Suruhanjaya Komunikasi dan Multimedia Malaysia
Malaysian Communications and Multimedia Commission

PUBLIC INQUIRY PAPER

Review of Access Pricing

1 October 2012

This Public Inquiry Paper was prepared in fulfilment of Sections 58 and 61 of the Communications and Multimedia Act 1998.

CONTENTS

PREFACE

The Malaysian Communications and Multimedia Commission ("**SKMM"**) invites submissions from industry participants, other interested parties and members of the public on the questions and issues raised in this Public Inquiry Paper ("PI Paper") concerning the **Review of Access Pricing**. Submissions are welcome on the specific matters on which comment is sought and on the SKMM's preliminary views. Submissions are also welcome on the rationale and analysis in this PI Paper where no specific questions have been raised. Such submissions should be substantiated with reasons and, where appropriate, evidence or source references. Written submissions, in both hard copy and electronic form, should be provided to the SKMM in full by **12 noon, Wednesday, 14 November 2012**.

Submissions should be addressed to:

The Chairman
Malaysian Communications and Multimedia Commission
63000 Cyberjaya
Selangor

Attention: Ms Janakky Raju/ Ms Long Hui Ching/ Ms Karen Woo
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In the interest of fostering an informed and robust consultative process, the SKMM proposes to make submissions received available to interested parties upon request. The SKMM also reserves the right to publish extracts or entire submissions received. Any commercially sensitive information should be provided under a separate cover clearly marked '**CONFIDENTIAL**'. However, for any party who wishes to make a confidential submission, it would be of assistance if a "public" version of the submission were also provided (if possible).

The SKMM also proposes to conduct a public clarification session at which stakeholders may seek clarification on the issues raised in this PI Paper. The public clarification session will be held at the Auditorium of the SKMM, Cyberjaya, **on Wednesday, 24 October 2012 at 9.30am**.

Members of the public who wish to attend the clarification session should register with the SKMM on the above contact details by **12 noon on Tuesday, 16 October 2012**. Parties who wish to address questions to the SKMM during the session should also notify the SKMM of those questions in advance to the above contact details by **12 noon on Tuesday, 16 October 2012**. These questions will be made public for discussion during the session.

The cost models developed for this Public Inquiry are available, upon written request, to interested licensees for their own examination. Any confidential data has been removed, however, and for some cost models, only "blank" versions (no operator data) are available.

The SKMM thanks interested parties for their participation in this consultative process and looks forward to receiving written submissions.

ABBREVIATIONS AND GLOSSARY

2G	Second Generation mobile network standard (and service)
3G	Third Generation mobile network standard (and service)
Access List	The list of facilities and services determined by the SKMM under Chapter 3 of Part VI of the CMA, in respect of which the Standard Access Obligations apply
ALD 2005	Commission Determination on Access List, Determination No. 1 of 2005
ALD 2009	Variation to Commission Determination on Access List (Determination No. 1 of 2005), Determination No. 1 of 2009
BRAS	Broadband Remote Access Server
BSC	Base Station Controller
BTS	Base Transceiver Station
CAPM	Capital Asset Pricing Model
CMA	Communications and Multimedia Act 1998
DEL	Direct Exchange Line
DSL	Digital Subscriber Line
GSM	Global Standard for Mobile (see also 2G)
HSBB	High-Speed Broadband network by Telekom Malaysia pursuant to an agreement with the Government of Malaysia dated 16 September 2008
IP	Internet Protocol
IPTV	Internet Protocol Television
LRIC	Long-Run Incremental Cost
LTBE	Long-term benefit of end users
LTE	Long-Term Evolution, a mobile network standard
MAC	Media Access Control
MEA	Modern Equivalent Asset
MMS	Multimedia Message Service
Modem	Modulator-Demodulator
MSAP 2006	Commission Determination on the Mandatory Standard on Access Pricing, Determination No. 1 of 2006
MTR	Mobile (voice) termination rate (or price)
MVNO	Mobile Virtual Network Operator
NGN	Next Generation Network
Node B	A BTS in a 3G mobile network
NPOs	The National Policy Objectives for Malaysia's communications and multimedia industry, as set out in subsection 3(2) of the CMA
OLT	Optical Line Termination

ONU	Optical Network Unit
PI Paper	This Public Inquiry Paper
PON	Passive Optical Network
PPIT	*Persatuan Penyedia Infrastruktur Telekomunikasi Malaysia* (Telecommunications Infrastructure Providers Association of Malaysia)
PSTN	Public Switched Telephony Network
QoS	Quality of Service
RNC	Radio Network Controller
RSU	Remote Switching Unit
SAOs	Standard Access Obligations
SBC	State Backed Company
SIO	Services In Operation
SKMM	Malaysian Communications and Multimedia Commission (*Suruhanjaya Komunikasi dan Multimedia Malaysia*)
SMS	Short Message Service
TRX	Transmit-Receive Antennas
TSLRIC	Total Service Long-Run Incremental Cost
TSLRIC+	TSLRIC with mark-up for common business costs
USP	Universal Service Provision
VDSL	Very high-speed Digital Subscriber Line
VoIP	Voice Over Internet Protocol
WACC	Weighted Average Cost of Capital
WiMAX	Worldwide Interoperability for Microwave Access

EXECUTIVE SUMMARY

The SKMM is conducting this public inquiry to determine cost-based prices for the facilities and services on the Access List for the period 2013-2015 and to use these prices to set regulated rates for some of these facilities and services. The previous revision to cost-based prices occurred in 2006 and the mandated prices from that review have expired in the intervening period.

This PI Paper sets out the SKMM's preliminary views on which facilities and services on the Access List should be subject to price regulation and, where relevant, provides tables of proposed regulated prices for the period 2013-2015. The public inquiry seeks feedback from interested parties on a number of specific issues including SKMM's approach to developing economic cost models for specific services, particularly on use of the Long-Run Incremental Cost and the Building-block methodologies.

The fundamental guiding principles for price regulation are also described in this Paper. The SKMM considers price regulation to be important for some facilities and services in order to promote the long-term benefit of end users of telecommunications services and to support continuing competition in the industry.

The SKMM has been working with licensees since October 2011 to collect relevant data and to develop a series of 5 interlinked economic cost models that were used to calculate appropriate cost-based prices. For this public inquiry, the Access List facilities and services have been classified into 3 major categories: Fixed Services; Mobile Services; and Co-location and Infrastructure Sharing Services.

Fixed Services covers Fixed Origination and Termination Services, Transmission Services, Fixed Access Services (including Bitstream Services) and HSBB Services. For Fixed Origination and Termination, the proposed regulated prices have been calculated based on a Long-Run Incremental Cost model. They are, on average, lower than the current rates. The same model is used to calculate proposed regulated prices for Transmission Service at a variety of transmission rates. These prices are also generally lower than the rates set previously.

For most Fixed Access Services, the proposed regulated rates have been calculated based on a Building-block model of a copper access network. This would bring most Fixed Access Services within the regulated price regime for the first time. Feedback is welcomed on the use of an alternative price-setting method, namely retail-minus, for Bitstream Services and Digital Subscriber Line Resale Service.

The SKMM is also proposing to set a price point for HSBB wholesale services by setting regulated prices for one HSBB internet service. HSBB wholesale services have not previously been subject to price regulation. The proposed prices have been calculated using a Building-block model of the HSBB costs.

Mobile Services covers both cellular mobile and WiMAX services. The SKMM proposes to continue price regulation for Mobile Origination and Termination voice services, at lower average rates than currently in force. In addition, it is proposed to regulate WiMAX Origination and Termination voice services at the same rates as for Mobile voice.

Co-location and Infrastructure Sharing services include both Infrastructure Sharing and Network Co-location facilities and services. The SKMM proposes to set regulated prices for Infrastructure Sharing Service from a Building-block model based on extensive cost data provided primarily by tower or state-backed companies. In addition, the SKMM proposes to set regulated prices for Network Co-location Service based primarily on data provided by Mobile network operators.

The issues on which the SKMM particularly seeks comment are summarized at the beginning of this PI Paper. Written feedback on these and other relevant issues are welcome before the end of the public inquiry period. At the conclusion of this public inquiry, the SKMM will issue a PI Report and a Commission Determination of final regulated prices for the period 2013-2015.

SUMMARY OF ISSUES FOR COMMENT

The SKMM welcomes comment particularly on the following questions and issues raised in this PI Paper:

Table 1: Summary of questions and issues for comment

Number	Section	Question/Issue
1	4.1	The SKMM seeks comments on whether the criteria for *ex-ante* determination of access prices remain appropriate.
2	4.2	The SKMM seeks comments on whether the pricing guidelines are appropriate and whether there are any other criteria that should be considered.
3	4.3	The SKMM seeks comments on the appropriateness of setting regulated prices for the period up to and including 2015.
4	4.4	The SKMM seeks comments on the appropriateness of using glide paths and the method by which the glide path has been calculated.
5	4.5	The SKMM seeks comments on the appropriateness of using the cost model results in arbitrating disputes over access pricing.
6	5.2	The SKMM seeks comments on whether the choices made for TSLRIC models are appropriate.
7	6.1	The SKMM seeks comments on whether an alternative costing methodology to LRIC is more appropriate for fixed access.
8	6.2	The SKMM seeks comments on whether the building-block methodology is appropriate for the costing of fixed access.
9	7.1	The SKMM seeks comments on using the building-block approach to setting prices for co-location facilities and infrastructure-sharing services.
10	7.2	The SKMM seeks comments on the approach to setting prices for installation charges.
11	8.2	The SKMM seeks comments on the approach taken in dealing with Fixed Services and whether it provides a consistent view of the Fixed Services in Malaysia.
12	8.3	The SKMM seeks comments on the assumptions used to derive the WACC for Fixed Services; and its estimates of the disaggregated WACC values used for Fixed services.
13	9.7	The SKMM seeks comments on the proposed regulated prices for fixed network origination and termination services.

Number	Section	Question/Issue
14	9.8	The SKMM seeks comments on the treatment of small fixed operators in the setting of regulated prices.
15	10.5	The SKMM seeks comments on its approach to setting transmission prices and the proposed prices for transmission services.
16	10.5	The SKMM seeks comments on setting higher regulated prices for Transmission Service in East Malaysia and requests data on any additional costs that should be reflected in cost-based prices.
17	11.8	The SKMM seeks comments on which fixed access services, if any, should be subject to price regulation and on the reasonableness of the proposed maximum regulated prices.
18	11.8	The SKMM seeks comments on the alternative of using a retail-minus methodology for setting regulated prices for Digital Subscriber Line Resale Service and requests information on what would be the appropriate "minus" factor to be used in this methodology.
19	12.5	The SKMM seeks comments on its proposed approach to regulating prices for Bitstream Services and on the appropriateness of the proposed prices for some Bitstream Services.
20	12.5	The SKMM seeks comments on the alternative of using a retail-minus methodology for setting regulated prices for Bitstream Services and requests information on what would be the appropriate "minus" factor to be used in this methodology.
21	13.5	The SKMM seeks comments on the forecast take-up and service demands for the HSBB network.
22	13.6	The SKMM seeks comments on the asset base used for setting HSBB costs and the adjustments to account for the Government contribution.
23	13.7	The SKMM seeks comments on the appropriate depreciation schedule to be used in the HSBB cost model and its preliminary choice of straight-line depreciation.
24	13.12	The SKMM seeks comments on its proposed approach to regulating prices on the HSBB network and on the appropriateness of the proposed prices for residential broadband Internet service.
25	14.4	The SKMM seeks comments on the suitability and completeness of the demand and network design assumptions in the Mobile model.

Number	Section	Question/Issue
26	14.10	The SKMM seeks comments on whether it should continue to set symmetric prices for facilities and services on the Access List.
27	14.11	The SKMM seeks comments on its final proposed prices for Mobile origination and termination services.
28	14.12	The SKMM seeks comments on the appropriateness or otherwise of the "pure LRIC" approach to costing interconnection services in the Malaysian context.
29	15.6	The SKMM seeks comments on its proposed approach to regulating prices for WiMAX services.
30	16.2	The SKMM seeks comments on the completeness of the models for co-location and infrastructure sharing.
31	17.6	The SKMM seeks comments on its proposed approach to infrastructure sharing services and whether these services should be subject to direct regulated prices.
32	18.2	The SKMM seeks comments on its proposed approach to regulating prices for Co-location Service and on the appropriateness of the proposed prices.
33	18.2	The SKMM seeks comments on whether there should be separate prices for Co-location Service in Urban, Rural and Remote areas and, if so, the basis on which the prices should be set.

SUMMARY OF SKMM VIEWS ON REGULATED ACCESS PRICES

The following Table 2 summarises the SKMM's preliminary views on which services on the Access List should be subject to price regulation.

The SKMM stresses that this PI Paper only sets out the SKMM's preliminary views. The SKMM invites comments in response to those preliminary views and the questions raised in this PI Paper in order to finalise an appropriate list of Access Prices. A more detailed explanation of the SKMM's reasoning for reaching the preliminary views are set out in the discussions below:

Table 2: Summary of SKMM's preliminary views

Service	SKMM's preliminary view
Fixed Network Origination Service	Price regulation. Separate prices for IP-based origination.
Fixed Network Termination Service	Price regulation. Separate prices for IP-based termination.
Mobile Network Origination Service	Price regulation for mobile and WiMAX services
Mobile Network Termination Service	Price regulation for mobile and WiMAX services
Interconnect Link Service	Price regulation
Wholesale Local Leased Circuit Service	Price regulation based on transmission prices
Infrastructure Sharing	Price regulation
Domestic Connectivity to International Services, specifically connection services to the submarine cable system	Price regulation

Service	SKMM's preliminary view
Network Co-Location Service	Price regulation for access to physical space provided by service providers, including submarine cable landing station No price regulation for other configurations
Full Access Service	Price regulation
Line Sharing Service	Price regulation
Bitstream Services, including (a) Bitstream with Network Service and (b) Bitstream without Network Service	Price regulation for bitstream services associated with two popular DSL rates No price regulation of other layer 2 access services Price regulation for bitstream network service based on transmission prices
Sub-loop Service	No price regulation
Digital Subscriber Line Resale Service	Price regulation
Digital Terrestrial Broadcasting Multiplexing Service	No price regulation. [Not included in current cost models.]
Wholesale Line Rental Service	Price regulation
HSBB Network Service with QoS HSBB Network Service without QoS	Price regulation for HSBB layer 2 service providing access to residential broadband Internet service No price regulation of other layer 2 services
Transmission Service	Price regulation of common transmission types

PART A: BACKGROUND

1 INTRODUCTION

The SKMM, since September 2011, has been developing new cost models in order to determine cost-based prices for the facilities and services on the Access List for the period 2013-2015. The previous revision to cost-based prices had occurred in 2006 and the mandated prices had expired in the interim.

In October 2011, the SKMM held an industry briefing for licensees and key stakeholders to describe the proposed cost modelling process and major activities to be undertaken. At that briefing, the SKMM foreshadowed the present Public Inquiry. Immediately following the industry briefing, the SKMM issued data requests to a wide range of licensees to seek data on telecommunications networks and the costs of providing services. A series of follow-on meetings were then held with these licensees to explain the data requests and to seek industry cooperation to ensure that national and operator-specific circumstances were fully taken into account.

During the period to January 2012, the SKMM analysed network and cost data from local and international sources. Substantial and detailed responses to the data requests were received from all major licensees. Further meetings with network operators were held during December 2011 to clarify items in those data responses and to request further data in some cases. Further data and explanatory material was received.

After careful analysis of all data received, the SKMM released a series of cost models – described later in this PI Paper – for "model viewing" to permit the licensees which provided the initial data to give detailed feedback on the interpretation of the data and the construction of the models. In some cases, data was removed from the released models in order to ensure that any confidential information was not disclosed. Where necessary, "blank" models containing no data but with all calculation formulas in place were also released. Accompanying each model was an operational manual, which described the model calculations in detail, and a brief description of how the input data for the model had been derived. Further meetings with licensees were held in March 2012 to receive initial feedback on the models and to clarify any issues with their construction. Detailed written responses to the model viewing were received from many licensees in April 2012.

In preparing for this Public Inquiry, the SKMM has carefully considered all feedback received from licensees and, in several instances, has amended the models and updated its views on appropriate cost-based prices. This PI Paper provides the preliminary results of the SKMM's deliberations and seeks further comment from interested parties.

1.1 Role and conduct of this Public Inquiry

Subsection 58(2)(b) of the Communications and Multimedia Act 1998 ("CMA") provides that the Commission may hold a public inquiry if it is satisfied that the matter is of significant interest to either the public or to current or prospective licensees under the CMA.

The objective of this public inquiry is to inform as well as to invite views of the public and the licensees under the CMA on the findings of the abovementioned study.

Recognizing the long-term consequences of access pricing (among which are financial implications for firms, impact on consumers and on incentives to technological innovation), the SKMM is of the view that it is appropriate in the circumstances to hold a public inquiry under subsection 58(2)(b) of the CMA in order to obtain maximum industry and public comment. The SKMM's approach is also designed to promote certainty and transparency in the exercise of its powers.

Under subsection 61(1)(d) of the CMA, the Public Inquiry period must be a minimum of forty five (45) days, within which public submissions will be invited. In the present Public Inquiry, licensees and the public are being given 45 days to formulate and submit their views on the matter.

The SKMM will take into consideration all submissions received within the Public Inquiry period. The SKMM is required under section 65 of the CMA to publish a report, setting out its findings as a result of any inquiry it conducts and such report must be published within thirty (30) days of the conclusion of the inquiry. The SKMM will summarise the submissions received and publish the same in the report.

The SKMM looks forward to this Public Inquiry process being informed by the full participation of the public and industry.

1.2 Structure of this PI Paper

This PI Paper is structured into four (4) parts and one Annexure, as follows:

Part A: Background

Chapters 1 and 2 are an introduction to this review, covering the process and context in which the review is conducted.

Part B: General Regulatory Pricing Principles

Chapters 3 to 7 describe the underlying regulatory principles that have guided the SKMM's development of costs models and the associated decisions on which prices should be directly regulated.

Part C: Fixed Services

Chapters 8 to 13 describe the SKMM's preliminary conclusions on the regulated prices to be set for fixed network services. These include Fixed Origination and Termination services, Transmission-related services, Fixed Access services, Bitstream services and HSBB services. The conclusions draw on a set of interlinked cost models and analysis of the data received from licensees. The cost models and their results are presented in these chapters.

Part D: Mobile Services

Chapters 14 and 15 describe the SKMM's preliminary conclusions on the regulated prices to be set for Mobile and WiMAX Origination and Termination services. The conclusions are based on a cost model for Mobile and WiMAX services developed and analysis of the data received from licensees. The cost model and its results are presented in these chapters.

Part E: Co-location and Infrastructure Sharing Services

Chapters 16 to 18 describe the SKMM's preliminary conclusions on the regulated prices to be set for Co-location and Infrastructure Sharing services. The conclusions are based on a cost model for Co-location and Infrastructure Sharing services and analysis of the data received from licensees, in particular from tower companies for Infrastructure Sharing. The cost model is described in chapter 16.

Annexure

Annexure 1 provides a summary of the consultations held with licensees and responses received in the preparation of this Public Inquiry.

1.3 Purpose of this Public Inquiry

This PI Paper has been issued by the SKMM to solicit views from industry participants, other interested parties and members of the public to assist the SKMM to determine:

(a) which facilities and services on the Access List should be subject to price regulation through the setting of access prices; and

(b) the level of access prices to be set each year for the relevant facilities and services on the Access List.

After considering the results of this Public Inquiry, the SKMM will make one or more Determinations on the regulated access prices for some or all of the facilities and services on the Access List.

