of the price control. ComReg has also calculated an average rate for the price control period by weighting the pure LRIC rate for each year by the wholesale termination traffic volumes for each year to derive a weighted average rate per minute that can apply across the price control period.

4.12 ComReg has also modelled an operator with a 33% market share on the basis that the HG3I/ 02 merger proceeds and, as a result, the number of MNOs in the future would decline to three. Under this scenario, and a scenario whereby market share is 25% until 2013 and 33% thereafter, the preliminary pure LRIC MTRs are as follows:

Table 16 – Analysis of pure LRIC costs (Euro) under baseline scenario[87] and two alternative market share scenarios

Element	2015	2016	2017	Average 2015-2017
Total Pure LRIC (baseline 25% market share)	0.0060	0.0057	0.0053	0.0057
Scenario: 33% market share 2003-2032	0.0048	0.0045	0.0043	0.0045
Scenario: 25% until 2014 and 33% from 2014 until 2032	0.0056	0.0053	0.0050	0.0053

4.13 This indicates that a pure LRIC MTR based on a 33% market share assumption will be lower than if the pure LRIC MTR is based on a 25% market share assumption.

ComReg Preliminary View

4.14 The Draft BU Pure LRIC Model calculates the maximum MTR for Ireland on an annual basis. The draft MTRs based on the Draft BU Pure LRIC Model for 2014 – 2017 are listed below:

a. 0.64 Euro cent per minute for 2014;,

b. 0.60 Euro cent per minute for 2015;

c. 0.57 Euro cent per minute for 2016; and

d. 0.53 Euro cent per minute for 2017.

4.15 The average MTR for the price control period is 0.57 Euro cent per minute, based on the weighted[88] average for 2015, 2016 and 2017. ComReg is of the preliminary view that 0.57 Euro cent per minute should be the maximum MTR for Ireland over the period of the price control and until such time as the next review is in place. This is on the basis of the pure LRIC costs that a hypothetical efficient operator with a 25% market share would not incur if it did not have to provide wholesale call termination over the time frame of the price control period. ComReg is of the preliminary view that this method of pricing is more suitable than setting a single weighted average MTR over the price control period.

[87] A hypothetical efficient mobile operator in an Irish context is assumed to have a 25% market share.
[88] The weightings are based on the relative wholesale call termination volumes for each year.

Q. 6	Do you agree with ComReg's preliminary views regarding the maximum MTR that MSPs should charge for the forthcoming price control period? Please provide reasons for your response, clearly indicating the relevant paragraph numbers to which your comments refer, along with relevant factual evidence supporting your views.

Q. 7	In light of the preliminary results from the Draft BU Pure LRIC Model, do you believe that there is any other data that might be relevant? If so, please provide the data to ComReg. In particular, where available, please provide data which ComReg has been thus far unable to obtain from operators as indicated in Table 12 of this Consultation.

4.4 Notification procedures and Statements of Compliance

4.16 It is proposed that the decision instrument would come into effect on the date it is adopted, which will also be its date of publication. The decision instrument will be notified to the six SMP MSPs. It is expected that this will take place later this year. It is now proposed in the draft decision instrument annexed to this Consultation Document that the following notification requirements will apply.

4.17 All invoices and credit notes issued by SMP MSPs to any undertaking at the start of the month one month from the effective date in respect of MVCT shall comply with the new maximum MTR – this is to allow time *inter alia* for adjustment to billing systems.

4.18 Each SMP MSP shall pre-notify ComReg of its intention to amend its published MTR at least two months in advance of the amendment, unless otherwise agreed by ComReg.

4.19 Each SMP MSP shall furnish to ComReg - at the date of this pre-notification - a statement confirming that its proposed amended MTR complies with the maximum MTR calculated by reference to the Draft BU Pure LRIC Model.

4.20 This two month advance notification requirement does not apply to the initial amendment to MTRs referred to in paragraph 4.17 above. It would only apply to any amendment to MTRs intended to take effect on any date subsequently. In relation to the initial amendment, MSPs shall pre-notify ComReg of their intention to amend published MTRs on a particular date to be set out in the final decision instrument which date shall be one month after the effective date and shall at the same time notify ComReg of their compliance with the maximum MTR published in ComReg's final decision instrument.