1.4 Matters outside scope

Matters that are outside the scope of this review include:

(a) determinations on which facilities and services should be included on the Access List;

(b) determinations on non-pricing terms and conditions;

(c) consideration of exemptions from the standard access obligations ("SAOs"), which are subject to the grant by the Minister.

1.5 Issues for comment

Throughout this PI Paper, the SKMM has identified specific questions and issues particularly relevant to its final determinations. The SKMM encourages comments on these questions in particular and welcomes comments on any other related issues that stakeholders believe are relevant.

It should be noted that where the SKMM has provided a "preliminary view" on any matter relevant to this Public Inquiry, this view is provided in the following context:

(a) it is a proposition only that invites views from parties on whether they agree or disagree, and why; and

(b) it is not to be taken as a final view of the SKMM.

2 ACCESS REGULATION

2.1 Current Access List

The facilities and services potentially subject to price regulation are listed in Commission Determination on Access List, Determination No. 1 of 2005 ("ALD 2005"), dated 12 June 2005. It was amended on 5 January 2009 by Variation to Commission Determination on Access List (Determination No. 1 of 2005), Determination No. 1 of 2009 ("ALD 2009"). Both instruments are collectively referred to as the Access List.

At the time of this Public Inquiry, the facilities and services on the Access List are the following (based on paragraph 6 of ALD 2005 as amended by ALD 2009):

(1) Fixed Network Origination Service

(3) Fixed Network Termination Service

(4) Mobile Network Origination Service

(5) Mobile Network Termination Service

(6) Interconnect Link Service

(7A) Wholesale Local Leased Circuit Service

(12) Infrastructure Sharing

(13) Domestic Connectivity to International Services, specifically connection services to the submarine cable system

(14) Network Co-Location Service

(16) Full Access Service

(17) Line Sharing Service

(18) Bitstream Services, including (a) Bitstream with Network Service and (b) Bitstream without Network Service

(19) Sub-loop Service

(20) Digital Subscriber Line Resale Service

(23) Digital Terrestrial Broadcasting Multiplexing Service

(24) Wholesale Line Rental Service

(25) HSBB Network Service with QoS

(26) HSBB Network Service without QoS

(27) Transmission Service.

The full definitions of these services are provided in ALD 2005 and ALD 2009.

In the present study, Digital Terrestrial Broadcasting Multiplexing Service is not included, as it is not presently offered.

2.2 Current Access Pricing Determinations

The access prices set by the Commission were specified in Commission Determination on the Mandatory Standard on Access Pricing, Determination No. 1 of 2006 ("MSAP 2006"), which came into force on 15 February 2006 and which revoked the earlier Commission Determination on the Mandatory Standard on Access Pricing, Determination No. 3 of 2005. The MSAP 2006 was subsequently amended by Variation to Commission Determination on the Mandatory Standard on Access Pricing (Determination No. 1 of 2006), Determination No. 2 of 2007, and Variation to Commission Determination on the Mandatory Standard on Access Pricing (Determination No. 1 of 2006), Determination No. 1 of 2008, which came into force on 31 December 2008. This latter variation extended prices for the services to 30 June 2010, which have now expired.

Subsequently, some access prices have been set by Ministerial Direction on Mobile Interconnection Cost, Ministerial Direction No. 2 of 2010, and varied by Ministerial Direction No. 4 of 2010. These Directions set a new uniform price for some services to apply from 15 July 2010. In a document entitled *Clarification on the Implementation of Ministerial Direction on Mobile Interconnection Cost (Ministerial Direction No. 2 of 2010), as varied by Direction No. 4 of 2010*, the SKMM indicated that:

> The new rate will apply to all voice calls (excluding video calls) originating and terminating on fixed (PSTN) network and mobile network including WiMAX network (both fixed and mobile WiMAX).

However, the new rate will not be applicable to telephony service over IP network (TSoIP). They are also not applicable to Required Application Services (RAS) such as Directory services, Emergency services and Operator Assistance services.

The new rate set by the Ministerial Directions is 5 sen/minute (RM 0.05 per minute). This is the maximum value for a 24-hour weighted average price.

In *Guideline on Implementation of the Commission Determination on Mandatory Standard on Access Pricing*, dated 17 April 2006, the SKMM provided the following clarifications on the meaning of access prices:

- On maximum prices and 24-hour averages:

  3.1 In the Determination, the Commission has mandated 24 hour weighted average prices for interconnection services such as fixed and mobile origination/termination services and Equal Access (PSTN) services. The negotiating parties are free to apply peak and off-peak prices. The peak and off-peak prices can individually exceed the mandated maximum prices in the Determination but cannot on a 24 hour weighted average basis exceed the maximum prices.

  3.2 If the negotiating parties apply peak and off-peak prices, the negotiating parties can apply year-end reconciliation to ensure that the actual prices do not exceed the maximum prices. In the event the reconciled 24 hour weighted average prices exceed the maximum prices, then the maximum prices shall apply.

  3.3 Negotiating parties are also at liberty to apply a single 24 hour weighted average price.

- On determination of length:

  4.1 The prices for transmission services such as Interconnect Link Service, Domestic Network Transmission Service, Broadcasting Transmission Service, Domestic Connectivity to International Services and Private Circuit Completion Service are stated according to distance in kilometre (km). The distance in km refers to length of the cable and not the geographical distance between the transmission points.

The same meanings apply in this PI Paper.

2.3 Exclusion of some services

Ministerial Direction on High-Speed Broadband and Access List, Direction No. 1 of 2008, directs the SKMM, *inter alia*, to defer the implementation of Full Access Service, Line Sharing Service and Sub-loop Service where those services are provided over the HSBB network for seven (7) years from 16 September 2008 to 15 September 2015.

As described in this PI Paper, the SKMM is minded to set access prices for the period 2013 to 2015. In accordance with the Ministerial Direction, any discussion of costs or prices in this PI Paper for Full Access Service, Line Sharing Service or Sub-loop Service does not refer to their implementation on the HSBB network.

PART B: GENERAL REGULATORY PRICING PRINCIPLES

3 Background and Context

3.1 Introduction

The cost modelling exercise will determine costs and related access prices for all facilities and services on the Access List. The SKMM, however, will only determine regulated access prices for those facilities and services that it determines require price regulation. The proposed regulated prices and the method by which they have been determined are the subject of this Public Inquiry.

In its previous study of access prices in 2005, the SKMM proposed two criteria for assessing when intervention through access pricing regulation would be warranted. The criteria are:

(a) presence of high barriers to entry; and

(b) absence of a trend towards effective competition.

After seeking comments in a Public Inquiry, the SKMM concluded that these were appropriate criteria for access pricing regulation:[1]

> In conclusion, the [SKMM] confirms its preliminary view that the scope of access pricing regulation should encompass all markets where barriers of entry are high and there is no trend toward effective competition.

These criteria and related matters are further discussed in chapter 4 below.

3.2 Legislative Objectives

In performing its statutory function under the CMA, the SKMM is guided by the National Policy Objectives ("NPOs") set out in subsection 3(2) of the CMA and, in particular, objective 3(2)(d) to regulate for the long term benefit of end users ("LTBE"). The LTBE will be promoted by achieving the following objectives:

- Promoting competition in relevant markets;

1 See SKMM, *A Report on a Public Inquiry: Access Pricing*, 30 November 2005, p. 12.

- Achieving any-to-any connectivity in relation to communications services; and

- Encouraging the economically efficient use of and investment in communications infrastructure.

The LTBE will be promoted by sustainable lower prices, higher quality of service and greater choice of products.

In its Public Inquiry into access pricing in 2005,[2] the SKMM stated that moving to a system where access prices are either determined in a competitive market or are set on the basis of efficiently incurred costs supports most, if not all, of the NPOs. In particular, the correct pricing of access services will:

- Benefit the Malaysian communications industry by providing the appropriate signals for investment and new entry into the market place;

- Lead to a more efficient allocation of resources; and

- Promote sustainable competition rather than short-term competition based on arbitrage opportunities.

Part VI of the CMA contains provisions on economic regulation including access to services. Section 149 within Part VI requires access providers to provide access to facilities and services on reasonable terms and conditions, which, in SKMM's view, include the prices that an access provider sets.

In addition to Part VI, Part VIII of the CMA contains provisions on consumer protection including the following principles on rate setting:[3]

- rates must be fair and, for similarly situated persons, not unreasonably discriminatory;

- rates should be oriented toward costs and, in general, cross-subsidies should be eliminated;

- rates should not contain discounts that unreasonably prejudice the competitive opportunities of other providers;

2 SKMM, *A Report on a Public Inquiry: Access Pricing*, 30 November 2005, Section 3.1.2.
3 Communications and Multimedia Act 1998, Section 198.

- rates should be structured and levels set to attract investment into the communications and multimedia industry; and

- rates should take account of the regulations and recommendations of the international organisations of which Malaysia is a member.

In summary, the CMA provides adequate provisions to allow the SKMM to address the pricing of facilities and services on the Access List and prices should be oriented towards cost.

4 Principles in Setting Access Prices

4.1 *Ex-ante* Determination of Access Prices

The Public Inquiry on Access Pricing conducted by the SKMM in 2005 raised the issue of allowing commercial negotiations to take precedence over the setting of access prices by the regulator.

While the SKMM has broadly agreed with allowing commercial negotiations to take precedence, it has also recognized that an access provider who controls essential facilities could prolong commercial negotiations to gain or protect an unfair first-mover advantage. In a fast moving industry like communications, a first-mover advantage may be difficult for an access seeker to overcome; and *ex-post* intervention by the SKMM may not provide a sufficient remedy. Hence, intervention by the SKMM in access pricing cannot be conditional only on the failure of commercial negotiations. There is a role for *ex-ante* regulation of prices.

The SKMM recognizes that operators are free to enter into commercially negotiated agreements for facilities or services. However, there are circumstances in which access seekers may be denied recourse to fair and reasonable access prices. These circumstances are:

- **Presence of high barriers to entry**: high barriers to entry potentially allow a service provider to delay competition by setting unreasonably high prices and thus gain a first mover advantage in downstream markets; and

- **Absence of a trend towards effective competition**: lack of sufficient competition in the provision of access facilities can lead to bottleneck conditions for the supply of wholesale services.

In these cases, setting maximum regulated prices for facilities or services on the Access List should help provide commercial certainty in the market and aid commercial negotiations.

Question 1
The SKMM seeks comments on whether the criteria for *ex-ante* determination of access prices remain appropriate.

4.2 Access Pricing Guidelines

When the SKMM has determined that setting maximum regulated prices for a facility or service on the Access List is necessary, then it should set access prices based on appropriate criteria. They are:

1. Appropriate Cost Recovery:

    - Recovery of legitimate costs;
    - Efficient costs;
    - Reasonable rate of return;
    - Appropriate time period;

2. Promotion of economic efficiency in investments:

    - Ensuring the right build/buy decisions are made;
    - Incentives to reduce costs and improve productivity;
    - Incentives for innovation;
    - Incentives to meet suitable levels of quality.

These criteria are described in more detail in the following subsections. The specific calculation methods for access prices are described in later Chapters.

4.2.1 Appropriate cost recovery

As a general principle, service providers should be able to recover all the costs legitimately incurred in providing the service. This should include some part of fixed and common costs if they are necessarily incurred to support the service. If a regulated price does not provide appropriate cost recovery, then a service provider may be disincentivised from providing the service or may provide it with insufficient quality or timeliness.

In practice, what constitutes a legitimate cost may be open to question. Service providers will often have a wholesale division that "markets" interconnection and other regulated services to access seekers. The efficient operations in this division – that is, those operations that are required to provide the regulated service – cause legitimate costs, but any activity associated with promotion of the service or with non-regulated wholesale services should be excluded. The underlying principle is that the activities should be *necessary* to provide the regulated service.

Costs should also be efficiently incurred. That is, only those activities that, taken as a whole, are *sufficient* to provide the service should be included; and the effective and efficient costs for those activities should be included in the cost base. The judgement of what constitutes "efficient" can take several forms. Some regulators have undertaken benchmarking of activities or prices in similar jurisdictions in order to assess if an international level of efficiency is being achieved. At a more practical level, a regulator can collect data on the costs incurred by service providers within its jurisdiction and compare costs of providing the same service. The regulator can then assume a level of efficiency in its regulated pricing that has actually been achieved, or could be achieved, by a service provider within its purview. This is the option that the SKMM has adopted.

A service provider finances its operations through a mixture of equity and debt. Its revenue must cover its operating expenses and the costs of its capital investments; and it will also seek to make further profit. The regulated price should cover the (efficiently incurred) operating expenses and cost of capital but not the further profit (because the profit is not necessary for the service provision). The cost of capital, however, must take into account the returns required for continued financing of the service provider: that is, the returns that equity and debt providers require in order to continue investing.[4]

For regulatory costing, the approach to covering the financing costs of the service provider is to define a Weighted Average Cost of Capital (WACC) that includes, on average, appropriate returns for equity and debt holders. The WACC is then used to calculate the required annual return on the capital investments to cover the costs of financing. In calculating one set of regulated prices for a service, it is necessary to estimate an efficient WACC value. The calculation of the WACC values is described later in this PI Paper.

Once regulated prices have been set, the industry generally will adjust its stance to accommodate the change. The prices should therefore be set for a suitable period to provide regulatory certainty and to allow cost recovery for regulated services to occur. On the other hand, the regulatory period cannot be too long, because uncertainty in forecasts and technological change will mean that the assumptions made in setting

4 For a discussion of this "economic approach" to costing, see Alfred Kahn, *The Economics of Regulation: Principles and Institutions*, The MIT Press, Cambridge, USA, Reissue Edition, 1988, *pp.* 25-66.

prices may not continue to apply. Typically, regulators use 3-5 years as the period for setting prices. The SKMM has determined 2013-2015 (3 years) as the appropriate period in this instance.

4.2.2 Promotion of economic efficiency in investments

Like Ofcom,[5] regulators are concerned about promoting economic efficiency of three kinds:

- Productive efficiency: achieved when the costs of production are minimized;

- Allocative efficiency: achieved when prices are close to cost, so that resources are aligned to production; and

- Dynamic efficiency: achieved when companies have the correct incentives to invest and to innovate.

The economic assumption is that these efficiencies will be achieved in a fully competitive market. In response to competition, a firm reduces its production costs as much as possible, sets prices competitively close to its costs, and flourishes through productive investments and innovation. In cases where there is no full competition, that is, in areas of market failure, the regulated prices should be set to the levels that would be achieved in a fully competitive market.

Productive efficiency is achieved through setting prices for an efficient service provider. This has the effect, too, of driving all competing service providers over time towards an efficient operating point.

Allocative efficiency is achieved by setting prices based on costs. This ensures that a service provider with a dominant market position has no incentive to allocate resources to an unfairly profitable service to the detriment of other investments.

Dynamic efficiency is achieved through setting regulated prices that would arise in a fully competitive market. For mobile termination, for example, setting prices based on long-run incremental costs (see later chapters) sends the right signals about innovation: a mobile service provider gains new customers through service innovation, not from, say, a retail tariff plan that sets the price of on-net calls so low that it encourages groups of callers (e.g. "family and friends") to be on the same network and discourages

5 Ofcom (UK), "Strategic Review of Telecommunications", *Phase 1 consultation document*, 2004.

interconnection calling. Setting appropriate prices for transmission services means that network operators are presented with competitively neutral build/buy decisions.

The principal aim of the costing and pricing methods presented in later chapters of this report is to provide prices that would arise from a competitive market, even when competition may not be fully effective.

Question 2
The SKMM seeks comments on whether the pricing guidelines are appropriate and whether there are any other criteria that should be considered.

4.3 Time Horizon

The cost models for this Public Inquiry have been constructed to calculate prices for the period to 2016. This period was chosen because it was long enough to provide regulatory certainty for licensees while not being so long that forecasts of demand and unit costs could not reliably be made.

The SKMM is intending to set regulated prices for appropriate facilities and services on the Access List for the period 2013 to 2015 – that is, a period of 3 years. This will provide regulatory certainty for network operators, service providers and facility providers through their typically three-year business planning cycles.

The SKMM will then have an opportunity to refresh its estimates of cost-based prices before the next period of regulatory decision from 2016 onwards.

Question 3
The SKMM seeks comments on the appropriateness of setting regulated prices for the period up to and including 2015.

4.4 Glide paths

Glide paths provide a means to gradually introduce new prices without significant disruption to the existing market players and their finances. However, the glide-path approach does mean that an economically inefficient outcome (i.e. rates that are not appropriately set equal to costs) will be tolerated for longer. Such an outcome will be at the expense of one or other stakeholder, and at the expense of efficient competition and the consumer surplus that results from efficient competition. Glide paths therefore have mixed effects and should not be extended any longer than is required.

In some cases, the SKMM has chosen to use a glide path from the existing regulated prices to new ones, where the prices are sufficiently different. In all such cases, the glide path starts from the current regulated rate in 2012 and reaches the price calculated from the cost models in 2015, with a linear interpolation between these values for the intervening years.

Question 4
The SKMM seeks comments on the appropriateness of using glide paths and the method by which the glide path has been calculated.

4.5 Use of Cost Models in Arbitrating Disputes

The cost models presented in this PI Paper have been developed to establish the cost base – and hence cost-based prices – for all the facilities and services on the Access List. In some cases, the calculated values will be used to set regulated prices.

In all cases, however, the cost models provide an estimate of average prices that should be charged by access providers. The SKMM intends to use the cost model results in any dispute that may be notified between an access provider and an access seeker where the access price is an issue. The SKMM can seek further information from the access provider in order to estimate its average prices and then compare its average price to the cost-based price from the models.

Question 5
The SKMM seeks comments on the appropriateness of using the cost model results in arbitrating disputes over access pricing.

5 Long-Run Incremental Costs

5.1 Use of LRIC

The SKMM has adopted the Long-Run Incremental Cost (LRIC) standard as the methodology that will generally be used for costing interconnection services. LRIC, when implemented correctly, has traditionally been the preferred standard for costing these services because:

- It sets prices in a neutral way so that an access seeker sees interconnection prices that would be achieved in a fully competitive market; and

- It provides an interconnection regime that will drive the telecommunications industry in general to an efficient operating point, so that investments are made to achieve overall efficiency.

Within the LRIC framework, there are a number of variants. The SKMM has in the past used TSLRIC with a mark-up for common costs (TSLRIC+).[6] "Total service" means that the increment used for costing is the complete aggregate of similar retail and wholesale services offered. For example, to cost mobile voice termination, the full demand for on-net and off-net (origination and termination) voice calls is considered: this recognizes that the unit cost of providing termination is affected by the total scale of the mobile network. A mark-up for common costs is included in recognition of the fact that some of these common costs are for facilities that support the termination service. TSLRIC+ is the costing methodology that regulators have used around the world successfully to support interconnection services.[7]

LRICs may be calculated "top-down" (that is, from the accounts of an individual firm) or "bottom-up" (that is, from customer demand using engineering and industrial assumptions). For a regulator such as the SKMM, which is seeking to provide an independent cost model of an efficient service provider, the bottom-up approach is appropriate and effective. Bottom-up models do have a weakness in that they may not include all costs truly incurred in providing a service. This can be overcome as indicated in the "Model calibration and reconciliation" subsection below.

6 For further details of the LRIC approach, see, for example: European Commission, "Commission Recommendation of 7 May 2009 on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU" (2009/396/EC), *Official Journal of the European Union*, Lex. 124/67, 20 May 2009.

7 For an overview of costing methodologies and the application of TSLRIC, see Mark A. Jamison, "Cost concepts for utility regulators", Public Utility Research Center, University of Florida, 19 October 2006.

Within the bottom-up TSLRIC+ approach, the SKMM must make some suitable choices for costing methodology, as described in the next section.

5.2 TSLRIC Features

5.2.1 Long run with pragmatic choices

The term "long run" refers to the concept that over a sufficient time-period all input costs, including capital investments, are variable. That is, over time all assets are replaced with new assets at the then-current asset costs. One can therefore consider annualised costs, including an annual charge for the cost of capital employed, as if the production process were to continue indefinitely. Annualised costs are then a proxy for the cash flows leaving the firm that must be paid for by equivalent revenue from services.

While all costs can be considered variable in the long run, it is usual in telecommunications networks to recognize that the investment in major locations, such as telephone exchanges in a PSTN, is unlikely to be repeated except in the very long term. This gives rise to the pragmatic decision to use a so-called "scorched node" approach to the cost model. In this case, the major locations are considered fixed but the quantities of equipment at these locations and the transmission facilities between them are considered variable. This method recognizes the geographical extent of existing networks within the country and the country's own geography. It is appropriate where there are existing service providers that have laid out their facilities for the long term based on the customer demand information available to them at the time of their network expansion.

The alternative to "scorched node", namely "scorched earth", would only be appropriate if there were no established service providers or if the regulator wished to ignore past decisions. The latter path is likely to be significantly disruptive to the telecommunication industry.

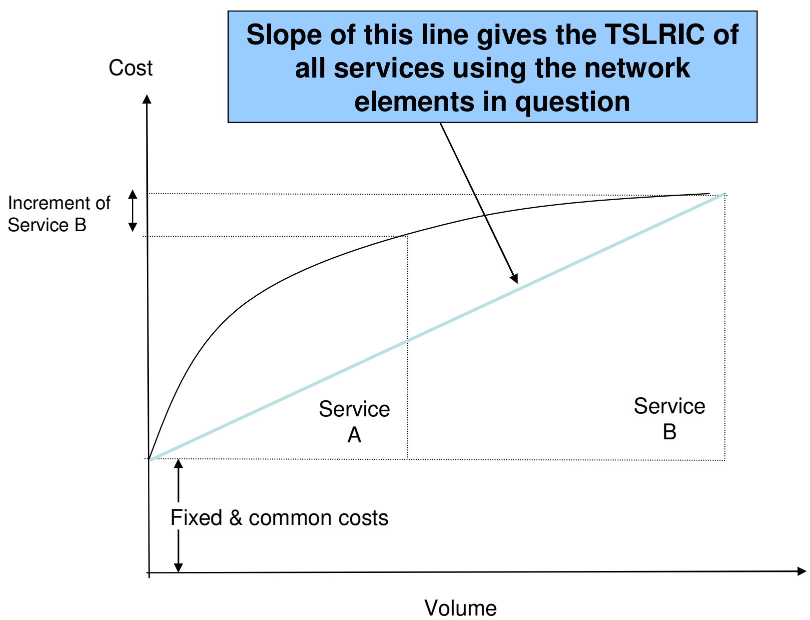
"Long run" also means that costs should be forward-looking: that is, the costs of replacing assets at any time should be based on the estimated costs at that time. In telecommunications, these costs will generally be different from historic or accounting costs.

5.2.2 Incremental costs

The appropriate costs for setting interconnection prices should take into account that a service provider provides both its own retail services and interconnection services, and the cost of service provision depends on the scale of the total service volume. Thus, for example, a mobile service provider carries voice calls that are wholly on its own network as well as origination and termination calls. Even without regulation, it would probably provide on-net and termination calls because they are of benefit to its customers (and may provide call origination if there were sufficient customer demand).

The service increment to be considered should therefore be the total volume of like services (e.g. voice calls). The cost so calculated is sometimes called "*average* incremental cost" because it is averaged over all relevant service volumes. This is illustrated in the following figure.

Figure 1: Total Service LRIC



Source: Ovum

An alternative to this approach is to consider just the incremental cost induced by the interconnection service: that is, the difference between the cost with the service and the cost without the service. This is discussed further in the "Pure LRIC" section below.

The incremental cost is in contrast to the marginal cost, which is the unit cost of providing one further unit of volume (e.g. a call minute) at the current total service volume. If an interconnection price were set at the marginal cost, then the access provider would not recover its cost of interconnection from the interconnection charges. This would lead to allocative and dynamic inefficiencies, as it would encourage the service provider not to provide capacity for interconnection.

5.2.3 Treatment of fixed and common costs

The provision of telecommunications services involves a significant proportion of fixed and common costs. For example, a service provider must build a telecommunications network of a certain size and with sufficient facilities before it can attract customers. Fixed costs are costs that are not directly variable with service volumes. Common costs are those that are induced by facilities or activities necessary for service provision but which are not attributable to any specific service.

Fixed and common costs must be recovered somehow if the service provider is to remain in business. If they were not included in interconnection prices, then they would be recovered from retail prices.

In top-down allocation, fixed network costs, for example, can be allocated to each network service in proportion to the service volume. In a bottom-up model, this is realised through a mark-up on network element costs, which then contribute to service costs. Other fixed costs can be similarly accounted for through appropriate mark-ups.

In top-down allocation, common costs are those fixed costs remaining after all other costs have been allocated. Most costs can be allocated to services either through service usage factors or via activity-based costing methods that allocate costs in proportion to the level of activity. In a well-formed top-down model, the level of common costs should be relatively low in proportion to the total costs and are then allocated through a mark-up on all the cost categories, including retail costs. In a bottom-up model, a mark-up can also be applied but care must be taken to ensure that the mark-up is set to recover common costs over all the activities of the service provider – including, for example, retail services and international activities whose costs are not directly modelled.

In a "pure LRIC" formulation, common costs are not included, as noted below.

5.2.4 Model calibration and reconciliation

Bottom-up models have a potential weakness in not fully taking into account all the costs necessarily incurred in providing services. Because of this, it may be necessary to adjust the model through calibration and reconciliation in order to ensure that all costs are included.

Model calibration involves comparing the modelled network quantities with the deployed network of a real operator in one or more past years, given the known service demands for that operator in those years. A well-formed bottom-up model will give network quantities similar to the deployed network or any significant divergence will be explicable, for example by efficiency factors. The calibration process can be undertaken for significant operators. It ensures that the bottom-up model is driven by the real situation faced by service providers.

Model reconciliation involves comparing the level of costs calculated in the model to the actual costs incurred by a real operator in some past year when the model service demands are set to the actual demands experienced in that year. The comparison has two parts. Firstly, the level of operating expenses and the overall asset values (when adjusted to the same basis, either historic or current costs) should be similar to the observed values; or any divergence should be explicable. This ensures that the bottom-up model is capturing all the relevant service costs.

The second part of model reconciliation is to set an appropriate level of mark-up for common costs. In past years, the service providers' accounts will show some level of common costs and the proportion of these costs compared to total costs can be calculated. If the model is calibrated and reconciled in the first part, then it will produce costs in past years that correspond to the observed values. For future years, the model needs to take account of the fact that costs that are not directly modelled (such as retail costs) will also vary. For example, the retail cost per subscriber may be held constant and the overall level of retail costs will then vary linearly with the number of subscribers. By extrapolating these other costs for a real operator, using the real operator's forecasts, the model can calculate a proportionate mark-up for common costs in future years. A mark-up for the efficient operator model can then be estimated from these calculated values. This ensures that the model can account for common costs.

The TSLRIC bottom-up models presented in Part C and D of this PI Paper have been calibrated and reconciled with Malaysian reported operator data.

Question 6

The SKMM seeks comments on whether the choices made (discussed under this section 5.2) for TSLRIC models are appropriate.

6 Fixed Access Costs

Although LRIC is the standard costing methodology, there are some important exceptions where it may not be suitable or is not preferred. This chapter indicates the most important of these exceptions – for fixed access networks – and the following chapter describes other exceptions.

6.1 An alternative to LRIC

The most important exception to the standard LRIC methodology involves the costing of fixed access networks. The cost of the fixed access network is a significant portion of the cost of providing bitstream and access to network elements (in the customer access network) and hence the costing methodology for the fixed access network can have an important role in promoting or discouraging competition in new Internet-related services.

For a fixed access network, bottom-up LRIC costing would generally require a very detailed model of the access network in its many variants. For this reason, where a LRIC approach has been adopted, a top-down LRIC model of the incumbent's fixed network has been the standard approach (with the important exceptions of France and Norway, where detailed, bottom-up LRIC models have been constructed). In either case, the assets are revalued to their modern equivalent values. This can be fraught with difficulties in the case of copper access networks, where there would not be a like-for-like substitution of old facilities by new versions of the same: copper would be replaced by optical fibre; ducts and trenches would be placed by new techniques or would be avoided by sharing of other non-telecommunications facilities.

In essence, a fixed access network is installed once and used for a long time. It is generally unlikely that there will be investment by an alternative provider (the access seeker) in a fixed access network in the same geographical area. The fixed access network has the characteristic of an "enduring bottleneck" facility. The SKMM has concluded that the same applies to HSBB networks.[8]

In addition, for existing copper access networks, it is likely that much of the capital asset has already been fully depreciated but is still of economic value. This means that the revaluation of the asset to a modern equivalent risks over-recovering the full cost of the asset. Experience in Australia[9] has shown that the LRIC approach leads to cost

8 See SKMM, "Review of Access List and Mandatory Standard on Access", Public Inquiry Report, 21 December 2008, section 12.4.2.

9 See, for example, Australian Competition and Consumer Commission, "Review of the 1997 telecommunications access pricing principles for fixed line services", Draft report, September 2010. (There was no "final report" because of changes to legislation in the meantime.)

estimates that appear to be higher than can be justified by the level of investment by the incumbent network provider. Hence, a new approach to costing fixed access has been proposed in Australia, one in which the fixed network provider is appropriately compensated for its investments while an access seeker is not burdened with costs that have already been recovered.

In Europe, too, there has been recent debate about the appropriate way to price the legacy copper access networks in light of the ongoing transition to fibre access. The opposing cases for lower regulated rates by WIK Consult[10] and for current or higher regulated rates by Plum Consulting[11] have been argued in detail.

On the one hand (as argued by WIK Consult) the wholesale unbundled fibre price must be sufficiently higher than the wholesale unbundled copper price in order to provide an incentive for the incumbent operator to make the transition to fibre. Since there is a limited willingness by the end user to pay extra for the equivalent fibre service, then the copper access price should be lowered to provide the incentive for the incumbent operator. This argument would seem to undervalue the opportunity on fibre to provide new value-added services such as IPTV. In any case, the argument does not apply directly to Malaysia, where the government is providing incentives for the transition to fibre access.

On the other hand (as argued by Plum Consulting) the wholesale unbundled copper price (based on cost) is a key component in determining the retail price for copper-based Internet service. Lowering the wholesale price will flow through to lower retail prices, making the business case for fibre deployment more difficult, given the end-user's limited willingness to pay more for fibre-based services. Hence, Plum argues, the current wholesale copper prices in Europe should be maintained in order to support the continuing deployment of fibre. Plum Consulting also supports a discounted cash flow model (which the WIK Consult paper shows is equivalent to a bottom-up LRIC model with a tilted annuity) for costing fibre access.

The essential issue for a non-European reader is how to cost the copper and fibre assets in a way that provides a neutral build-buy decision for all stakeholders, including the incumbent copper provider. Neither argument is fully convincing in this regard. The WIK paper depends on a model of competition that is quite European in its assumptions. Part of the Plum argument is that continuity of present practice is important to provide regulatory commitment to cost recovery, in order not to discourage new investments.

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10 WIK-Consult, "Wholesale pricing, NGN take-up and competition", *Report for ECTA (European Competitive Telecommunications Association)*, 7 April 2011.

11 Plum Consulting, "Costing methodology and the transition to next generation access", *Report for ETNO (European Telecommunications Network Operators' Association)*, March 2011.

In Malaysia, the take-up of wholesale copper access services has been low, suggesting *prima facie* that there may be price and non-price barriers to effective competition. The government is encouraging the transition to fibre access; and the provision of wholesale fibre access services will be important for supporting future competition. Consistent pricing for wholesale fixed access services will therefore be important for enabling the transition from copper to fibre in support of government policy.

A recent working paper by Professor Martin Cave et al.[12] has described a more neutral study of different costing methods for local loop unbundling (similar to Full Access Service or Line Sharing Service on the Access List) using a detailed accounting database constructed by ARCEP (the French regulator). The paper compares the price for local loop unbundling with declining copper usage calculated by four different methods:

1. A bottom-up LRIC model (called "LRIC (Plum)" in the paper);

2. A method called "CCA (Plum)", which is not fully described but appears to be a Fully Allocated Cost model with Current Cost Accounting (one of the methods advocated by Plum Consulting);

3. The ARCEP costing method, which is Current Cost Accounting with a tilted annuity; and

4. The Historic Cost Accounting method calculated by the authors.

Several variants of these models are used but, in all cases, the LRIC model produces the highest prices. In addition, as the number of copper loops decline, after the first few years the LRIC prices rise, due to reduced economies of scale in the smaller network. The case where the civil works (installed costs for ducts etc.) are costed using Historic Cost Accounting while the cables are costed by the four different methods shows lesser variation between prices but still has higher LRIC prices; the other methods produce prices that are quite close together.

It can be concluded from this study that Historic Cost Accounting for civil works is an appropriate method for obtaining cost recovery from these assets and that accounting for the (copper) cables through historic costs is satisfactory; adjustment for current costs makes only a marginal difference to the calculated prices.

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12 Martin Cave, Antoine Fournier & Natalia Shutova, "Which Price Level for Copper Access in the Transition to Fibre?", *Working paper under review*, TERA Consultants, September 2011.

Professor Cave and his co-authors identify three pricing objectives, the first two of which they describe as "traditional":

a) "**A cost recovery objective**, according to which the maintenance of investment incentives in sunk costs on the part of the regulated incumbent requires a commitment by the regulator to allow the recovery of future costs.

b) "**An efficient entry objective**, according to which prices should be at a level which encourages efficient entry and discourages inefficient entry.

c) "**An efficient migration objective**, ensuring a desirable transition by creating appropriate incentives on the part of operators and consumers to switch to fibre."[13]

The authors show that it is desirable to separate the physical infrastructure (civil works and ducts and pipes) from the copper cables in treating costs and that historic cost accounting can be used for the physical infrastructure (the majority of costs). They also emphasise that exact cost recovery is important in balancing the objectives listed above; that is, although various costing methodologies will produce different results, it is important to choose a methodology that minimizes the risk of over-compensation or under-recovery for the incumbent.

In summary, then, an alternative to LRIC is desirable for costing the fixed access network. A method starting from historic cost accounting will provide a suitable level of costs. The building-block approach described below and used for the Fixed Access and HSBB models has the required attributes for costing fixed access network.

The same arguments do not apply to mobile access networks. In this case, there are alternative competitive providers in each area and facilities are regularly enhanced or replaced. The LRIC methodology is appropriate in these circumstances.

Question 7
The SKMM seeks comments on whether an alternative costing methodology to LRIC is more appropriate for fixed access.

13 Martin Cave *et al., op. cit.,* p. 4.

6.2 The Building-Block approach

In order that a network provider can be compensated for efficiently incurred investments in the fixed access network, a building-block approach to modelling can be taken. In the building-block approach, the asset values are "locked in" through an initial regulatory asset base. This asset base is "rolled forward" for future years through a forecast of actual investments.

This approach overcomes the issues identified with the LRIC approach in the following ways:

- It does not require detailed top-down allocation of costs by the incumbent service provider and can, instead, be developed by the regulator based on a simple data return from the incumbent.

- No revaluation of assets is undertaken and hence there is no risk of over-recovery of investments through a windfall gain from increased installation costs.

- Actual investments are used (as explained below), avoiding the risk of under-recovery of incurred costs by the incumbent.

- The costing of copper and fibre assets and civil works is done on the same basis, meaning that the transition from copper access to fibre access is fairly treated.

The initial regulatory asset base is set to the actual investments by the service provider in the fixed access network. That is, the regulatory asset base is the depreciated value of the assets in the initial year of the model. The depreciated value is used because past depreciation will have been recovered in past charges; and the assets will not be replaced for a very long time, if at all, so that the depreciation costs are not recurrent. This valuation therefore recognizes that the network provider has already recovered some part of the cost of the assets.

In theory, the initial valuation should also be adjusted for efficiency: that is, the network provider should be compensated only for investments efficiently incurred. However, this is difficult to do in practice where investments have been made over many years.

The asset base is rolled forward year by year using the actual and forecast investments in the access network. The annual depreciation charge is taken from the asset values and the net new investments added. This means that in each year the building-block asset values track the actual investments made or planned by the network provider.

Depreciation may be calculated in a number of ways. For older assets, however, there will be a long history of straight-line depreciation in the initial asset values. Hence, straight-line depreciation is probably preferred in this case in order to ensure that the network provider is not over-compensated for the assets.

HSBB assets also represent an enduring bottleneck that is unlikely to be duplicated in the same geographic area by an alternative access provider. The HSBB build also uses the same civil works and ducts and pipes as constructed for the copper assets. The HSBB assets should therefore be costed in a comparable way to the copper access.

The SKMM has, however, considered depreciation methods other than straight line for the HSBB assets. This is for two reasons. Firstly, the assets are relatively new so that the historical base of depreciation is not so relevant. Secondly, HSBB assets will be put in place in anticipation of strong future growth: back loading the depreciation to correspond to the demand profile may be appropriate in this case. In our preliminary position for this PI Paper, the SKMM has used straight-line depreciation for the HSBB assets but seeks comments (see the HSBB model description in Part C of this PI Paper) on whether a tilted annuity approach should be preferred, to better approximate future economic depreciation of HSBB assets.

Once the asset values of the building block have been established for a given year, then the network provider should recover the costs through:

- The annual cost of capital (that is, the asset value times WACC);

- The annual depreciation; and

- The annual operational expenditure associated with the building block.

The sum of these items is the so-called "revenue requirement" from the building block. This value is then allocated to services using, for example, the number of access lines or number of services in operation (SIOs).[14] The building-block method is described more fully in Part C of this PI Paper.

A particular issue arises in relation to HSBB assets. In this case, the investments in early years, while the HSBB is being rolled out, may be quite large. This will have the effect (which may be mitigated somewhat by back-loading the depreciation charges) of producing rising rates for interconnection in the early years followed by a decline in later

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14 For further details of building-block models, see, for example, Australian Competition and Consumer Commission, *op. cit.*, chapters 5-7.

years. The effect on competition of this rising and falling profile will need to be balanced against the risk of over- or under-compensation in estimating the future, efficiently incurred investments and the appropriate depreciation schedule.

Question 8

The SKMM seeks comments on whether the building-block methodology is appropriate for the costing of fixed access.

7 Other Exceptions to LRIC-based Prices

7.1 Co-location and Infrastructure Sharing services

A second category of services whose costs are not always best estimated through a LRIC approach are co-location and infrastructure-sharing services. Here, as a general rule, the facility provider has invested in the facility for its own service purposes. In other words, the investment is justified by the provision of the network provider's own services. Any "spare" space for co-location or sharing has been created because it has been beneficial to the provider's original investment. For example, a fixed network provider may have provided a building of a certain size to house a particular generation of equipment but new technology with a smaller footprint or falling demand have meant that not all the building is now used.

There is no requirement on the access provider to build new facilities to accommodate co-location or infrastructure sharing by an access seeker. This is in contrast to, say, voice call termination, where the provider builds a network of sufficient size to carry the traffic (both because it is required to do so and also because it is to the benefit of its end customers). This suggests that a different costing regime is appropriate.

The costs relevant to co-location and infrastructure sharing are not generally long-run or incremental. In these cases, the potential access provider has built a facility of a certain size because it was efficient to do so at the time. The business case underlying this investment would compensate the provider through its own services. The facility now has unused space that could be utilized by the access seeker.