In addition, MSPs shall also pre-notify Eircom for updates to the Switched Transit Routing and Price List ('**STRPL'**) (and every other undertaking with which that MSP has entered into a contract in respect of access to MVCT) of changes, if any, to MTRs 30 days in advance of any such changes. In relation to the initial change to MTRs which may be required to be made, MSPs shall pre-notify Eircom and other relevant undertakings on a particular date to be set out in the final Decision Instrument, which date shall be one month after the effective date.

Q. 8	Do you agree with ComReg's preliminary views regarding notification periods and statements of compliance? Please provide reasons for your response, clearly indicating the relevant paragraph numbers to which your comments refer, along with relevant factual evidence supporting your views.

Q. 9	Is there any other issue you wish to respond to relating to the issues discussed in this Consultation Document? Please provide reasons for your response, clearly indicating the relevant paragraph numbers to which your comments refer, along with relevant factual evidence supporting your views.

Chapter 5

5 Submitting comments

5.1 All comments are welcome to the consultation however it would make the task of analysing responses easier if comments were referenced to the relevant question numbers from this document.

5.2 The consultation period will run from 11 April 2014 to 23 May 2014 during which the Commission welcomes written comments on any of the issues raised in this paper.

5.3 Having analysed and considered the comments received, ComReg will review the main proposals set out in the consultation, amend if necessary in light of representations received and will then notify the draft measure to the European Commission, the NRAs and BEREC, pursuant to Regulation 13 of the European Communities (Electronic Communications Networks and Services) (Framework) Regulations 2011. ComReg will take utmost account of any comments received from the European Commission and will adopt and publish the final decision.

5.4 In order to promote further openness and transparency ComReg will publish all respondents' submissions to this consultation, subject to the provisions of ComReg's guidelines on the treatment of confidential information in ComReg Document No. 05/24. We would request that electronic submissions be submitted in an-unprotected format so that they can be appended into the ComReg submissions document for publishing electronically.

Please note:

5.5 ComReg appreciates that many of the issues raised in this paper may require respondents to provide confidential information if their comments are to be meaningful.

5.6 As it is ComReg's policy to make all responses available on its website and for inspection generally, respondents to consultations are requested to clearly identify confidential material and place confidential material in a separate annex to their response.

5.7 Such Information will be treated subject to the provisions of ComReg's guidelines on the treatment of confidential information as set out in ComReg Document No. 05/24.

Annex: 1 Draft Decision Instrument

1. STATUTORY POWERS GIVING RISE TO THIS DECISION INSTRUMENT

A 1.1 This Direction and Decision Instrument (hereinafter "Decision Instrument") relates to a further specification of the cost orientation obligation imposed by the Commission for Communications Regulation ("ComReg") under Section 12.1 of the Decision Instrument annexed to ComReg Decision D11/12 at Appendix I.

A 1.2 This Decision Instrument is made:

i. Pursuant to Regulations 8, 13 and 18 of the Access Regulations;

ii. Pursuant to and having regard to the Significant Market Power (SMP) designations on H3GI, Meteor, Lycamobile, Telefónica, Tesco Mobile and Vodafone in the Relevant Markets as provided for in Section 5.1 of the Decision Instrument annexed to ComReg Decision D11/12;

iii. Pursuant to and having regard to the cost orientation obligation imposed on each of H3GI, Meteor, Lycamobile, Telefónica, Tesco Mobile and Vodafone by Section 12.1 of the Decision Instrument annexed to ComReg Decision D11/12;

iv. Having had regard to the functions and objectives of ComReg as set out in sections 10 and 12 of the Communications Regulation Act 2002, as amended and Regulation 16 of the Framework Regulations and Regulation 6 of the Access Regulations;

v. Having, where appropriate, pursuant to section 13 of the Communications Regulation Act 2002, as amended, complied with policy directions made by the Minister for Communications, Marine and Natural Resources;

vi. Having taken into account the requirements of Regulation 13 of the Access Regulations;

vii. Having taken the utmost account of the 2009 Termination Rate Recommendation;

viii. Having had regard to the market definition, market analysis and reasoning in the consultation entitled "Market Review – Voice Call Termination on Individual Mobile Networks" (ComReg Document No. 12/46) and in the Response to Consultation and Decision Document entitled "Market

Review: Voice Call Termination on Individual Mobile Networks" (ComReg Decision D11/12, Document No. 12/124);

ix. Having regard to the analysis and reasoning set out in the consultation and draft decisions document entitled "Voice Termination Rates in Ireland: Proposed Price Control for Fixed and Mobile Termination Rates" (ComReg Document No. 12/67);

x. Having taken account of the submissions received from interested parties in relation to "Voice Termination Rates in Ireland: Proposed Price Control for Fixed and Mobile Termination Rates" (ComReg Document No. 12/67) following a public consultation pursuant to Regulation 12 of the Framework Regulations;

xi. Having regard to the analysis and reasoning set out in ComReg Decision D12/12, and in particular having regard to the choice of Pure LRIC made in that Decision;

xii. Having regard to the analysis and reasoning set out in the consultation and draft decision ComReg Document No. 14/29;

xiii. Having taken account of the submissions received from interested parties in relation to ComReg Document No. 14/29following a public consultation pursuant to Regulation 12 of the Framework Regulations; and

xiv. Having made the draft measure and the reasoning on which the measure is based accessible to the European Commission, BEREC and the national regulatory authorities in other EU Member States pursuant to Regulation 13 and Regulation 14 of the Framework Regulations and having taken account of any comments made by these parties.

A 1.3 The provisions of the Response to Consultation and Final Decision document entitled "Mobile and Fixed Voice Call Termination Rates in Ireland" (ComReg Decision D12/12, Document No. 12/125), the Response to Consultation and Final Decision document entitled "Market Review: Voice Call Termination on Individual Mobile Networks" (ComReg Decision D11/12, ComReg Document No. 12/124), the Consultation and Draft Decision document ComReg Document No. 14 and the Response to Consultation and Final Decision Document entitled [X] ComReg Decision D14/X, ComReg Document No 14/X [**The Decision**] shall, where appropriate, be construed with this Decision Instrument. For the avoidance of doubt, however, to the extent that there is any conflict between a decision instrument dated prior to the Effective Date and this Decision Instrument, it is the latter which shall prevail.

PART I - GENERAL PROVISIONS (SECTIONS 2 and 3 OF THE DECISION INSTRUMENT)

2. DEFINITIONS

A 1.4 In this Decision Instrument, unless the context otherwise suggests:

"**2009 Termination Rate Recommendation**" means the recommendation published by the European Commission on 7 May 2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU (2009/396/EC) (OJ L124/67 20.5.2009);

"**Access**" shall have the same meaning as under Regulation 2 of the Access Regulations, as may be amended from time to time; for the purposes of this Decision Instrument Access shall include access to Mobile Voice Call Termination;

"**Access Regulations**" means the European Communities (Electronic Communications Networks and Services) (Access) Regulations 2011 (S.I. No. 334 of 2011), as may be amended from time to time;

"**Authorisation Regulations**" means the European Communities (Electronic Communications Networks and Services) (Authorisation) Regulations 2011 (S.I. No. 335 of 2011), as may be amended from time to time;

"**BEREC**" means the Body of European Regulators for Electronic Communications, as established pursuant to Regulation (EC) No. 1211/2009 of the European Parliament and of the Council of 25 November 2009;

"**Bottom Up Pure Long Run Incremental Costs**" or "**BU Pure LRIC**" means the methodology used to estimate the Pure LRIC of an efficient operator which is derived from an economic/engineering model of an efficient network;

"**Bottom Up Pure Long Run Incremental Costs Model**" or "**BU Pure LRIC Model**" means the model, as may be amended from time to time, used by ComReg to set MTRs in Ireland and as will be furnished electronically by ComReg to each SMP Mobile Service Provider together and contemporaneous with this Decision Instrument. The operation and details of the BU Pure LRIC Model are more particularly described in Chapter XX of ComReg Decision 14/XX **[The Decision];**