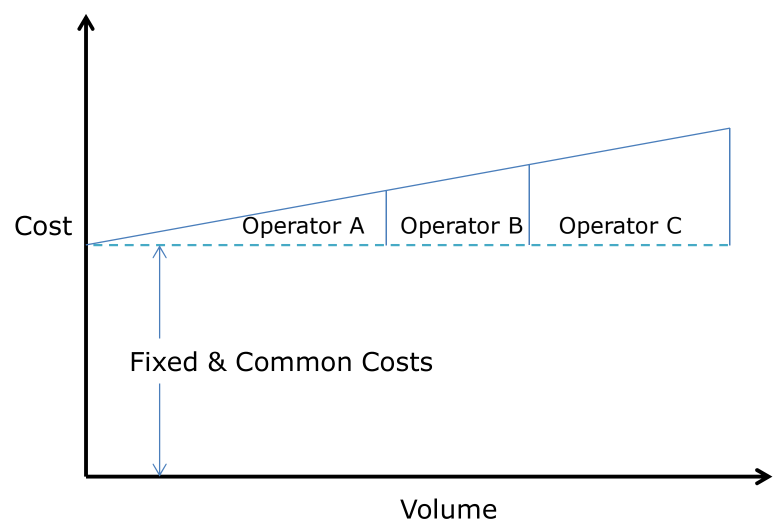
The access provider should, of course, be compensated for the use of the facility by the access seeker. The operational costs directly associated with the use, such as electricity consumption, can be calculated and included in the charge.

For the use of the capital assets, the appropriate value is the marginal cost of providing the additional space (floor space, antenna space, etc.). The remaining full cost of the facility will be recovered by the access provider from its own services.

In summary, then, the access provider should not be compensated for the full incremental cost of the space, but rather should be compensated for the marginal cost.

In many cases, a third party, namely a tower company, builds towers or other assets for use by all service providers. If the tower company was compensated only for marginal cost of the facility, it would not recover its full costs in the long term. The construction of an individual facility is dominated by the fixed and common costs and the volume-related costs increase linearly with volume. This is shown in the figure below. The incremental cost per unit is the same as the marginal cost and the final price depends on the allocation of fixed and common costs.

Figure 2: Facility Cost for tower companies



Source: Ovum

It is common for the tower companies to set a higher price for the lead-in operator than for second and subsequent operators. This price distinction recognizes that the lead-in operator is willing to share more of the risk of investment with the tower company: that is, the lead-in operator takes on a larger allocation of the fixed and common costs. The prices for all operators taken together should recover the full fixed and common costs.

Reported practice in other jurisdictions for the costing of co-location and infrastructure sharing varies. The European Regulators' Group compiled a summary[15] of practice in December 2007 that showed a wide variety of costing methods (from market prices to LRIC) in which Fully Allocated Cost and LRIC were the most common. However, the reported method can be misleading. For example, in Jordan,[16] although co-location costing is included in the bottom-up LRIC models, it is performed using a building-block approach with price trends derived from network equipment.

15 ERG, *Report on ERG Best Practices on Regulatory Regimes in Wholesale Unbundled Access and Bitstream Access*, Annex – Evidence Based Analysis and Benchmark, ERG (07) 53rev1b, December 2007.
16 Models and documentation available at http://www.trc.gov.jo.

The SKMM has taken a building-block approach to costing co-location facilities and infrastructure sharing services. This is described in more detail in Part E of this PI Paper.

Question 9
The SKMM seeks comments on using the building-block approach to setting prices for co-location facilities and infrastructure-sharing services.

7.2 Installation charges

A third category of costs – ones that are often calculated in LRIC models – but which are not true LRIC costs are installation charges. These are one-off charges associated with initial service provision. They are usually not long run (in the sense that they are not in the long term substitutable) and often not incremental. They are usually a minor issue in the overall cost base. An approach that recovers just the direct costs associated with the installation activities is generally to be preferred, because it provides a transparent basis for costing.

The most straightforward and transparent approach to setting these charges is to match them to the direct operational costs efficiently incurred in putting the service into operation. This is the approach that has been adopted by the SKMM. (In some cases in other jurisdictions, installation charges have been set also to recover some part of the capital cost of the service, but this is much harder to justify.)

Once the installation charges have been set, then the related operational costs are removed from the cost base for setting the other service charges (monthly rental, etc.). In this way, the full costs of providing the service are recovered through all the service charges but the operational costs associated with service set-up are included only once.

Question 10
The SKMM seeks comments on the approach to setting prices for installation charges.

PART C: FIXED SERVICES

8 Introduction to Fixed Services

8.1 Fixed Services

The category Fixed Services encompasses those facilities and services on the Access List that are provided on a fixed telecommunications network. The principal supplier of these services is Telekom Malaysia but there are smaller operators such as Fiberail, Fibrecomm, TIME, Maxis, Sacofa and Celcom Timur.

There are 13 fixed services on the Access List. They can be clustered into 5 categories, as follows:

- Fixed termination and origination services
    - Fixed Network Origination Service
    - Fixed Network Termination Service
- Transmission-related services
    - Interconnect Link Service
    - Wholesale Local Leased Circuit Service
    - Domestic Connectivity to International Services – Connection services to the submarine cable system (see also Part E on co-location facilities)
    - Transmission Service
- Fixed Access services
    - Full Access Service
    - Line Sharing Service
    - Sub-loop Service
    - Digital Subscriber Line Resale Service

- Wholesale Line Rental

- HSBB Services
    - HSBB Network Service with QoS
    - HSBB Network Service without QoS
- Bitstream Services
    - Bitstream with Network Service
    - Bitstream without Network Service

This Part of the PI Paper is organized into these 5 categories.

8.2 Fixed Services Cost Models

8.2.1 Interlinked cost models

In order to provide a full set of costs for Fixed Services, the SKMM has developed three interlinked cost models. The models are listed in the following table.

Table 3: The Cost Models of Fixed Services

Model	Applicable Services	Methodology
Fixed Core & Transmission Model	Fixed network services and transmission services	Hybrid LRIC: bottom-up TSLRIC+ with top-down reconciliation
Fixed Access Model	Bitstream, DSL and copper loop-based services	Building block
HSBB Model	HSBB wholesale services	Building block

Source: Ovum

The cost models are not independent of one another but, rather, are designed to work together. There are specific direct linkages between the models, as follows:

- The same forecast of working and installed lines is used in the Fixed core and transmission model and the Fixed access model.

- The proportion of IP core network costs associated with Layer 2, as calculated in the Fixed core and transmission model, is used to calculate Layer 2 only costs for the core network building block in the HSBB model.

- The HSBB asset values are used in calculating the common business cost mark-up in the Fixed core and transmission model.

- The common cost mark-up in the HSBB model is the same as the mark-up calculated in the Fixed core and transmission model.

- The common cost mark-up in the Fixed access model is the same as the mark-up calculated in the Fixed core and transmission model.

The above linkages ensure that the cost models provide consistent outcomes for all facilities and services on the Access List. (In addition, the Fixed core and transmission model has linkages with the Mobile and WiMAX model and the Co-location and Infrastructure Sharing model, as described in the relevant chapters below.)

Question 11

The SKMM seeks comments on the approach taken in dealing with Fixed Services and whether it provides a consistent view of the Fixed Services in Malaysia.

8.2.2 Features of the Fixed core and transmission model

The Fixed core and transmission model is forward-looking, which means in part that it should use replacement costs for equipment that reflect Modern Equivalent Assets ("MEA"). In all cases, licensees were asked to provide the latest unit prices for their equipment. When available, this data provides an estimate of MEA values – or, at least, the best available estimates of MEA values.

The Fixed core and transmission model has also been subject to model calibration and reconciliation (as described in section 5.2.4). This means that, in some cases, equipment sizes have been adjusted (which leads to a new unit price for equipment of this size) or unit prices have been varied. Wherever possible, the original data provided by licensees has been retained in the models.

Price trends are required to adjust MEA values for future years. Again, price trends have been requested from licensees and this data has been used, where possible. There are generally different price trends for unit (capital) prices and for operational costs associated with equipment.

8.2.3 Economic lives

All models required data on economic lives of capital assets. Licensees were asked for the economic lives of their equipment. In some cases, accounting lives or other depreciation lifetimes, which are generally shorter than the true economic lifetimes, were provided. In these cases, the data has been adjusted to give economic lifetimes that are consistent with actual usage. Some economic lives have also been altered as part of the model reconciliation process.

8.2.4 Depreciation schedules

All the models provide the same choice of a number of possible depreciation schedules. The depreciation formulas are given in the model manuals. In most cases, the SKMM has preferred to use a tilted annuity approach for calculating depreciation, because this provides the closest approximation to economic depreciation (which is the theoretical depreciation to be used in an economic cost model).

There is one exception, however, in the Fixed Access model. In this case, straight-line depreciation is preferred because much of the asset base has already been fully depreciated and its investment costs recovered from past prices. A tilted annuity would risk under- or over-recovery of costs.

As noted in section 6.2, the SKMM has also considered different depreciation schedules for the HSBB network. As a preliminary choice, we have used straight-line depreciation in the HSBB model but is open to considering a tilted annuity profile instead.

8.3 Weighted Average Cost of Capital

8.3.1 Role of WACC

The Weighted Average Cost of Capital ("WACC") plays a key role in economic cost models because it is a major component of the calculation of annual charges from capital investments. It is used to calculate the return on capital required by the service provider in order to finance its debts and provide an appropriate return to investors.

A WACC value is required for each of the economic cost models. For the Fixed Services models, the WACC values are based on the financial position of Telekom Malaysia, since it is the largest and most influential provider.

8.3.2 Capital Asset Pricing Model

The Capital Asset Pricing Model ("CAPM") is used to calculate the WACC values. There are several layers of detail to the calculation under the CAPM. The models require a pre-tax WACC value and, at the top layer, the basic equation is:

$$\text{Pre-tax WACC} = g.C_D + (1-g)/(1-t).C_E$$

where

C_D is the cost of debt (expressed as a percentage);

C_E is the cost of equity (expressed as a percentage);

g is the gearing, g = Debt/(Debt + Equity), where equity is expressed in market terms;

t is the tax rate.

The CAPM then defines methods by which the various parameter values are estimated. The remainder of this section describes the estimation of the input parameters for the CAPM calculation.

8.3.3 Gearing

Gearing is defined as the proportion of debt in the total value (debt plus equity) of the enterprise. For calculating the pre-tax WACC value, forward-looking gearing is required: that is, what the gearing will be over the regulatory period. Equity value should be expressed in market terms. This means that, in those cases where gearing ratios declared by operators are in net book terms, the values must be adjusted for market values (using the ratio of equity value to earnings).

For Telekom Malaysia, recent gearings lie around 15%. The ratio inferred from the Q4 2011 financial results and its market capitalisation at the end of 2011 is 11%, which is lower than the two-year average estimated from Bloomberg data of 19%. Nomura[17] estimates increasing gearing by Telekom Malaysia in the range of 20% to 2013. For the long-term debt required for the cost models, a conservative value is 15%. This value has been used.

8.3.4 Taxation

The standard corporate tax rate for all large companies is 25%. This is used for the Fixed Services calculation.

When previously considering WACC values, the tax treatment of dividends payable to shareholders was also taken into account. This is an issue that might particularly affect investors in Telekom Malaysia. However, in recent years Malaysia's imputation tax credit system has been simplified and it is no longer necessary to make adjustments for personal income tax treatment. For international investors, no allowance has been made for any double taxation that may otherwise apply, because it is assumed that the marginal investor will have the means to reduce or remove any such liability.

8.3.5 Cost of Debt

The debt referred to here should be long-term debt. This is because the economic models are concerned with operations that continue indefinitely and the operators must cover their debt obligations over the long term.

To set the period over which the debt should be financed, the SKMM has considered the average asset lives of the assets in each economic model. In the Fixed core and transmission model, the average asset life is 15.6 years, so long-term debt with 15-year maturity has been used in the CAPM. The cost of debt to maturity can then be estimated using data available from Bloomberg on Malaysian corporate bond yields by maturity period and credit rating. (In undertaking this analysis of Bloomberg data, the period of economic instability from September 2008 to March 2009 after the Lehman Brothers collapse has been excluded.) The estimated cost of debt for Telekom Malaysia is 5.5%.

8.3.6 Cost of Equity

The cost of equity is calculated from parameters estimated from past time series that are then adjusted for forward-looking values. Under the CAPM, the cost of equity can be calculated from the formula:

17 Nomura, Network Collaboration in Asia, 28 June 2011.

$C_E = R + \beta_E.EMRP + \lambda.CRP$

where

C_E is the cost of equity (expressed as a percentage);

R is the risk-free rate;

β_E is the forward-looking equity beta (a measure of volatility);

EMRP is the Equity Market Risk Premium;

λ is a measure of exposure to country risk;

CRP is the Country Risk Premium.

In the above equation, the term λ.CRP permits firms to have different exposures to country risk. The parameter λ is scaled to around 1 like β. In the present analysis, as described below, the term provides only a small adjustment to the cost of equity for some firms on world markets.

In making its estimates, the SKMM has considered three markets (as described in the next subsection) and then calculated a weighted average value. The basic analysis is undertaken in US dollar terms and then the results are converted into Ringgit terms.

(a) Reference markets and exposure

To estimate the cost of equity, one is aiming to determine the return required by a well-diversified marginal investor. Given that exchange and investment controls have been loosened in recent years, it would be unsatisfactory to consider investors in the local market only. Instead, the SKMM has sought to base estimates on a broader market base but with a domestic and regional bias. Three markets have been used in the analysis:

- Malaysia;
- ASEAN-5, consisting of Indonesia, Malaysia, Philippines, Singapore and Thailand;
- Global or mature markets.

Most of the major telecommunications operators have significant exposure to foreign shareholders (in addition to strategic investors in specific firms). Available shareholder information was examined and assumptions were made about the relative weighting of each market for domestic and foreign active investors. In the following table, "Large Service Provider" refers to Telekom Malaysia and "Small Service Provider" refers to TIME, but the same market weightings are also used for estimating the cost of equity for mobile and other service providers (described later in this PI Paper).

Table 4: Average market weighting for investors

Market	Large Service Provider		Small Service Provider	
	Domestic	Foreign	Domestic	Foreign
Malaysia	20%	10%	30%	20%
ASEAN-5	40%	30%	50%	40%
Global/Mature	40%	60%	20%	40%

Source: Ovum analysis

For a service provider, then, the market weights for its average investors can be calculated from the proportion of foreign active investors. For Telekom Malaysia, with an estimated 54% of foreign active investors, the market weights become Malaysian 15%, ASEAN-5 35% and Global/Mature 51%. These market weights are used to calculate weighted average values for each parameter from the values estimated from each market.

(b) Period of analysis

The market estimates of parameters should be based on recent data, in order to provide the best basis for forward-looking values. For the present analysis, the estimates are based on the most recent four years of market data, given that the cost models are projecting forward the costs for a similar period.

However, there have been two extraordinary periods that have been excluded from past data. The first is a period of 7 months from September 2008 to March 2009, after the collapse of Lehman Brothers, and the second is from July 2011, after the Eurozone crisis became acute. In both these periods, the yield to maturity of 10-year US sovereign bonds showed marked declines. Malaysian Government Sovereign bonds also showed a significant decline in yields in the first period. By excluding these periods, the SKMM believes that it is making a conservative choice for estimation of forward-looking parameters, when yields are likely to recover somewhat.

(c) Risk-free rate and risk premiums

The risk-free rates appropriate to each service provider have been estimated from the yields to maturity of zero coupon US Treasury bonds. This is a standard measure. For Telekom Malaysia, with a time to maturity of 15 years, the risk-free rate is 4.5%.

The country risk premium for Malaysia can be calculated from the default spreads of Malaysian Government Sovereign bonds (compared to US Treasury bonds). For the period of analysis, the default spreads are zero or negative for maturities above 14 years and only 0.4% for maturity of 8 years. These values must be multiplied by the relative volatility of Malaysian markets against the world market index to provide a country risk premium.

For the ASEAN-5 market, the most liquid bonds are again the Malaysian Government Sovereign bonds. Hence, the country risk premium for the ASEAN-5 market is also derived from the default spreads for Malaysian Government Sovereign bonds, now multiplied by the relative volatility of the ASEAN-5 market.

For global markets, the SKMM has estimated a value of 5% for the equity market risk premium. This value comes from considering a variety of data sources, including publicly available estimates from very long time series and reported survey results. The equity market risk premium for other markets is calculated by adding the appropriate country risk premium.

For Telekom Malaysia, with a 15-year maturity and hence no country risk premium for Malaysian or ASEAN-5 markets, the Equity Risk Premium is 5% for all markets.

(d) Exposure to risk

The exposure to risk of the returns is included through the values of the parameters β and λ.

In the case of β, one can estimate the value of the equity beta by regressing share returns against market returns. The equity beta value can then be un-levered to calculate an estimated asset beta. The SKMM has considered time series of returns for Malaysian service providers, where these are available.

The result is a set of asset beta estimates for Malaysian service providers. The asset betas for other markets are scaled versions of the Malaysian values.

The equity betas to be used are re-levered values of the asset betas using the forward-looking gearing ratio: 15% in the case of Telekom Malaysia.

In the case of λ, the value has been estimated from Malaysian macro-economic statistics. One value is used in all cases.

The following table shows the estimated values for the parameters β and λ for Telekom Malaysia.

Table 5: Telekom Malaysia: Parameters for exposure to risk

	Malaysia	ASEAN-5	World
Asset beta	0.65	0.49	0.40
Equity beta	0.74	0.56	0.46
Lambda			2.25

Source: Ovum analysis

(e) Relative inflation

The above analyses will provide estimated costs of equity based on US dollar amounts. These values must then be adjusted to rates in Ringgit. The adjustment involves scaling the values by the relative inflation in Malaysia against the US inflation. Both inflation rates should be forward-looking.

For the US, data is available on the market's expectation for the average inflation rate that will prevail for the following 5 years: for Telekom Malaysia, the relevant figure is 2.3%. For Malaysia, the SKMM has considered a variety of sources to estimate a future inflation rate of 2.5% for all relevant maturities.

(f) Final cost of equity

With the analysis presented above, all the parameters needed for calculating the cost of equity have been estimated. The formula for the cost of equity, presented above, is repeated here for convenience:

$C_E = R + \beta_E.EMRP + \lambda.CRP$

where

C_E is the cost of equity (expressed as a percentage);

R is the risk-free rate;

β_E is the forward-looking equity beta (a measure of volatility);

EMRP is the Equity Market Risk Premium;

λ is a measure of exposure to country risk;

CRP is the Country Risk Premium.

For Telekom Malaysia, the CRP is 0 for all markets and the EMRP is 5% for all markets. The risk-free rate is 4.5%. The following table summarizes the calculation of cost of equity for Telekom Malaysia.

Table 6: Telekom Malaysia: Calculation of cost of equity

	Malaysia	**ASEAN-5**	**World**	**Weighted Average**
Market weights	15%	35%	51%	
Equity beta	0.74	0.56	0.46	
Equity market risk premium	5.0%	5.0%	5.0%	
Cost of Equity (USD estimates)	8.2%	7.0%	6.5%	6.9%
Cost of Equity MYR				**7.1%**

Source: Ovum analysis

8.3.7 Estimated WACC values

With the values derived in the sections above, the final estimated WACC value can be calculated from the formula given in section 8.3.2, repeated here for convenience:

$$\text{Pre-tax WACC} = g.C_D + (1-g)/(1-t).C_E$$

where

C_D is the cost of debt (expressed as a percentage);

C_E is the cost of equity (expressed as a percentage);

g is the gearing, g = Debt/(Debt + Equity), where equity is expressed in market terms;

t is the tax rate.

For Telekom Malaysia, the cost of debt is estimated to be 5.5%, the cost of equity 7.1%, the forward-looking gearing 15%, and the tax rate 25%. These figures provide a pre-tax WACC value of 8.9% for Telekom Malaysia as a whole.