"Communications Regulation Act 2002, as amended" means the Communications Regulation Act 2002 (No. 20 of 2002), as amended by the Communications Regulation (Amendment) Act 2007 (No. 22 of 2007), the Communications Regulation (Premium Rate Services and Electronic Communications Infrastructure) Act 2010 (No. 2 of 2010) and the Communications Regulation (Postal Services) Act 2011 (No. 21 of 2011);

"**ComReg**" means the Commission for Communications Regulation, established under section 6 of the Communications Regulation Acts 2002 as amended, as may be amended from time to time;

"**ComReg Decision D11/12**" means ComReg Document No. 12/124 entitled "Market Review: Voice Call Termination on Individual Mobile Networks" dated 21 November 2012;

"**ComReg Decision D12/12**" means ComReg Document No. 12/125 entitled "Mobile and Fixed Voice Call Termination Rates in Ireland" dated 21 November 2012;

"ComReg Decision D14/XX" means ComReg Document No. 14/XX entitled X dated Y **[The Decision];**

"ComReg Document No. 14/29" means ComReg Document Number 14/29 entitled "Mobile Termination Rates: Draft Bottom Up Pure Long Run Incremental Cost Model" dated 11 April 2014;

"**Effective Date**" means the date set out in Section 7.1 of this Decision Instrument;

"**End-User(s)**" shall have the same meaning as under Regulation 2 of the Framework Regulations, as may be amended from time to time;

"**Framework Directive**" means Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services, as amended by Directive 2009/140/EC of the European Parliament and of the Council of 25 November 2009;

"**Framework Regulations**" means the European Communities (Electronic Communications Networks and Services) (Framework) Regulations 2011 (S.I. No. 333 of 2011), as may be amended from time to time;

"**H3GI**" means Hutchison 3G Ireland Limited and its subsidiaries, and any undertaking which it owns or controls and any undertaking which owns or controls it, and its successors, affiliates and assigns;

"**Interconnection**" shall have the same meaning as under Regulation 2 of the Access Regulations, as may be amended from time to time;

"**Lycamobile**" means Lycamobile Ireland Limited and its subsidiaries, and any undertaking which it owns or controls and any undertaking which owns or controls it, and its successors, affiliates and assigns;

"**Meteor**" means Meteor Mobile Communications Limited and its subsidiaries, and any undertaking which it owns or controls and any undertaking which owns or controls it, and its successors, affiliates and assigns;

"**Mobile Network**" means a digital wireless cellular network using radio frequency spectrum in any of the 900 MHz, 1800 MHz and/or 2100 MHz Bands or other radio frequency spectrum bands as assigned by ComReg to an Undertaking from time to time;

"**Mobile Number(s)**" shall have the same meaning as set out in the National Numbering Conventions, as may be amended from time to time. The current meaning of a Mobile Number is a number from the Irish national numbering scheme commencing with the network code 08X, where X can represent any digital character 0-9, except 1. For the avoidance of doubt, Mobile Number shall include both a Mobile Number which is the subject of a Primary Allocation/Reservation and a Mobile Number which is the subject of a Secondary Allocation/Reservation;

"**Mobile Service Provider**" or "**MSP**" means an Undertaking providing End-Users with land based/terrestrial publicly available mobile voice telephony services using a Mobile Network;

"**Mobile Termination Rate(s) (MTR(s))**" means the wholesale charge(s) levied by a Mobile Service Provider for the supply of MVCT;

"**Mobile Voice Call Termination (MVCT)**" means the provision by a Mobile Service Provider of a wholesale service to other Undertakings for the purpose of terminating incoming voice calls to Mobile Numbers in respect of which that Mobile Service Provider is able to set the MTR. For the avoidance of doubt, the provision of MVCT involves the provision of an Interconnection service;

"**National Regulatory Authority**" or "**NRA**" shall have the same meaning as under Regulation 2 of the Framework Regulations, as may be amended from time to time;

"**Primary Allocation/Reservation**" shall have the same meaning as under the National Numbering Conventions, as may be amended from time to time. The current meaning of Primary Allocation/Reservation is the direct allocation or reservation of numbers by the Numbering Plan Management to individual network operators, service providers or users;