The pre-tax WACC for fixed services must be further subdivided for use in the Fixed Core, Fixed Access and HSBB models, as there are different risk profiles for each of these services.

In considering the CAPM presented in section 8.3.2, it is clear that most parameters determining the WACC value are the same for all fixed services. The gearing and cost of debt are determined at the aggregate level; the tax and inflation rates are the same; and the basic market parameters are the same. The only difference is the exposure to market risk, measured through equity beta, which in turn affects the cost of equity. The unlevered value, the asset beta, is used to create forward-looking values of the cost of equity.

The SKMM has therefore undertaken a disaggregation of the overall fixed asset beta, which essentially represents the value for Telekom Malaysia Group as a whole, into its component values. Asset beta with constant gearing has the property that its overall value is a weighted average of its constituent asset betas.

For the weights within the fixed services, the annualised asset values used in the economic models can be used. Although these values depend on the WACC value, the values can be iterated as new WACC values are obtained – and the process quickly converges to constant WACC values. In the present analysis, one set of weights based on the capital employed in each fixed-service activity over the period 2011-2016 has been used.

Telekom Malaysia also has other activities that, in 2011, represented about 14% of its income. It is likely that the market weight of these activities is less than their contribution to revenue. The SKMM has used a market weight of 10%. These activities can also be assumed to have an equity beta of 1, the market average, leading to an asset beta of 0.88 at Telekom Malaysia's gearing level.

In estimating the disaggregated asset betas, the SKMM has taken account of the general line of reasoning described by Ofcom in 2011 and 2012 with respect to BT.[18] The Ofcom approach cannot be directly implemented in Malaysia, but Ofcom's values and the qualitative approach can be used to estimate asset betas for the present purpose.

The weightings used and the disaggregated asset betas for the Malaysia market determined by these considerations are shown in the following table.

Table 7: Telekom Malaysia: Disaggregated asset beta values

	Group	Core	Fixed Access	HSBB	Other
Weighting within Fixed Services		41%	39%	20%	
Weighting within Group		18%	35%	37%	9%
Asset beta (Malaysia)	**0.65**	**0.60**	**0.54**	**0.85**	**0.88**

Source: Ovum analysis

These values for asset beta and the other parameter values, as for all fixed services, result in the costs of equity and WACC values shown in the following table.

18 Ofcom, "Charge control framework for WBA Market 1 services", July 2011, pp. 93-131, and "LLU/WLR charge control draft statement – Annexes", February 2012, pp. 130-138.

Table 8: Telekom Malaysia: Fixed Services WACC Values

	Group	Core	Fixed Access	HSBB
Asset beta (Malaysia)	0.65	0.60	0.54	0.85
Cost of Equity (USD)				
Malaysia	8.2%	7.9%	7.5%	9.3%
ASEAN-5	7.0%	6.8%	6.5%	7.7%
Global/Mature	6.5%	6.3%	6.1%	6.3%
Weighted Average	6.9%	6.7%	6.5%	7.6%
Cost of Equity MYR	**7.1%**	**6.9%**	**6.7%**	**7.8%**
Pre-tax WACC	**8.86%**	**8.65%**	**8.39%**	**9.70%**

Source: Ovum analysis

Question 12

The SKMM seeks comments on the following:

a) the assumptions used to derive the WACC for Fixed Services; and

b) the estimates of the disaggregated WACC values used for Fixed services.

9 Fixed Termination and Origination Services

9.1 Services

There are two services on the Access List:

- Fixed Network Origination Service
- Fixed Network Termination Service

The costs and prices for these services are calculated in the Fixed Core and Transmission Model, which is a standard TSLRIC+ model of a Malaysian fixed network operator of the size of Telekom Malaysia. Much of the data is based on submissions from Telekom Malaysia. There is also the option of costing services based broadly on a fixed operator of the size of TIME.

9.2 Service demands and traffic

There are three (3) sets of services for which demands are used in the model. The model works by dimensioning a network that will meet these service demands each year at an appropriate quality of service.

9.2.1 Voice services and traffic

In a fixed network, the number of working lines represents the number of subscribers to the voice service. The working lines used in the model are a smoothed version of the forecast provided by Telekom Malaysia. In the long term, the model forecast declines at the same rate as Telekom Malaysia forecasts.

For the call minutes generated by these subscribers, the model uses a smoothed version of the forecast provided by Telekom Malaysia. For traffic incoming from mobile operators and traffic outgoing to mobile operators, the forecast used is constructed through reconciliation between the data responses provided by Telekom Malaysia and the mobile operators. The traffic levels are consistent with that of the standard mobile operator in the Mobile and WiMAX model.

The other call parameters, such as successful call rate, have been given by Telekom Malaysia, with some missing data interpolated from similar call services.

Telekom Malaysia, as is common with most incumbent fixed operators globally, currently operates two core networks: a traditional circuit-switched PSTN; and a modern IP-based network. Telekom Malaysia will likely transition to a fully IP core network as it becomes economically feasible to do so.

In order to model the effect of an increasing IP core network, the model splits the voice traffic into that carried largely on the PSTN and that carried largely on the IP network. Telekom Malaysia provided data (in its routing factors) that indicates about 10% of traffic is currently carried on the IP network. The model has a parameter to indicate how much traffic in 2016 should be carried on the IP network. By default, this value is set at 50%. The model uses straight-line growth from the traffic in 2011 to the assumed traffic in 2016.

Networks are dimensioned to carry traffic in the busy hour. For the voice services, the proportion of traffic in the busy hour of a busy day is assumed to be around 9.5%.

9.2.2 Data services

The data services considered in the model are in two forms: DSL services, which are the retail broadband services provided by the network operator; and bitstream services, which are the wholesale version of DSL services used by other operators to provide data services to end users. These services are included in the model to ensure that the full scale of the fixed network is taken into account.

In the model, the DSL service forecasts are those provided by Telekom Malaysia. For bitstream, however, there are few, if any, currently working services. The model uses a forecast for bitstream services assuming that regulated prices will stimulate demand. The forecast is S-shaped, reaching 20% of the volume of DSL lines after 2020.

The data service volumes are those forecasted by Telekom Malaysia. The busy-hour data volume, about 2.5%, is much lower than for voice services.

9.2.3 Leased Lines

The forecasts of leased lines, both retail and wholesale services, are based on the forecasts provided by Telekom Malaysia. These services are included in the model to ensure that the full scale of the fixed network is taken into account.

9.3 Network model

The network extent is modelled through two dimensions. The first is the number of installed lines, where the forecast is a smoothed version of the data provided by Telekom Malaysia. In this data, the proportion of working copper lines to the total installed is increasing, as the transition to fibre access comes about. This characteristic has been preserved in the model forecast.

The second dimension is the geographic extent of the network, which is represented by the transmission distances in the model. The initial values are taken from the data provided by Telekom Malaysia, but the model calibrates the total transmission distances calculated bottom-up with the total length of fibre deployed by Telekom Malaysia. (This, in effect, accounts for the multiplexing of transmission to higher rates.)

With these dimensions, the model is a "scorched node" model: that is, it preserves the established network locations, dimensions network elements at these locations (and calibrates the numbers with actual network deployments – see below), and optimizes the transmission facilities between locations.

The service demands are allocated to network elements through routing factors, which indicate which network elements, and in what proportion, contribute to the delivery of each service. For voice services, the routing factors were mainly provided by Telekom Malaysia for both the PSTN and the IP core network. In some cases, missing items were interpolated. Some values were also modified to give consistency between items.

Telekom Malaysia did not provide routing factors for data services. The model uses routing factors that are in proportion to the deployed equipment volumes supplied by Telekom Malaysia.

To dimension a network, the capacities and planned utilization of network elements need to be known. These were mostly provided by Telekom Malaysia, with some missing values interpolated from similar equipment. With these network-element capacities and routing factors, the model produces network-element quantities at nodes that are similar to actual deployments in past years. This is model calibration. There is one exception, where the calculated number of local exchanges is smaller than the number deployed. The SKMM has used the number calculated bottom-up in its preliminary costing.

Once network quantities have been calculated and calibrated, the model calculates annual capital and operational costs associated with deploying the network. This is done using unit capital investments and operational costs for each network element. The cost data was provided by Telekom Malaysia, with missing data interpolated by comparison with similar equipment.

The costs calculated bottom-up must be reconciled with the top-down book values and general ledger costs provided by Telekom Malaysia. The initial cost data provided by Telekom Malaysia produced too much cost in the calibrated network for past years. In order to achieve cost reconciliation, a variety of changes to the cost data could be made. A decision was made to adjust the unit purchase prices of equipment, to bring the values into line with unit prices for similarly sized equipment seen in other models. The values changed were for the network switching equipment: remote switching units, local exchanges, tandem switches, gateway switches for interconnection and international. With these changed unit prices, the model gave costs reconciled with the top-down data. Transmission cost data was not varied by the cost reconciliation process.

The annual costs associated with network equipment are allocated back to services using traffic-weighted routing factors. The unit costs of services can then be calculated.

The IP-based network element costs are allocated to services using the IP-based traffic-weighted routing factors only. The TSLRIC are then calculated using the successful call minutes for IP-based voice services. The weighted average IP Network Origination and Termination prices are calculated from the relevant model services.

9.4 Cost mark-ups

Mark-ups are used in the model to account for costs that are not otherwise included in the bottom-up calculations. There are two mark-ups used in the model.

The first is a mark-up on network costs for network indirect and support costs. The actual level of these costs – assets, depreciation and operational costs – was provided by Telekom Malaysia for past years. The mark-up is then the proportion of these costs compared to the total direct network cost. In the model, the core network cost is calculated bottom-up (as described above), while the access cost is taken from the top-down cost data provided by Telekom Malaysia. The resulting mark-up on network element costs is about 6%.

The second mark-up is for common business costs that are necessarily incurred in supporting the provision of the regulated services. This mark-up is applied to total service unit costs to provide the final service prices. The common business cost is spread over the network costs (including HSBB) and the retail costs. The model projects forward the retail costs in line with the number of subscribers (or services in operation).

The general overhead costs are also projected forward in line with the number of subscribers. The common cost mark-up is then the general overhead cost as a proportion of the total network and retail costs. The resulting mark-up on service costs is, on average, 4.8% during the regulatory period.

9.5 Responses to model viewing

The salient comments received after the model viewing period are summarised below.

1. The fixed network architecture will migrate from PSTN to IP-based NGN architecture and the current charges are below the charges calculated by the model. The model as released relied on the assumption that the current network architecture would stay the same throughout the forecast period not taking account of potential efficiency gains from an IP-based NGN.

2. The fixed core and transmission model must reflect the fact that Telekom Malaysia's legacy core network is effectively a stranded asset, already replaced by the Government's contribution as part of its Public-Private Partnership agreement with Telekom Malaysia. It should also ensure that termination rates are based on the costs incurred by an efficient operator.

3. There was no indication how overhead charges and indirect costs were defined and apportioned.

4. The equipment unit investment cost should reflect optimised replacement cost.

5. The models are network based and do not show the process flow of products.

6. Prices produced by the model: The voice origination costs are higher than voice termination costs, while the cost for fixed termination is higher than the costs for mobile termination services. The fixed termination rate calculated in the model as released appears substantially higher than in other benchmark countries. The costs for IP Network (0154) termination and origination services was noted to show an uptrend raising the question whether the model is based on a fiber network or microwave network.

7. Other network and direct costs should be taken into consideration, such as dark fibre rented from a third party; leased lines leased from a third party; rights of way for utilizing the paths; commission for channel partners; and USP funds.

9.6 Changes after model viewing

As a result of the comments after the model viewing, extensive changes were made to the Fixed Core and Transmission model.

The IP traffic has been split from traditional PSTN traffic to separate the design of a traditional PSTN core from a new NGN core. For the big operator option, the default design assumes that 50% of the voice traffic will be carried on the NGN core by 2016 (from about 10% in 2011). This parameter can be amended by the model user. For the small operator option, it is assumed that all traffic is carried on an NGN core.

A number of relatively minor changes have been made to the network design. In particular, the minimum numbers of transmission links required between sites have been revised.

For the big operator option, HSBB annualised costs are required for calculating the appropriate common cost mark-up. These HSBB annualised costs are now taken from the HSBB model instead of being re-estimated in the Fixed Core model.

The interconnection traffic to and from the mobile networks has been revised in line with the changed traffic forecasts in the Mobile model. The WACC value has been updated to the latest estimate (as given in this PI Paper).

There were also detailed follow-on discussions with Telekom Malaysia during which new data was provided. Specifically, the resulting changes were:

- A new forecast of lines supported by RSUs was provided. This was incorporated into the model.

- The split in top-down costs between retail and other was revised and is used in the model to calculate a revised common cost mark-up.

- The calculation of the number of Access Gateways was revised in line with new capacity data from Telekom Malaysia and revisions to the number of IP-supported lines.

There are other significant changes in cost allocations for facilities and services on the Access List. These changes, which do not affect the calculated values for termination and origination services, are described in the Transmission and Bitstream chapters below.

9.7 Proposed Regulated Prices

The model produced different costs for the PSTN and IP Network (0154) origination and termination services because of the different routing used, due to differing management of services and, partly, the transition from a traditional PSTN to an IP-based core. The SKMM was provided with detailed routing use cases and frequencies from Telekom Malaysia and used this data to determine routing factors reflective of the actual practice in the most significant core network.

In general, the calculated prices are declining over the regulatory period; reflecting the progress in simplifying the core network as demand for fixed voice services declines. At the edge of the core network, Telekom Malaysia is projecting only half the number of lines supported by RSUs in 2016 from the number in 2011. In the centre of the core network, there is progressive transfer to an all-IP network.

The calculated prices are close to the current mandated rate of 5 sen/minute, except for the use of the submarine cable and the use of IP-based termination or origination. The SKMM is therefore proposing to move directly to the calculated LRIC prices immediately, except for Double Tandem prices, where it is necessary to use a glide path to the rate in 2015 to avoid the anomalous transition of increasing rates followed by decreasing rates. Originally, the calculated prices for Double Tandem Termination are 4.67 sen/minute (2013) and 4.66 sen/minute (2014), and for Double Tandem Origination are 7.05 sen/minute (2013) and 6.73 sen/minute (2014).

The proposed prices are shown in the following tables.

Table 9: Fixed Network Termination Service Proposed Prices

PSTN Network Termination

	Units	2013	2014	2015
Local	sen/min	4.08	4.03	4.03
Single Tandem	sen/min	4.08	4.03	4.03
Double Tandem	sen/min	4.93	4.85	4.78
Double Tandem with Submarine Cable	sen/min	17.19	17.17	17.26

IP Network (0154) Termination

	Units	2013	2014	2015
National	sen/min	1.52	1.48	1.51

Source: Fixed Model, default settings; Ovum calculation

Table 10: Fixed Network Origination Service Proposed Prices

PSTN Network Origination

	Units	2013	2014	2015
Local	sen/min	4.43	4.40	4.39
Single Tandem	sen/min	4.43	4.40	4.39
Double Tandem	sen/min	5.49	5.97	6.46
Double Tandem with Submarine Cable	sen/min	18.21	17.81	17.50

IP Network (0154) Origination

	Units	2013	2014	2015
National	sen/min	1.27	1.24	1.26

Source: Fixed Model, default settings; Ovum calculation

Question 13

The SKMM seeks comments on the proposed regulated prices for fixed network origination and termination services.

9.8 Sensitivity analysis

This section provides some additional results from the model to demonstrate how the final calculated prices change with modifications to key parameters.

9.8.1 Small operator option

The model provides an option for considering a small fixed operator, based essentially on demand data provided by TIME. This has permitted the SKMM to study the effects of scale on the fixed termination rate.

For the small operator model, only demands for voice service have been included. This means that the full scale of the core network, including data traffic and leased lines, is not taken into account. All the traffic is assumed to be carried on an IP-based core network. Mark-ups for indirect network costs and common business costs are assumed to be at the same level as for the "big operator".

The results given by the small operator option represent an upper bound on the real interconnection costs. This is because:

- The service increment does not include data traffic, so that some economies of scale are not included;

- The routing factors have not been changed to account for potentially more efficient routing in the smaller network;

- The equipment sizes and costs have not been changed, meaning that possible cost savings from using smaller equipment sizes have not been included.

Some indicative results from the small operator option are given in the following table. These values are 2-9 times higher than for the comparable "big operator", showing that there are economies of scale available to the incumbent operator.

Table 11: Fixed Network Origination and Termination Prices – Small Operator

PSTN Network Origination

	Units	2012	2013	2014	2015
Local	sen/min	9.89	11.20	12.91	15.28
Single Tandem	sen/min	10.25	11.62	13.42	15.90

PSTN Network Termination

	Units	2012	2013	2014	2015
Local	sen/min	23.19	26.34	30.45	36.12
Single Tandem	sen/min	23.19	26.34	30.45	36.12

Source: Fixed Model, small operator option

The above values should be treated with caution for the reasons cited earlier. It is likely also that the traffic forecasts are pessimistic. They do suggest, however, that there could be a clear cost difference between the small fixed operator and the incumbent in Malaysia.

In setting interconnection prices, it would not be appropriate to take scale alone into account in discriminating between fixed operators. Smaller operators have the ability to grow through continued investment and innovative services; their business cases will depend more on new data services than expansion of voice services. The SKMM has therefore come to the preliminary conclusion to continue one set of origination and termination prices for fixed network origination and termination services.

Question 14

The SKMM seeks comments on the treatment of small fixed operators in the setting of regulated prices.

9.8.2 WACC value

The WACC value is a key parameter in determining the return on capital required for a suitable return to investors. The following tables show the effect on origination and termination service prices of increasing the pre-tax WACC by 2 percentage points to 10.65%.

Table 12: Fixed Network Termination Service Prices

PSTN Network Termination

	Units	2012	2013	2014	2015
Local	sen/min	4.51	4.30	4.24	4.25
Single Tandem	sen/min	4.51	4.30	4.24	4.25
Double Tandem	sen/min	5.11	4.91	4.91	5.03
Double Tandem with Submarine Cable	sen/min	18.42	18.25	18.23	18.32

IP Network (0154) Termination

	Units	2012	2013	2014	2015
National	sen/min	1.66	1.56	1.53	1.55

Source: Fixed Model, WACC=10.65%

Table 13: Fixed Network Origination Service Prices

PSTN Network Origination

	Units	2012	2013	2014	2015
Local	sen/min	4.82	4.67	4.64	4.64
Single Tandem	sen/min	4.82	4.67	4.64	4.64
Double Tandem	sen/min	7.94	7.46	7.12	6.84
Double Tandem with Submarine Cable	sen/min	19.94	19.32	18.90	18.58

IP Network (0154) Origination

	Units	2012	2013	2014	2015
National	sen/min	1.38	1.31	1.28	1.30

Source: Fixed Model, WACC=10.65%

9.8.3 Proportion of IP Traffic

The model assumes a growing proportion of IP traffic carried on an NGN core. If this assumption is not made, the current proportion of IP traffic – 10.12% – may continue for the remainder of the regulatory period. The following tables show the effect of restricting the proportion of IP traffic to 10.12% for the period to 2016.