"**Pure Long Run Incremental Costs**" or "**Pure LRIC**" means those costs and only those costs which would be avoided in the long run if a SMP Mobile Service Provider were to cease to provide MVCT. For the avoidance of doubt, it excludes all costs which are common to the provision of MVCT and to other services;

"**Relevant Markets**" means all of the markets defined in Section 4.2 of the Decision Instrument annexed to ComReg Decision D11/12;

"**Secondary Allocation/Reservation**" shall have the same meaning as under the National Numbering Conventions, as may be amended from time to time. The current meaning of Secondary Allocation/Reservation is the allocation or reservation

of numbers to a downstream Undertaking or to an End-User, by an Undertaking to whom a Primary Allocation/Reservation has already been made. For the avoidance of doubt, a downstream Undertaking in this context includes any Undertaking other than the Undertaking to whom the Primary Allocation/Reservation was made;

"**Significant Market Power (SMP) Mobile Service Provider**" means a Mobile Service Provider designated with SMP in Section 5 of the Decision Instrument annexed to ComReg Decision D11/12, namely H3GI, Lycamobile, Meteor, Telefonica, Tesco Mobile and Vodafone;

"**Telefonica**" means Telefonica Ireland Limited and its subsidiaries, and any undertaking which it owns or controls and any undertaking which owns or controls it, and its successors, affiliates and assigns, including Liffey Telecom, but excluding, for the purposes of this Decision Instrument, Tesco Mobile;

"**Tesco Mobile**" means Tesco Mobile Ireland Limited and its subsidiaries, and any undertaking which it owns or controls and any undertaking which owns or controls it, and its successors, affiliates and assigns, but excluding for, the purposes of this Decision Instrument, Telefonica;

"**Undertaking**" shall have the same meaning as under Regulation 2 of the Framework Regulations, as may be amended from time to time;

"**Vodafone**" means Vodafone Ireland Limited and its subsidiaries, and any undertaking which it owns or controls and any undertaking which owns or controls it, and its successors, affiliates and assigns;

"**900 MHz Band**" means the 880 to 915 MHz band of radio frequency spectrum paired with the 925 to 960 MHz band of radio frequency spectrum;

"**1800 MHz Band**" means the 1710 to 1785 MHz band of radio frequency spectrum paired with the 1805 to 1880 MHz band of radio frequency spectrum; and

"**2100 MHz Band**" means the 1900 to 1920 MHz band of radio frequency spectrum, and the 1920 to 1980 MHz band of radio frequency spectrum paired with the 2110 to 2170 MHz band of radio frequency spectrum.

3. SCOPE AND APPLICATION

A 1.5 This Decision Instrument applies to H3GI, Lycamobile, Meteor, Telefónica, Tesco Mobile and Vodafone.

A 1.6 This Decision Instrument is binding upon H3GI, Lycamobile, Meteor, Telefónica, Tesco Mobile and Vodafone and each such SMP Mobile Service Provider shall comply with it in all respects.

A 1.7 This Decision Instrument relates to a further specification of the cost orientation obligation imposed by ComReg under Section 12.1 of the Decision Instrument annexed to ComReg Decision D11/12 in relation to the Relevant Markets.

PART 2 – Further Specification of the Price Control Obligation (SECTION 4 OF THE DECISION INSTRUMENT)

4. FURTHER SPECIFICATION OF THE OBLIGATIONS RELATING TO PRICE CONTROL

A 1.8 Pursuant to Regulation 13 of the Access Regulations and in accordance with Section 12.1 of the Decision Instrument annexed to ComReg Decision D11/12, each SMP Mobile Service Provider is subject to a cost orientation obligation as regards MTRs and prices charged by the SMP Mobile Service Provider to any other Undertaking for Access to or use of those products, services or facilities referred to in Section 8 of the Decision Instrument annexed to ComReg Decision D11/12.

A 1.9 Pursuant to Regulations 13 and 18 of the Access Regulations each SMP Mobile Service Provider shall ensure that its MTR is no more than the rate determined in accordance with the [Draft] BU Pure LRIC Model and set out in the table below.

From XX onwards	BU Pure LRIC MTRs (€ cent per minute)
MTR	0.57

A 1.10 With effect from [date to be inserted] [this date to be the start of the first month which begins one month from the effective date] each SMP Mobile Service Provider shall apply Section 4.2 to all invoices/credit notes issued by it to any Undertaking in respect of MVCT.

A 1.11 Notwithstanding and without prejudice to the obligations imposed on each SMP Mobile Service Provider in Section 11.5 of the Decision Instrument annexed to ComReg Decision D11/12, unless otherwise agreed with ComReg, each SMP Mobile Service Provider shall pre-notify ComReg of its intention to amend its published MTR either (i) not less than 2 months in advance of the date on which any such proposed amendment is expected to come into effect; or (ii) on [date to be inserted][this date to be one month from the effective date of the decision]; whichever date is later.

A 1.12 Each SMP Mobile Service Provider shall furnish to ComReg - at the date of the pre-notification provided for in Section 4.4 - a statement confirming that its proposed amended Mobile Termination Rate complies with Section 4.2 of this Decision Instrument.

A 1.13 Without prejudice to Section 11.5.2 of the Decision Instrument annexed to ComReg Decision D11/12, and for the avoidance of doubt, each SMP Mobile Service Provider shall notify Eircom (and every other Undertaking with which that SMP Mobile Service Provider has entered into a contract in respect of Access to MVCT) either (i) not less than 30 calendar days in advance of the date on which any amendment to its published MTR is expected to come into effect; or on [date to be inserted] [this date to be one month from the effective date of the decision]; whichever date is later.

A 1.14 Without prejudice to section 4.2, ComReg may review and if necessary, amend the maximum prices for MTRs referred to in section 4.2, having regard to circumstances that it considers exceptional.

PART III - OPERATION AND EFFECTIVE DATE (SECTIONS 5 TO 8 OF THE DECISION INSTRUMENT)

5. STATUTORY POWERS NOT AFFECTED

A 1.15 Nothing in this Decision Instrument shall operate to limit ComReg in the exercise and performance of its statutory powers or duties conferred on it under any primary or secondary legislation (in force prior to or after the Effective Date of this Decision Instrument).

6. MAINTENANCE OF OBLIGATIONS

A 1.16 Unless expressly stated otherwise in this Decision Instrument, all obligations and requirements contained in Decision Notices and Directions made by ComReg applying to the SMP Mobile Service Providers and in force immediately prior to the Effective Date of this Decision Instrument, are continued in force by this Decision Instrument and the SMP Mobile Service Providers shall comply with same.

A 1.17 If any section, clause or provision or portion thereof contained in this Decision Instrument is found to be invalid or prohibited by the Constitution, by any other law or judged by a court to be unlawful, void or unenforceable, that section, clause or provision or portion thereof shall, to the extent required, be severed from this Decision Instrument and rendered ineffective as far as possible without modifying the remaining section(s), clause(s) or provision(s) or portion thereof of this Decision Instrument, and shall not in any way affect the validity or enforcement of this Decision Instrument.

7. WITHDRAWAL OF SMP OBLIGATIONS

A 1.18 Pursuant to Regulations 8, 13 and 18 of the Access Regulations, Section 12.2 of the Decision Instrument annexed to ComReg Decision D11/12 and the Decision Instrument contained at Annex 2 to ComReg Decision D12/12 are hereby withdrawn.

8. EFFECTIVE DATE

A 1.19 The Effective Date of this Decision Instrument shall be the date of this Decision Instrument which is the date of its notification to the SMP Mobile Service Providers and it shall remain in force until further notice by ComReg.

GERRY FAHY

COMMISSIONER

THE COMMISSION FOR COMMUNICATIONS REGULATION

X Day of X 2014

Annex: 2 Legal Basis

Obligations relating to the markets for voice call termination on individual mobile networks

A 2.1 By ComReg Decision D11/12, and pursuant to Regulations 25 to 27 of the Framework Regulations, ComReg designated Hutchison 3G Ireland Limited, Lycamobile Ireland Limited, Meteor Mobile Communications Limited, Telefónica Ireland Limited, Tesco Mobile Ireland Limited and Vodafone Ireland Limited (the "SMP Mobile Service Providers") as having significant market power ("SMP") on the markets for voice call termination on individual mobile networks (the "Mobile Termination markets").