Table 14: Fixed Network Termination Service Prices

PSTN Network Termination

	Units	2012	2013	2014	2015
Local	sen/min	4.39	4.17	4.08	3.97
Single Tandem	sen/min	4.39	4.17	4.08	3.97
Double Tandem	sen/min	5.07	4.91	4.87	4.81
Double Tandem with Submarine Cable	sen/min	17.54	17.38	17.32	17.25

IP Network (0154) Termination

	Units	2012	2013	2014	2015
National	sen/min	1.92	1.97	2.01	2.04

Source: Fixed Model, Proportion of IP traffic in 2016 = 10.12%

Table 15: Fixed Network Origination Service Prices

PSTN Network Origination

	Units	2012	2013	2014	2015
Local	sen/min	4.74	4.59	4.54	4.48
Single Tandem	sen/min	4.74	4.59	4.54	4.48
Double Tandem	sen/min	7.92	7.68	7.59	7.52
Double Tandem with Submarine Cable	sen/min	19.32	19.00	18.84	18.67

IP Network (0154) Origination

	Units	2012	2013	2014	2015
National	sen/min	1.67	1.70	1.74	1.77

Source: Fixed Model, Proportion of IP traffic in 2016 = 10.12%

The above results show that the effect of the transition to NGN has only a minor effect on origination and termination prices – less than 0.1 sen/minute. The PSTN origination prices increase (*cf*. Table 10), as expected, as the proportion of IP traffic decreases. The calculated PSTN termination prices show decreases (*cf*. Table 9) due to the fixed routing in the model: the model does not take into account the fundamental changes in network design accompanying the transition to NGN. The overall effect on cost, however, is small.

9.8.4 Depreciation schedules

The Fixed Core and Transmission model uses tilted annuity depreciation as the standard depreciation schedule. Long-run incremental costs should be calculated using economic depreciation, and tilted annuity depreciation provides the best approximation to economic depreciation (when, as in the present case, a very long time-series of costs for 30-50 years is not available). In past cost studies, however, the SKMM has used tilted straight-line depreciation for LRIC calculations: this has the benefit that annual depreciation costs can be directly calculated.

The present models provide an option to choose a depreciation method. In addition to tilted annuity, the models provide for straight-line depreciation, tilted straight-line depreciation and annuity calculations.

The following tables show the effect of varying the depreciation method.

Table 16: Fixed Network Origination and Termination Service Prices

PSTN Network Origination

	Units	2012	2013	2014	2015
Local	sen/min	5.65	5.57	5.62	5.70
Single Tandem	sen/min	5.65	5.57	5.62	5.70
Double Tandem	sen/min	9.29	8.82	8.51	8.27
Double Tandem with Submarine Cable	sen/min	23.09	22.52	22.17	21.92

IP Network (0154) Origination

	Units	2012	2013	2014	2015
National	sen/min	1.35	1.28	1.25	1.28

PSTN Network Termination

	Units	2012	2013	2014	2015
Local	sen/min	4.98	4.82	4.82	4.89
Single Tandem	sen/min	4.98	4.82	4.82	4.89
Double Tandem	sen/min	5.78	5.63	5.69	5.92
Double Tandem with Submarine Cable	sen/min	21.43	21.32	21.38	21.57

IP Network (0154) Termination

	Units	2012	2013	2014	2015
National	sen/min	1.62	1.53	1.50	1.53

Source: Fixed Model, Straight-line depreciation

Table 17: Fixed Network Origination and Termination Service Prices

PSTN Network Origination

	Units	2012	2013	2014	2015
Local	sen/min	4.91	4.72	4.66	4.62
Single Tandem	sen/min	4.91	4.72	4.66	4.62
Double Tandem	sen/min	8.17	7.63	7.24	6.92
Double Tandem with Submarine Cable	sen/min	20.80	20.11	19.64	19.26

IP Network (0154) Origination

	Units	2012	2013	2014	2015
National	sen/min	1.48	1.40	1.36	1.38

PSTN Network Termination

	Units	2012	2013	2014	2015
Local	sen/min	4.72	4.47	4.38	4.35
Single Tandem	sen/min	4.72	4.47	4.38	4.35
Double Tandem	sen/min	5.29	5.05	5.01	5.10
Double Tandem with Submarine Cable	sen/min	19.21	19.00	18.96	19.02

IP Network (0154) Termination

	Units	2012	2013	2014	2015
National	sen/min	1.78	1.67	1.63	1.65

Source: Fixed Model, Tilted straight-line depreciation

Table 18: Fixed Network Origination and Termination Service Prices

PSTN Network Origination

	Units	2012	2013	2014	2015
Local	sen/min	5.09	5.03	5.08	5.15
Single Tandem	sen/min	5.09	5.03	5.08	5.15
Double Tandem	sen/min	8.28	7.86	7.60	7.40
Double Tandem with Submarine Cable	sen/min	20.28	19.77	19.46	19.23

IP Network (0154) Origination

	Units	2012	2013	2014	2015
National	sen/min	1.25	1.19	1.17	1.19

PSTN Network Termination

	Units	2012	2013	2014	2015
Local	sen/min	4.46	4.33	4.33	4.41
Single Tandem	sen/min	4.46	4.33	4.33	4.41
Double Tandem	sen/min	5.19	5.07	5.14	5.35
Double Tandem with Submarine Cable	sen/min	18.78	18.68	18.74	18.92

IP Network (0154) Termination

	Units	2012	2013	2014	2015
National	sen/min	1.50	1.42	1.39	1.43

Source: Fixed Model, Annuity depreciation

Table 17 above shows the effect of changing to tilted straight-line depreciation: it would increase calculated prices by 0.2-0.3 sen/minute. For true LRIC prices, however, tilted annuity should be provided.

The results for the other depreciation schedules have been included only for completeness. It would be inappropriate to use a non-tilted method to calculate LRIC-based prices, given that the main equipment prices are estimated to be declining at 3-6% *per annum*.

10 Transmission-Related Services

10.1 Services

The transmission-related services on the Access List are the following:

- Transmission Service
- Wholesale Local Leased Circuit Service
- Interconnect Link Service
- Connection services to the submarine cable system (as part of Domestic Connectivity to International Services)

The costs and prices for these services are calculated in the Fixed Core and Transmission model described in sections 9.2-9.4 above. This model includes all the service demands that drive the size and costs of the fixed core network.

10.2 Allocations to transmission services

The basic calculations in the model allocate costs to network elements and services. These results are then used in the model to allocate costs to specific components of transmission services.

10.2.1 Wholesale transmission charges

The model calculates wholesale transmission charges based on the TSLRIC for core transmission. The costs of relevant network elements – core transmission, core routers, and management systems – are separated into quantity-related and distance-related components. These costs are then marked up with the common business cost mark-up.

The quantity-related costs can be recovered over all transmission services (shared network elements) while the distance-related costs can be recovered only by the wholesale services. The distance-related charges are therefore based on the unit cost per Km of the leased line demands.

The basic calculations are performed for the E1 transmission rate. The prices (both quantity-related and distance-related) for other rates are calculated by scaling the E1 prices using the factor 1.5 times the cost for each doubling in transmission rate. The value 1.5 is found in other models and is commonly used, but its supporting data is considered to be not strong. For further analysis related to this factor, see section 10.4.1.

For separating the calculated charges by distance zone, the "through connection" charge recovers the quantity-related costs and a small amount (100 m) of the distance-related costs. The other zones are based on adding distance-related components. The charge per km beyond 60 km is just the distance-related charge.

10.2.2 Leased line charges

For Wholesale Local Leased Circuit Service, the trunk segment charges are just those for the wholesale transmission services (as explained above). Leased line charges also include other components, for installation, port and tail segments. The port charge is quantity-related and the tail charge is distance-related.

The same process as for wholesale transmission services is used to allocate the relevant network element costs (not including trunk segment costs) to quantity-related and distance-related components. These values are marked-up with the common business cost mark-up to provide the full cost allocation.

The installation charges are calculated from the service provider's operational costs for leased-line services. A proportion of these costs is allocated to installation. This is in line with the regulatory principle of recovering only directly related operational costs in installation charges.

The installation charges are then removed from the cost base to provide new quantity-related and distance-related unit prices. These become the port and tail charges, respectively.

The calculations are carried out for the E1 transmission rate and the prices for other rates are scaled up or down in the same way as wholesale transmission services. There is one exception to this: the installation charge for services below E1 rate is set to the E1 value, in recognition that there is a minimum installation charge.

10.3 Responses to model viewing

The substantive comments received following the model viewing period are summarized below.

1. No cost-based argument was presented to support the distance ranges that have been adopted for transmission and leased line services.

2. Prices calculated by the model: The post-60 km per-kilometre rate should not be the same irrespective of the capacity of the service involved. No capacity charges are considered for connection services to submarine cable system. The proposed pricing structure for transmission services is not offered by the main providers. The charges should be based on an inter- and intra-regional basis, not on the distance served.

3. The methodology for Wholesale Local Leased Circuits of applying scale factors to the base E1 prices resulted in unrealistic access prices, which are way above the market prices that are actually charged for transmission services today.

4. The model should consider investment for the physical layers (Layer 1), i.e. civil works/trenching, pole erection and fibre optics.

5. The SDH, line card and drop card costs from one supplier suggest a capacity-to-cost ratio different from the 1.50 ratio used in the model.

10.4 Changes after model viewing

10.4.1 Allocations to transmission services

As a consequence of feedback received during model viewing, a full review was undertaken that revised the transmission allocations in the Fixed Core and Transmission model. This led to substantial changes in calculated service prices. The revisions did not affect the basic dimensioning or costing of the fixed core network.

The allocations to transmission services now work exactly as described in section 10.2. In the model released for model viewing there were a number of calculations that were substantially revised:

- The earlier model had a mixture of per-E1 and per-Km costs associated with transmission in the basic allocations. In the revised model, the per-E1 costs and the per-Km costs were clearly separated, so that each could be appropriately allocated to transmission services.

- Some items, such as the network management elements associated with transmission, were not included in the original allocations. They are now included in the overall transmission costs.

- For leased circuit charges, the port and tail costs are now clearly separated from the core transmission costs. The tail costs are directly calculated from junction fibre costs and not core costs.

- The installation costs for leased circuits are now based solely on an operator's operational costs. In the earlier model, the costs for installation were approximated from a reallocation of total operational costs. The installation charges for wholesale transmission services have been removed.

In addition, there were a number of minor changes to routing factors, to ensure consistency between network elements. There were also a few corrections to formulas that had been entered in error in the allocation tables.

One item that was not changed was the factor used to allocate costs to transmission rates other than E1.

One feedback received showed transmission costs at different rates and suggested that the correct factor was nearer 1.28 but it was not clear how this value was estimated. A calculation of a standard regression on the data produced a line of best fit with a factor of about 1.8. Using this higher value would have substantially increased the calculated prices for the higher transmission rates. These prices may have chilled demand for higher rate services at a time when data demands are increasing rapidly. The model has therefore retained the factor of 1.5 and assume that costs increase by 1.5 times for each doubling in transmission rate.

10.4.2 Other changes

In addition to the above changes, there were some minor revisions to the minimum numbers of transmission links required between sites. These revisions did not affect the final calculated costs for the standard parameter settings.

10.5 Proposed regulated prices

The provision of transmission is an important part of a communication network. For service providers, it is not effective to build transmission capacity to reach small or isolated pockets of customer demand. Hence there is a need for wholesale transmission services to be available. Because of the importance of transmission, having fully efficient prices in the market is desirable. This permits service providers to make an appropriate build or buy decision when determining how to access transmission.

There is some indication of a growing market in wholesale transmission services. On some major transmission routes, there are facilities available from Telekom Malaysia, Fibrecomm and Fiberail. In addition, major mobile network providers build or lease transmission on many routes. However, the majority of wholesale transmission services are provided by Telekom Malaysia and there is little evidence of other providers being able to price their services without reference to Telekom Malaysia's prices. Hence, the SKMM proposes to set regulated prices for Wholesale Local Leased Circuit Service and Transmission Service.

In addition, by their nature Interconnect Link Service and Connection services to the submarine cable system are monopolies in each instance and should have regulated prices.

The MSAP 2006 set regulated prices for transmission service that were steeply declining (in general) from 2006 to 2008. Since 2008, commercially negotiated wholesale transmission prices have also continued to fall on average, on routes where there is competition, as costs continue to decline. It is appropriate, therefore, to set prices based on cost from 2013. The calculated prices also rise less steeply with distance than the ones calculated for 2008, reflecting the fact that transmission distance has become relatively a lesser factor in the overall cost of transmission service.

A number of service providers remarked that market prices for transmission services, especially those based on IP technology, were no longer dependent on distance but were based solely on transmission rate. The underlying costs of transmission are still distance dependent (as, for example, the cost of providing a 200 km link is clearly greater than the cost of providing a 100 m link). A wholesale provider then, either explicitly or implicitly, averages the distance-dependent costs in some way to produce a distance-independent price.

For the SKMM to set distance-independent prices, this second level of averaging based on distance would be necessary. The SKMM does not have available a comprehensive dataset of actual and forecast distances for transmission service or leased lines, so averaging by distance would be based on limited data and would risk setting price signals that were inappropriate for some services. The SKMM therefore proposes to retain the current regulated price structure based on transmission level and distance bands. A provider that offers transmission services at distance-independent prices is required to use the regulated prices as averages and to ensure that the weighted average price over all the distances actually provided does not exceed the regulated price.

The proposed regulated maximum prices for transmission-related services are those calculated by the model and are shown in Table 19, Table 20, Table 21 and Table 22.

Table 19: Transmission Service Calculated Prices

64 kb/s leased circuit

	Units	2013	2014	2015
Installation	RM			
Trunk Segment				
Through-Connection	RM/year	132	123	116
Above 0.2 to 5 km	RM/year	259	231	211
Above 5 km to 10 km	RM/year	509	442	397
Above 10 km to 20 km	RM/year	892	765	682
Above 20 km to 30 km	RM/year	1,402	1,195	1,062
Above 30 km to 40 km	RM/year	1,912	1,626	1,442
Above 40 km to 50 km	RM/year	2,422	2,056	1,822
Above 50 km to 60 km	RM/year	2,932	2,487	2,202
Above 60 km	RM/km/year	51	43	38

E1 (2 Mb/s) leased circuit

	Units	2013	2014	2015
Installation	RM			
Trunk Segment				
Through-Connection	RM/year	962	902	850
Above 0.2 to 5 km	RM/year	1,895	1,689	1,544
Above 5 km to 10 km	RM/year	3,722	3,232	2,906
Above 10 km to 20 km	RM/year	6,520	5,593	4,989
Above 20 km to 30 km	RM/year	10,250	8,741	7,766
Above 30 km to 40 km	RM/year	13,980	11,889	10,544
Above 40 km to 50 km	RM/year	17,710	15,037	13,322
Above 50 km to 60 km	RM/year	21,440	18,185	16,099
Above 60 km	RM/km/year	373	315	278

E3 (34 Mb/s) leased circuit

	Units	2013	2014	2015
Installation	RM			
Trunk Segment				
Through-Connection	RM/year	4,872	4,569	4,304
Above 0.2 to 5 km	RM/year	9,592	8,553	7,819
Above 5 km to 10 km	RM/year	18,845	16,362	14,709
Above 10 km to 20 km	RM/year	33,007	28,314	25,256
Above 20 km to 30 km	RM/year	51,890	44,251	39,317
Above 30 km to 40 km	RM/year	70,773	60,187	53,379
Above 40 km to 50 km	RM/year	89,656	76,124	67,441
Above 50 km to 60 km	RM/year	108,539	92,061	81,503
Above 60 km	RM/km/year	1,888	1,594	1,406

STM-1 (155 Mb/s) leased circuit

	Units	2013	2014	2015
Installation	RM			
Trunk Segment				
Through-Connection	RM/year	10,861	10,185	9,594
Above 0.2 to 5 km	RM/year	21,385	19,067	17,431
Above 5 km to 10 km	RM/year	42,012	36,476	32,792
Above 10 km to 20 km	RM/year	73,585	63,123	56,304
Above 20 km to 30 km	RM/year	115,682	98,651	87,653
Above 30 km to 40 km	RM/year	157,779	134,180	119,002
Above 40 km to 50 km	RM/year	199,876	169,708	150,351
Above 50 km to 60 km	RM/year	241,973	205,237	181,699
Above 60 km	RM/km/year	4,210	3,553	3,135

STM-4 (622 Mb/s) leased circuit

	Units	2013	2014	2015
Installation	RM			
Trunk Segment				
Through-Connection	RM/year	24,436	22,916	21,587
Above 0.2 to 5 km	RM/year	48,116	42,901	39,221
Above 5 km to 10 km	RM/year	94,528	82,071	73,783
Above 10 km to 20 km	RM/year	165,566	142,026	126,684
Above 20 km to 30 km	RM/year	260,285	221,965	197,219
Above 30 km to 40 km	RM/year	355,003	301,904	267,754
Above 40 km to 50 km	RM/year	449,721	381,844	338,289
Above 50 km to 60 km	RM/year	544,440	461,783	408,824
Above 60 km	RM/km/year	9,472	7,994	7,053

Ethernet (10 Mb/s) leased circuit

	Units	2013	2014	2015
Installation	RM			
Trunk Segment				
Through-Connection	RM/year	2,165	2,030	1,913
Above 0.2 to 5 km	RM/year	4,263	3,801	3,475
Above 5 km to 10 km	RM/year	8,376	7,272	6,537
Above 10 km to 20 km	RM/year	14,670	12,584	11,225
Above 20 km to 30 km	RM/year	23,062	19,667	17,474
Above 30 km to 40 km	RM/year	31,455	26,750	23,724
Above 40 km to 50 km	RM/year	39,847	33,833	29,974
Above 50 km to 60 km	RM/year	48,240	40,916	36,223
Above 60 km	RM/km/year	839	708	625

Fast Ethernet (100 Mb/s) leased circuit

	Units	2013	2014	2015
Installation	RM			
Trunk Segment				
Through-Connection	RM/year	8,326	7,808	7,355
Above 0.2 to 5 km	RM/year	16,395	14,618	13,364
Above 5 km to 10 km	RM/year	32,209	27,964	25,140
Above 10 km to 20 km	RM/year	56,414	48,393	43,166
Above 20 km to 30 km	RM/year	88,688	75,631	67,199
Above 30 km to 40 km	RM/year	120,962	102,869	91,233
Above 40 km to 50 km	RM/year	153,235	130,107	115,267
Above 50 km to 60 km	RM/year	185,509	157,345	139,300
Above 60 km	RM/km/year	3,227	2,724	2,403

Gigabit Ethernet (1000 Mb/s) leased circuit

	Units	2013	2014	2015
Installation	RM			
Trunk Segment				
Through-Connection	RM/year	32,019	30,027	28,286
Above 0.2 to 5 km	RM/year	63,047	56,214	51,392
Above 5 km to 10 km	RM/year	123,862	107,540	96,679
Above 10 km to 20 km	RM/year	216,945	186,099	165,997
Above 20 km to 30 km	RM/year	341,057	290,846	258,420
Above 30 km to 40 km	RM/year	465,168	395,592	350,844
Above 40 km to 50 km	RM/year	589,280	500,338	443,267
Above 50 km to 60 km	RM/year	713,391	605,085	535,691
Above 60 km	RM/km/year	12,411	10,475	9,242

10 Gigabit Ethernet (10,000 Mb/s) leased circuit

	Units	2013	2014	2015
Installation	RM			
Trunk Segment				
Through-Connection	RM/year	123,133	115,473	108,776
Above 0.2 to 5 km	RM/year	242,453	216,176	197,632
Above 5 km to 10 km	RM/year	476,321	413,553	371,789
Above 10 km to 20 km	RM/year	834,282	715,661	638,356
Above 20 km to 30 km	RM/year	1,311,564	1,118,472	993,778
Above 30 km to 40 km	RM/year	1,788,845	1,521,283	1,349,200
Above 40 km to 50 km	RM/year	2,266,127	1,924,094	1,704,623
Above 50 km to 60 km	RM/year	2,743,408	2,326,905	2,060,045
Above 60 km	RM/km/year	47,728	40,281	35,542