A 2.2 Under Section 12 of the Decision Instrument annexed to ComReg Decision D11/12, and pursuant to Regulation 13 of the 2011 Access Regulations, ComReg imposed obligations relating to price control on the SMP Mobile Service Providers.

A 2.3 Pursuant to Regulation 18 of the Access Regulations, in this Document ComReg further specifies the obligations relating to price control contained in Section 12 of the Decision Instrument annexed to ComReg Decision D11/12.

Consultation Requirements

A 2.4 Regulation 12(3) of the 2011 Framework Regulations provides that, except in cases falling within Regulation 13(8) (i.e. exceptional cases involving urgency), before taking a measure which has a significant impact on a relevant market, ComReg must publish the text of the proposed measure, give the reasons for it, including information as to which of ComReg's statutory powers gives rise to the measure, and specify the period within which submissions relating to the proposal may be made by interested parties. Regulation 12(4) states that ComReg, having considered any representations received under Regulation 12(3), may take the measure with or without amendment. Regulation 12 of the 2011 Framework Regulations implements Article 6 of the Framework Directive.

A 2.5 Regulation 13(3) of the Framework Regulations provides that, upon completion of the consultation provided for in Regulation 12, where ComReg intends to take a measure which falls within the scope of Regulation 26 or 27 of the Framework Regulations, or Regulation 6 or 8 of the Access Regulations, and which would affect trade between Member States, it shall make the draft measure accessible to the European Commission, BEREC and the NRAs in other Member States at the same time, together with the reasoning on which the measure is based. Regulation 13 of the Framework Regulations implements Article 7 of the Framework Directive.

Annex: 3 Deloitte Draft BU Pure LRIC Model Specification Document

Questions

Section Page

Q. 1 Do you agree with ComReg's preliminary views regarding the appropriateness of the operator parameters and their application in the Draft BU Pure LRIC Model? Please provide reasons for your response, clearly indicating the relevant paragraph numbers to which your comments refer, along with relevant factual evidence supporting your views. 30

Q. 2 Do you agree with ComReg's preliminary views regarding the appropriateness of the service parameters and their application in the Draft BU Pure LRIC Model? Please provide reasons for your response clearly indicating the relevant paragraph numbers to which your comments refer, along with relevant factual evidence supporting your views. 38

Q. 3 Do you agree with ComReg's preliminary views regarding the appropriateness of the technological parameters and the network structure (including network design parameters and dimensioning rules) used to model the hypothetical efficient operator's mobile network? Please provide reasons for your response, clearly indicating the relevant paragraph numbers to which your comments refer, along with relevant factual evidence supporting your views. 69

Q. 4 Do you agree with ComReg's preliminary views regarding the appropriateness of the network element costs used to cost the hypothetical efficient operator's mobile network? Please provide reasons for your response, clearly indicating the relevant paragraph numbers to which your comments refer, along with relevant factual evidence supporting your views. 73

Q. 5 Do you agree with ComReg's preliminary views regarding the appropriate implementation approach in the Draft BU Pure LRIC Model? Please provide reasons for your response, clearly indicating the relevant paragraph numbers to which your comments refer, along with relevant supporting factual evidence. 85

Q. 6 Do you agree with ComReg's preliminary views regarding the maximum MTR that MSPs should charge for the forthcoming price control period? Please provide reasons for your response, clearly indicating the relevant paragraph numbers to which your comments refer, along with relevant factual evidence supporting your views. 92

Q. 7 In light of the preliminary results from the Draft BU Pure LRIC Model, do you believe that there is any other data that might be relevant? If so, please provide the data to ComReg. In particular, where available, please provide data which ComReg has been thus far unable to obtain from operators as indicated in Table 12 of this Consultation. 92

Q. 8 Do you agree with ComReg's preliminary views regarding notification periods and statements of compliance? Please provide reasons for your

response, clearly indicating the relevant paragraph numbers to which your comments refer, along with relevant factual evidence supporting your views. 93

Q. 9 Is there any other issue you wish to respond to relating to the issues discussed in this Consultation Document? Please provide reasons for your response, clearly indicating the relevant paragraph numbers to which your comments refer, along with relevant factual evidence supporting your views. 93