Source: Fixed Model, default settings

Table 20: Wholesale Local Leased Circuit Service Calculated Prices

64kb/s leased circuit

	Units	2013	2014	2015
Installation	RM	380.89	345.89	315.37
Port	RM/year	518.22	481.13	462.18
Tail	RM/km/year	214.78	218.68	223.00
Trunk Segment				
Through-Connection	RM/year	132	123	116
Above 0.2 to 5 km	RM/year	259	231	211
Above 5 km to 10 km	RM/year	509	442	397
Above 10 km to 20 km	RM/year	892	765	682
Above 20 km to 30 km	RM/year	1,402	1,195	1,062
Above 30 km to 40 km	RM/year	1,912	1,626	1,442
Above 40 km to 50 km	RM/year	2,422	2,056	1,822
Above 50 km to 60 km	RM/year	2,932	2,487	2,202
Above 60 km	RM/km/year	51	43	38

E1 (2Mb/s) leased circuit

	Units	2013	2014	2015
Installation	RM	380.89	345.89	315.37
Port	RM/year	3,789.45	3,518.22	3,379.68
Tail	RM/km/year	1,570.55	1,599.05	1,630.65
Trunk Segment				
Through-Connection	RM/year	962	902	850
Above 0.2 to 5 km	RM/year	1,895	1,689	1,544
Above 5 km to 10 km	RM/year	3,722	3,232	2,906
Above 10 km to 20 km	RM/year	6,520	5,593	4,989
Above 20 km to 30 km	RM/year	10,250	8,741	7,766
Above 30 km to 40 km	RM/year	13,980	11,889	10,544
Above 40 km to 50 km	RM/year	17,710	15,037	13,322
Above 50 km to 60 km	RM/year	21,440	18,185	16,099
Above 60 km	RM/km/year	373	315	278

E3 (34Mb/s) leased circuit

	Units	2013	2014	2015
Installation	RM	1,928.28	1,751.06	1,596.57
Port	RM/year	19,184.08	17,810.98	17,109.63
Tail	RM/km/year	7,950.89	8,095.17	8,255.16
Trunk Segment				
Through-Connection	RM/year	4,872	4,569	4,304
Above 0.2 to 5 km	RM/year	9,592	8,553	7,819
Above 5 km to 10 km	RM/year	18,845	16,362	14,709
Above 10 km to 20 km	RM/year	33,007	28,314	25,256
Above 20 km to 30 km	RM/year	51,890	44,251	39,317
Above 30 km to 40 km	RM/year	70,773	60,187	53,379
Above 40 km to 50 km	RM/year	89,656	76,124	67,441
Above 50 km to 60 km	RM/year	108,539	92,061	81,503
Above 60 km	RM/km/year	1,888	1,594	1,406

STM-1 (155Mb/s) leased circuit

	Units	2013	2014	2015
Installation	RM	4,298.84	3,903.75	3,559.34
Port	RM/year	42,768.36	39,707.22	38,143.65
Tail	RM/km/year	17,725.47	18,047.11	18,403.78
Trunk Segment				
Through-Connection	RM/year	10,861	10,185	9,594
Above 0.2 to 5 km	RM/year	21,385	19,067	17,431
Above 5 km to 10 km	RM/year	42,012	36,476	32,792
Above 10 km to 20 km	RM/year	73,585	63,123	56,304
Above 20 km to 30 km	RM/year	115,682	98,651	87,653
Above 30 km to 40 km	RM/year	157,779	134,180	119,002
Above 40 km to 50 km	RM/year	199,876	169,708	150,351
Above 50 km to 60 km	RM/year	241,973	205,237	181,699
Above 60 km	RM/km/year	4,210	3,553	3,135

STM-4 (622Mb/s) leased circuit

	Units	2013	2014	2015
Installation	RM	9,672.38	8,783.43	8,008.51
Port	RM/year	96,228.81	89,341.24	85,823.22
Tail	RM/km/year	39,882.30	40,606.00	41,408.51
Trunk Segment				
Through-Connection	RM/year	24,436	22,916	21,587
Above 0.2 to 5 km	RM/year	48,116	42,901	39,221
Above 5 km to 10 km	RM/year	94,528	82,071	73,783
Above 10 km to 20 km	RM/year	165,566	142,026	126,684
Above 20 km to 30 km	RM/year	260,285	221,965	197,219
Above 30 km to 40 km	RM/year	355,003	301,904	267,754
Above 40 km to 50 km	RM/year	449,721	381,844	338,289
Above 50 km to 60 km	RM/year	544,440	461,783	408,824
Above 60 km	RM/km/year	9,472	7,994	7,053

Ethernet (10Mb/s) leased circuit

	Units	2013	2014	2015
Installation	RM	857.01	778.25	709.59
Port	RM/year	8,526.26	7,915.99	7,604.28
Tail	RM/km/year	3,533.73	3,597.85	3,668.96
Trunk Segment				
Through-Connection	RM/year	2,165	2,030	1,913
Above 0.2 to 5 km	RM/year	4,263	3,801	3,475
Above 5 km to 10 km	RM/year	8,376	7,272	6,537
Above 10 km to 20 km	RM/year	14,670	12,584	11,225
Above 20 km to 30 km	RM/year	23,062	19,667	17,474
Above 30 km to 40 km	RM/year	31,455	26,750	23,724
Above 40 km to 50 km	RM/year	39,847	33,833	29,974
Above 50 km to 60 km	RM/year	48,240	40,916	36,223
Above 60 km	RM/km/year	839	708	625

Fast Ethernet (100Mb/s) leased circuit

	Units	2013	2014	2015
Installation	RM	3,295.71	2,992.81	2,728.77
Port	RM/year	32,788.45	30,441.62	29,242.91
Tail	RM/km/year	13,589.27	13,835.85	14,109.30
Trunk Segment				
Through-Connection	RM/year	8,326	7,808	7,355
Above 0.2 to 5 km	RM/year	16,395	14,618	13,364
Above 5 km to 10 km	RM/year	32,209	27,964	25,140
Above 10 km to 20 km	RM/year	56,414	48,393	43,166
Above 20 km to 30 km	RM/year	88,688	75,631	67,199
Above 30 km to 40 km	RM/year	120,962	102,869	91,233
Above 40 km to 50 km	RM/year	153,235	130,107	115,267
Above 50 km to 60 km	RM/year	185,509	157,345	139,300
Above 60 km	RM/km/year	3,227	2,724	2,403

Gigabit Ethernet (1000Mb/s) leased circuit

	Units	2013	2014	2015
Installation	RM	12,673.94	11,509.13	10,493.73
Port	RM/year	126,090.79	117,065.85	112,456.11
Tail	RM/km/year	52,258.68	53,206.96	54,258.51
Trunk Segment				
Through-Connection	RM/year	32,019	30,027	28,286
Above 0.2 to 5 km	RM/year	63,047	56,214	51,392
Above 5 km to 10 km	RM/year	123,862	107,540	96,679
Above 10 km to 20 km	RM/year	216,945	186,099	165,997
Above 20 km to 30 km	RM/year	341,057	290,846	258,420
Above 30 km to 40 km	RM/year	465,168	395,592	350,844
Above 40 km to 50 km	RM/year	589,280	500,338	443,267
Above 50 km to 60 km	RM/year	713,391	605,085	535,691
Above 60 km	RM/km/year	12,411	10,475	9,242

10 Gigabit Ethernet (10000Mb/s) leased circuit

	Units	2013	2014	2015
Installation	RM	48,738.73	44,259.33	40,354.53
Port	RM/year	484,892.94	450,186.77	432,459.63
Tail	RM/km/year	200,965.25	204,611.91	208,655.77
Trunk Segment				
Through-Connection	RM/year	123,133	115,473	108,776
Above 0.2 to 5 km	RM/year	242,453	216,176	197,632
Above 5 km to 10 km	RM/year	476,321	413,553	371,789
Above 10 km to 20 km	RM/year	834,282	715,661	638,356
Above 20 km to 30 km	RM/year	1,311,564	1,118,472	993,778
Above 30 km to 40 km	RM/year	1,788,845	1,521,283	1,349,200
Above 40 km to 50 km	RM/year	2,266,127	1,924,094	1,704,623
Above 50 km to 60 km	RM/year	2,743,408	2,326,905	2,060,045
Above 60 km	RM/km/year	47,728	40,281	35,542

Source: Fixed Model, default settings

The price for Interconnect Link Service is based on the cost of trunk fibre.

Table 21: Interconnect Link Service Calculated Prices

For each pair of fibre cable

	Units	2013	2014	2015
Link employing a fibre cable	RM/km/year	475.95	383.59	328.78

Source: Fixed Model, default settings

The price for Connection services to the submarine cable system is based on the cost for junction fibre.

Table 22: Connection Services to the Submarine Cable System Calculated Prices

For each pair of fibre cable

	Units	2013	2014	2015
Link employing a fibre cable	RM/km/year	270.60	270.81	277.44

Source: Fixed Model, default settings

Question 15

The SKMM seeks comments on its approach to setting transmission prices and the proposed prices for transmission services.

In proposing the above regulated prices, the SKMM is aware that the cost basis is for a large telecommunications operator providing transmission services throughout Malaysia. For the developing transmission markets in East Malaysia, there may be cost differences due to smaller market size and difficult terrain. Setting higher prices in East Malaysia would provide incentives for additional transmission infrastructure in the region and the development of transmission competition. The SKMM is therefore seeking views and data on whether regulated prices for Transmission Services should distinguish between Peninsular Malaysia and East Malaysia and on what basis the price difference should be calculated. The SKMM prefers in all cases that regulated prices should be cost-based.

Question 16

The SKMM seeks comments on setting higher regulated prices for Transmission Service in East Malaysia and requests data on any additional costs that should be reflected in cost-based prices.

10.6 Sensitivity analysis

This section provides some additional results from the model to demonstrate how the final calculated prices change with variations to key parameters.

10.6.1 WACC value

The following table shows the effect on service prices for Wholesale Local Leased Circuit Service at E1 rate of increasing the pre-tax WACC by 2 percentage points to 10.65%.

Table 23: Wholesale Local Leased Circuit Service (E1 rate) Prices

E1 (2 Mb/s) leased circuit

	Units	2012	2013	2014	2015
Installation	RM	421.49	379.60	344.73	314.32
Port	RM/year	4,116.72	3,929.08	3,645.63	3,499.59
Tail	RM/km/year	1,656.15	1,688.33	1,719.45	1,753.90
Trunk Segment					
Through-Connection	RM/year	1,082	1,005	942	887
Above 0 to 5 km	RM/year	2,292	1,997	1,779	1,626
Above 5 km to 10 km	RM/year	4,661	3,940	3,419	3,073
Above 10 km to 20 km	RM/year	8,289	6,914	5,930	5,289
Above 20 km to 30 km	RM/year	13,125	10,879	9,277	8,243
Above 30 km to 40 km	RM/year	17,961	14,845	12,625	11,197
Above 40 km to 50 km	RM/year	22,798	18,810	15,972	14,152
Above 50 km to 60 km	RM/year	27,634	22,776	19,320	17,106
Above 60 km	RM/km/year	484	397	335	295

Source: Fixed Model, WACC=10.65%

The corresponding Transmission Service prices are the same as the trunk segment prices in the above table.

10.6.2 Proportion of IP Traffic

The model assumes a growing proportion of IP traffic carried on an NGN core. If this assumption is not made, the current proportion of IP traffic – 10.12% – may continue for the remainder of the regulatory period. The following table show the effect of restricting the proportion of IP traffic to 10.12% for the period to 2016.

Table 24: Wholesale Local Leased Circuit Service (E1 rate) Prices

E1 (2 Mb/s) leased circuit

	Units	2012	2013	2014	2015
Installation	RM	422.99	380.99	346.03	315.56
Port	RM/year	3,952.58	3,763.09	3,484.48	3,338.11
Tail	RM/km/year	1,541.10	1,570.69	1,599.31	1,631.08
Trunk Segment					
Through-Connection	RM/year	1,034	960	900	848
Above 0 to 5 km	RM/year	2,171	1,893	1,687	1,542
Above 5 km to 10 km	RM/year	4,401	3,720	3,230	2,903
Above 10 km to 20 km	RM/year	7,814	6,518	5,591	4,987
Above 20 km to 30 km	RM/year	12,364	10,248	8,739	7,764
Above 30 km to 40 km	RM/year	16,914	13,978	11,887	10,542
Above 40 km to 50 km	RM/year	21,464	17,708	15,035	13,320
Above 50 km to 60 km	RM/year	26,014	21,438	18,183	16,098
Above 60 km	RM/km/year	455	373	315	278

Source: Fixed Model, Proportion of IP traffic in 2016 = 10.12%

This table shows that the proportion of IP traffic (and hence of NGN) has little effect on transmission costs during the regulatory period, when the core network is in transition. A model based solely on NGN architecture would be expected to yield lower prices than for a model with the core network in transition. However, while Telekom Malaysia is making the transition, it should be able to recover its efficient costs – and other transmission service providers have a potential benefit in being able to provide lower prices based on a pure NGN architecture.

10.6.3 Depreciation schedules

The Fixed Core and Transmission model uses tilted annuity depreciation as the standard depreciation schedule, as described in section 9.8.4 above. In past cost studies, however, the SKMM has used tilted straight-line depreciation for LRIC calculations: this has the benefit that annual depreciation costs can be directly calculated.

The models provide an option to choose a depreciation method. In addition to tilted annuity, the models provide for straight-line depreciation, tilted straight-line depreciation and annuity calculations.

The following tables show the effect on Wholesale Local Leased Circuit Service at E1 rate of varying the depreciation method.

Table 25: Wholesale Local Leased Circuit Service (E1 rate) Prices

E1 (2 Mb/s) leased circuit

	Units	2012	2013	2014	2015
Installation	RM	419.32	377.63	342.93	312.67
Port	RM/year	4,083.41	3,903.31	3,626.95	3,486.74
Tail	RM/km/year	1,984.06	2,023.65	2,061.98	2,104.29
Trunk Segment					
Through-Connection	RM/year	1,105	1,028	965	911
Above 0 to 5 km	RM/year	2,518	2,187	1,944	1,775
Above 5 km to 10 km	RM/year	5,289	4,460	3,864	3,470
Above 10 km to 20 km	RM/year	9,530	7,939	6,801	6,063
Above 20 km to 30 km	RM/year	15,185	12,577	10,718	9,521
Above 30 km to 40 km	RM/year	20,840	17,215	14,635	12,979
Above 40 km to 50 km	RM/year	26,495	21,854	18,552	16,437
Above 50 km to 60 km	RM/year	32,150	26,492	22,469	19,895
Above 60 km	RM/km/year	565	464	392	346

Source: Fixed Model, Straight-line depreciation

Table 26: Wholesale Local Leased Circuit Service (E1 rate) Prices

E1 (2 Mb/s) leased circuit

	Units	2012	2013	2014	2015
Installation	RM	420.53	378.74	343.96	313.63
Port	RM/year	4,428.50	4,219.03	3,907.16	3,743.19
Tail	RM/km/year	1,740.16	1,774.31	1,807.35	1,843.89
Trunk Segment					
Through-Connection	RM/year	1,155	1,070	1,001	939
Above 0 to 5 km	RM/year	2,416	2,105	1,874	1,710
Above 5 km to 10 km	RM/year	4,888	4,132	3,585	3,221
Above 10 km to 20 km	RM/year	8,673	7,235	6,205	5,533
Above 20 km to 30 km	RM/year	13,718	11,373	9,698	8,617
Above 30 km to 40 km	RM/year	18,763	15,510	13,192	11,700
Above 40 km to 50 km	RM/year	23,809	19,648	16,685	14,783
Above 50 km to 60 km	RM/year	28,854	23,785	20,178	17,866
Above 60 km	RM/km/year	505	414	349	308

Source: Fixed Model, Tilted straight-line depreciation

Table 27: Wholesale Local Leased Circuit Service (E1 rate) Prices

E1 (2 Mb/s) leased circuit

	Units	2012	2013	2014	2015
Installation	RM	422.04	380.07	345.12	314.66
Port	RM/year	3,742.99	3,583.51	3,334.82	3,211.37
Tail	RM/km/year	1,699.76	1,732.78	1,764.72	1,800.07
Trunk Segment					
Through-Connection	RM/year	996	928	873	825
Above 0 to 5 km	RM/year	2,233	1,942	1,729	1,580
Above 5 km to 10 km	RM/year	4,656	3,929	3,406	3,061
Above 10 km to 20 km	RM/year	8,366	6,971	5,974	5,327
Above 20 km to 30 km	RM/year	13,313	11,027	9,397	8,348
Above 30 km to 40 km	RM/year	18,260	15,082	12,821	11,370
Above 40 km to 50 km	RM/year	23,206	19,138	16,245	14,391
Above 50 km to 60 km	RM/year	28,153	23,194	19,668	17,412
Above 60 km	RM/km/year	495	406	342	302

Source: Fixed Model, Annuity depreciation

Table 26 above shows that the effect of changing to tilted straight-line depreciation would be to increase prices (except for installation) by about 11%. For true LRIC prices, however, tilted annuity should be used.

The results for the other depreciation schedules have been included only for completeness. It would be inappropriate to use a non-tilted method to calculate LRIC-based prices, given that transmission equipment prices are estimated to be declining at 5% *per annum* for quantity-related elements and increasing at 3% *per annum* for distance-related costs.

11 Fixed Access Services

11.1 Services

The services on the Access List considered in this chapter are:

- Wholesale Line Rental Service
- Full Access Service
- Line Sharing Service
- Sub-loop Service
- Digital Subscriber Line Resale Service.

The common characteristic of these services is that they are all dependent on a copper loop (or sub-loop) and traditional PSTN operations. (Bitstream services, which also depend on copper access, are described separately because they also include some core transmission costs. HSBB services, which depend on fibre-based fixed access, are also described separately.)

The costs and prices for the fixed access services are estimated in a Fixed Access model, which uses a building-block approach. The reasons for using a building-block approach for fixed access costing are described in chapter 6. Since the major portion of the assets have been installed and depreciated over a long period, straight-line depreciation is the default depreciation schedule in the model.

11.2 Modelled services

The Fixed Access model has two types of wholesale services: those in which the access seeker takes over the whole copper loop; and those that involve sharing the copper loop between the access provider’s PSTN service and the access seeker’s DSL (or bitstream) service. The first category includes Wholesale Line Rental, Full Access Service and Sub-loop Service. The second category includes Line Sharing Service, Digital Subscriber Line Resale Service (at various line rates) and Bitstream Services (at various line rates).

The SKMM received forecasts from service providers for Wholesale Line Rental and Line Sharing Service (for wholesale DSL), in addition to total DSL services at various line rates. The SKMM extended these forecasts for Full Access Service and Sub-loop Service.

For Full Access Service, it was assumed that a proportion of lines taken up for the service would follow the same trend as Wholesale Line Rental. For Sub-loop Service, it was assumed that a small proportion of sub-loops would eventually be taken up by the service.

Forecasts for Digital Subscriber Line Resale Service and Bitstream Services were not present in the data provided by service providers. The SKMM therefore developed forecasts for these services assuming that setting appropriate cost-based prices for these wholesale services would stimulate demand. In each case, an S-shaped forecast of take-up was developed. The take-up proportion was then applied to the aggregate forecast of DSL services at each line rate: that is, some wholesale DSL and Bitstream services were substituted for retail DSL services.

The model uses the same forecast of overall working copper lines as in the Fixed Core and Transmission model. The service provider forecasts for DSL services show that about 40% of the working lines carry DSL services. In the SKMM forecasts, in the longer term, approximately 16% of working lines would be taken up by access seekers for Digital Subscriber Line Resale Service or Bitstream Services. This is a conservative estimate of the effect of competitive access. All working lines that are not wholesale lines are assumed to be the access provider's retail lines (for PSTN and DSL retail services).

11.3 Fixed Access model

The basic building blocks used in the model are Access Infrastructure (that is, the ducts, pipes and poles used to house cables and equipment) and Copper Access Lines & Equipment (which is mostly copper cables). The split between these asset classes is based on partial data supplied by Malaysian service providers.

Future capital expenditures are based on the same forecast of installed lines as in the Fixed Core and Transmission model. Asset values per installed line are assumed to increase modestly over time but the long-term decline in installed lines leads to decreases in overall capital investment in later years.

Future operational costs are based on the forecasts of working lines. The SKMM estimated the increase in operational costs per working line from service provider data and assumed that this was associated with lines and equipment, not infrastructure. Future unit costs are then multiplied by the number of working lines to give the total operational expenditure. A proportion of the lines and equipment operational cost was assumed to be driven by installations.

Forecasts of installations are based on growth in working lines (if any) and churn.

11.4 Allocation of costs to services

All services that use the full copper loop, except Sub-loop Service, have the same allocation factors of 1 for each building block. That is, each line uses the same proportion of each asset. For Sub-loop Service, the allocation factors are based on the proportion of the total loop length that is copper.

The basic allocation factors for services that share the copper loop are set to 0. The standard building-block model calculations then roll forward the asset base and allocate costs to wholesale line services and retail lines.

In a second allocation step, some of the costs allocated initially to retail lines are reallocated to Line Sharing Service, Digital Subscriber Line Resale Service and Bitstream Services. The SKMM assumes that, for shared-line services, the costs are shared equally between the telephony service (provided by the access provider) and the data service (provided by the access seeker). This applies directly to Line Sharing Service and Digital Subscriber Line Resale Service and Bitstream Services at the most popular line rate (which is 1 Mb/s). For Digital Subscriber Line Resale Service and Bitstream Services at other line rates, a regulatory gradient –the same as is used for transmission services in the Fixed Core and Transmission model – is applied. These allocation factors are used to reallocate costs from retail lines to shared-line wholesale services.

Costs allocated to services are turned into costs per line by dividing with the corresponding number of lines. A common cost mark-up is applied, using the common cost mark-up calculated in the Fixed Core and Transmission model.

11.5 Fixed Access WACC

The SKMM has used a WACC value of 8.39% for Fixed Access assets. This value comes from disaggregating the estimated WACC for all of Telekom Malaysia, as described in section 8.3.7 and noted in Table 8.

11.6 Responses to model viewing

After the model viewing period, substantive comments on the Fixed Access model were received. Below is a summary of these comments.

1. The model results could lead to the over-recovery of costs. Some access assets should be considered “stranded” (and hence not included in the cost base).

2. The book values used for setting the Regulatory Asset Base did not reflect the true value of the access assets, as there was accelerated depreciation of some equipment items. The asset base should be increased by 15%.

3. There was insufficient granularity in the model to discern cost differences between services.

4. Inappropriate assumptions had been made in setting some key parameters.

11.7 Changes after model viewing

The SKMM has been mindful that there should be appropriate cost recovery for Fixed Access services. The current book values, together with straight-line depreciation, represent the asset base used by the fixed service providers in making their financial decisions. Book values therefore provide an appropriate basis on which to base regulated prices.

Through further detailed discussions with Telekom Malaysia, as indicated in the following section, the granularity of the Fixed Access model has been increased and all assumptions have been revisited.

In responding to the comments received after the model reviewing, the SKMM made the following changes to the viewed version of the model:

- The unit capital investments per installed line were assumed to increase in line with the price trend for equipment in each asset class. The price trend was 3.0% *per annum* for each asset class.

- The WACC value was updated to the latest estimated value and the common cost mark-ups were updated from the Fixed Core and Transmission model.

The SKMM also undertook a series of discussions with Telekom Malaysia to gain a more detailed understanding of the characteristics of fixed copper access. Telekom Malaysia also provided a partially populated model of its costs of providing fixed access. As a result of these discussions and a detailed audit of Telekom Malaysia’s model, the SKMM made further changes to the Fixed Access model, as follows:

- New forecasts for Full Access Service and Line Sharing Service were included in the model; these were provided by Telekom Malaysia. (The model also included new forecasts for Bitstream Services, as described later.)

- The allocation factors for Sub-loop Service were changed to correspond to an average copper sub-loop length of 500 m. In the model released for model viewing, this length was set to 300 m, the maximum reach at full bandwidth for VDSL service. Telekom Malaysia provided the average length of its copper distribution network; this would be the average sub-loop length if all sub-loops were taken up by Sub-loop Service. The new value is less than the average distribution length, since it is likely that access seekers would prefer to take up Sub-loop Service in areas where the copper distribution is relatively short and high-speed VDSL services can be provided; hence the average sub-loop take-up should be less than the average in the whole network.

- A new network element, a handover distribution frame, was included for Wholesale Line Rental Service costing. The costs for this frame are calculated bottom-up in the model based on demand for Wholesale Line Rental Service.

- The pricing of Digital Subscriber Line Resale Service was changed to include just line charges, as in the Telekom Malaysia model, without installation charges.

The general effect of these changes has been to increase calculated costs somewhat.

11.8 Proposed regulated prices

As noted in section 2.3, Full Access Service, Line Sharing Service and Sub-loop Service are not available on the HSBB network. The definitions of Full Access Service, Line Sharing Service and Sub-loop Service all require the access network to consist, at least in part, of a copper loop. Digital Subscriber Line Resale Service requires underlying DSL and hence is only available on a copper access loop. Wholesale Line Rental Service requires a connection to the access provider's PSTN.

Fixed Access services, together with Bitstream, permit a service provider to gain access to an end customer through the fixed network of another network operator. This most often means access via Telekom Malaysia's fixed network, as Telekom Malaysia provides over 90% of the fixed access lines. Fixed access is usually considered a bottleneck facility since it is generally uneconomic for a new entrant to duplicate an existing fixed network. This suggests that the prices for fixed access services should be regulated.

There is room for growth in fixed access since less than 40% of private households[19] are now connected to a fixed network. Hence, setting regulated wholesale prices may expose new fixed-network entrants to regulatory risk. The SKMM is not aware, however, of any plans by fixed network providers for substantial increases in the number of fixed lines, excluding the HSBB developments.

The SKMM therefore proposes to set cost-based prices for all fixed access services except for Sub-loop Service. Sub-loop Service is an exception because the costs of provision are likely to depend very strongly on the specific circumstances of the service provision in each instance. The length of the sub-loop may vary from, say, 300 m to 1,500 m; and installation activities will depend on the street cabinet. The line rental for Sub-loop Service should be based on the actual length of the proposed sub-loop and should be subject to commercial negotiation. The installation cost may also be subject to specific conditions in the sub-loop, such as ease of access to the street cabinet.

For Digital Subscriber Line Resale Service, the prices given below include only the line rental charges. An access seeker taking this service would have to pay additional usage charges (e.g. a cost per MB of data) based on the volume of data consumed by the end user. As discussed in section 12.5 below, the SKMM may use a retail-minus methodology for setting Bitstream Service prices. The same methodology could then be used for Digital Subscriber Line Resale Service: this is discussed at the end of this section.

For Full Access Service and Line Sharing Service, the model does not calculate line rental charges in 2013 because the revised forecasts provided by Telekom Malaysia do not include demand in that year. For these services, the SKMM proposes to use the 2014 calculated line rental in 2013 as well, as a close proxy for an actual cost-based price.

The proposed regulated prices are summarised in the following tables.

Table 28: Wholesale Line Rental Service Proposed Prices

	Units	2013	2014	2015
Installation (Provisioning)	RM	582.45	530.77	479.16
Line Rental	RM/month	35.76	34.85	33.57

Source: Fixed Access Model, default settings

19 DEL statistics (table 2, p. 3) in SKMM, *Pocket Book of Statistics*, Q1 2012.

Table 29: Full Access Service Proposed Prices

	Units	2013	2014	2015
Installation (Set-up & cutover)	RM	582.45	530.77	479.16
Line Rental	RM/month	34.69	34.69	33.40

Source: Fixed Access Model, default settings; modified for 2013

Table 30: Line Sharing Service Proposed Prices

	Units	2013	2014	2015
Installation	RM	291.22	265.39	239.58
Line Rental	RM/month	17.34	17.34	16.70

Source: Fixed Access Model, default settings; modified for 2013

Table 31: Digital Subscriber Line Resale Service Proposed Prices

	Units	2013	2014	2015
Line Rental				
Downstream 384 kb/s	RM/month	10.03	9.77	9.41
Downstream 512 kb/s	RM/month	11.87	11.56	11.13
Downstream 1 Mb/s	RM/month	17.80	17.34	16.70
Downstream 2 Mb/s	RM/month	26.70	26.02	25.05
Downstream 4 Mb/s	RM/month	40.05	39.02	37.58

Source: Fixed Access Model, default settings; without 256 kb/s rate

Question 17

The SKMM seeks comments on which fixed access services, if any, should be subject to price regulation and on the reasonableness of the proposed maximum regulated prices.

If the SKMM chooses to set regulated prices for Bitstream Service using a retail-minus methodology, it would be consistent also to set prices for Digital Subscriber Line Resale Service using the same methodology. The SKMM would use Telekom Malaysia's aggregate financial information to set the "minus" component in the retail-minus methodology or other additional information if it were available.

Question 18

The SKMM seeks comments on the alternative of using a retail-minus methodology for setting regulated prices for Digital Subscriber Line Resale Service and requests information on what would be the appropriate "minus" factor to be used in this methodology.

11.9 Sensitivity analysis

This section provides some additional results from the model to demonstrate how the final calculated prices change with modifications to key parameters.

11.9.1 WACC value

The following tables show the effect on service prices of increasing the pre-tax WACC by 2 percentage points to 10.39%.

Table 32: Wholesale Line Rental Service

	Units	2012	2013	2014	2015
Installation (Provisioning)	RM	523.92	582.45	530.77	479.16
Line Rental	RM/month	38.97	37.32	36.05	34.35

Source: Fixed Access Model, WACC = 10.39%

Table 33: Full Access Service

	Units	2012	2013	2014	2015
Installation (Set-up & cutover)	RM	-	582.45	530.77	479.16
Line Rental	RM/month	-	-	35.88	34.17

Source: Fixed Access Model, WACC = 10.39%

Table 34: Digital Subscriber Line Resale Service

	Units	2012	2013	2014	2015
Line Rental					
Downstream 384 kb/s	RM/month	10.93	10.46	10.11	9.63
Downstream 512 kb/s	RM/month	12.93	12.38	11.96	11.39
Downstream 1 Mb/s	RM/month	19.40	18.57	17.94	17.09
Downstream 2 Mb/s	RM/month	29.10	27.86	26.91	25.63
Downstream 4 Mb/s	RM/month	43.65	41.79	40.36	38.44

Source: Fixed Access Model, WACC = 10.39%

11.9.2 Placement offset

The Fixed Access model includes a parameter to offset the time of new asset placements from the beginning of the year to some months during the year. An offset of 6 months would defer new placements until after 6 months each year. This is a standard feature of building-block models. It has the effect of moving the cash flows for new placements later in time. It does not affect the roll forward of the initial regulatory asset base, which is fixed at the beginning of the first year and each annual charge occurs at the beginning of the year.

The calculated prices if the placement offset is set to 6 months are shown in the following tables. These values are shown for completeness of the description of the model.

Table 35: Wholesale Line Rental Service

	Units	2012	2013	2014	2015
Installation (Provisioning)	RM	523.92	582.45	530.77	479.16
Line Rental	RM/month	37.06	36.04	35.21	34.24

Source: Fixed Access Model, offset = 6 months

Table 36: Full Access Service

	Units	2012	2013	2014	2015
Installation (Set-up & cutover)	RM	-	582.45	530.77	479.16
Line Rental	RM/month	-	-	35.05	34.07

Source: Fixed Access Model, offset = 6 months

Table 37: Digital Subscriber Line Resale Service

	Units	2012	2013	2014	2015
Line Rental					
Downstream 384 kb/s	RM/month	10.40	10.11	9.87	9.60
Downstream 512 kb/s	RM/month	12.30	11.96	11.68	11.36
Downstream 1 Mb/s	RM/month	18.45	17.94	17.53	17.04
Downstream 2 Mb/s	RM/month	27.68	26.90	26.29	25.55
Downstream 4 Mb/s	RM/month	41.51	40.36	39.44	38.33

Source: Fixed Access Model, offset = 6 months

11.9.3 Depreciation schedules

The Fixed Access model uses straight-line depreciation as the standard depreciation schedule, as described in section 8.2.4 above: this is consistent with the valuation of the initial regulatory asset base. In past cost studies, however, the SKMM has used tilted straight-line depreciation for cost calculations.

The new models provide an option to choose a depreciation method. In addition to straight line, the models provide for tilted straight-line depreciation, annuity, and tilted annuity.

The following tables show the effect on the main fixed access services of varying the depreciation method.

Table 38: Wholesale Line Rental Service

	Units	2012	2013	2014	2015
Installation (Provisioning)	RM	523.92	582.45	530.77	479.16
Line Rental	RM/month	35.34	35.13	35.32	35.21

Source: Fixed Access Model, Tilted Straight-line Depreciation

Table 39: Full Access Service

	Units	2012	2013	2014	2015
Installation (Set-up & cutover)	RM	-	582.45	530.77	479.16
Line Rental	RM/month	-	-	35.15	35.03

Source: Fixed Access Model, Tilted Straight-line Depreciation

Table 40: Digital Subscriber Line Resale Service

	Units	2012	2013	2014	2015
Line Rental					
Downstream 256 kb/s	RM/year	-	-	-	-
Downstream 384 kb/s	RM/month	9.90	9.84	9.90	9.87
Downstream 512 kb/s	RM/month	11.72	11.65	11.72	11.68
Downstream 1 Mb/s	RM/month	17.58	17.47	17.57	17.52
Downstream 2 Mb/s	RM/month	26.37	26.21	26.36	26.27
Downstream 4 Mb/s	RM/month	39.55	39.31	39.54	39.41

Source: Fixed Access Model, Tilted Straight-line Depreciation

Table 41: Wholesale Line Rental Service

	Units	2012	2013	2014	2015
Installation (Provisioning)	RM	523.92	582.45	530.77	479.16
Line Rental	RM/month	34.84	34.85	35.30	35.48

Source: Fixed Access Model, Annuity Depreciation

Table 42: Full Access Service

	Units	2012	2013	2014	2015
Installation (Set-up & cutover)	RM	-	582.45	530.77	479.16
Line Rental	RM/month	-	-	35.16	35.34

Source: Fixed Access Model, Annuity Depreciation

Table 43: Digital Subscriber Line Resale Service

	Units	2012	2013	2014	2015
Line Rental					
Downstream 256 kb/s	RM/year	-	-	-	-
Downstream 384 kb/s	RM/month	9.77	9.78	9.90	9.96
Downstream 512 kb/s	RM/month	11.57	11.57	11.72	11.78
Downstream 1 Mb/s	RM/month	17.35	17.35	17.58	17.67
Downstream 2 Mb/s	RM/month	26.02	26.03	26.37	26.50
Downstream 4 Mb/s	RM/month	39.03	39.04	39.56	39.76

Source: Fixed Access Model, Annuity Depreciation

Table 44: Wholesale Line Rental Service

	Units	2012	2013	2014	2015
Installation (Provisioning)	RM	523.92	582.45	530.77	479.16
Line Rental	RM/month	33.73	34.38	35.52	36.48

Source: Fixed Access Model, Tilted Annuity Depreciation

Table 45: Full Access Service

	Units	2012	2013	2014	2015
Installation (Set-up & cutover)	RM	-	582.45	530.77	479.16
Line Rental	RM/month	-	-	35.37	36.32

Source: Fixed Access Model, Tilted Annuity Depreciation

Table 46: Digital Subscriber Line Resale Service

	Units	2012	2013	2014	2015
Line Rental					
Downstream 256 kb/s	RM/year	-	-	-	-
Downstream 384 kb/s	RM/month	9.46	9.64	9.96	10.23
Downstream 512 kb/s	RM/month	11.19	11.41	11.79	12.11
Downstream 1 Mb/s	RM/month	16.79	17.11	17.68	18.16
Downstream 2 Mb/s	RM/month	25.19	25.67	26.52	27.24
Downstream 4 Mb/s	RM/month	37.78	38.50	39.79	40.86

Source: Fixed Access Model, Tilted Annuity Depreciation

Of these options, tilted annuity depreciation may be considered, since it approximates economic depreciation. However, this would be inconsistent with the valuation of the initial regulatory asset base. Revaluing the initial regulatory asset base through economic depreciation, in order to use tilted annuity for future calculations, would then defeat the purpose of the building-block approach, which aims to ensure exact cost recovery for very long-lived assets.

12 Bitstream Services

12.1 Services

Bitstream Services on the Access List have two options: Bitstream without Network Service and Bitstream with Network Service. The latter service incurs transmission charges to the access seeker's premises. Bitstream provides layer 2 (data link layer) access to end customer's network terminations via an access provider's network. It is a primary means by which broadband service providers without fixed access facilities gain access to customers, thereby overcoming the enduring bottleneck of a single fixed access network.

12.2 Allocations to Bitstream prices

12.2.1 Price components

Bitstream Services have several components to their prices: Installation costs, Port rental charges (dependent on access rate and usage) and Line rental charges (dependent on line access rate). In addition, Bitstream with Network Service has added transmission costs.

Bitstream Services appear in both the Fixed Core and Transmission model and the Fixed Access model. The Bitstream price components are calculated as follows:

- Installation charges: calculated in the Fixed Access model as for other installation costs, through reallocation of PSTN installation charges;
- Port rental charges: calculated in the Fixed Core and Transmission model, as described below;
- Line rental charges: calculated in the Fixed Access model as for other line rental costs, through reallocation of PSTN line rental charges.

12.2.2 Bitstream port charges

In the Fixed Core and Transmission model, the costs of the network elements related to bitstream data services are allocated to Bitstream Services using the service-weighted routing factors. The service costs are then divided by the services in operation to give the annual cost per service unit.

When marked-up for common costs as for other data services, the unit annual costs become the annual price for bitstream core network facilities. This is the bitstream annual port charge.

12.3 Responses to model viewing

In addition to general comments received on Fixed Access services, Telekom Malaysia provided more detailed commentary on the differentiation of Bitstream Services from Digital Subscriber Line Resale Service and Full Access Service. As noted in section 11.7, the SKMM undertook more detailed discussions with Telekom Malaysia resulting in a model with greater granularity in differentiating costs between services. These discussions also produced a new forecast for Bitstream Services demand, as noted in the next section.

12.4 Changes after model viewing

The major changes to the Fixed Core and Transmission model have been described in sections 9.6 and 10.4 and to the Fixed Access model in section 11.7. These changes have some effects on the calculation of bitstream costs, as the cost allocations have been changed.

In addition, after detailed discussions with Telekom Malaysia on the structure of Fixed Access services, Telekom Malaysia provided a new forecast of overall Bitstream take-up. The revised forecast was allocated to downstream service rates in the same proportions as in the original forecast.

12.5 Proposed regulated prices

12.5.1 Calculated cost-based prices

The Bitstream prices calculated by the models are shown in the following tables. Bitstream Service without Network Service includes just the prices in the first table. Bitstream with Network Service includes the prices from both tables (where the transmission prices are the same as those calculated for Transmission Service and shown in section 10.5 above).

Table 47: Bitstream Service without Network Service Calculated Prices

Bitstream Line Charges

	Units	2012	2013	2014	2015
Installation	RM	-	655.25	597.12	539.05
Port Rental					
384 kb/s downstream	RM/year	467.38	341.68	306.96	294.76
512 kb/s downstream	RM/year	828.20	605.46	543.95	522.33
1 Mb/s downstream	RM/year	2,063.49	1,538.38	1,409.47	1,380.25
2 Mb/s downstream	RM/year	2,676.74	2,007.49	1,850.27	1,822.81
4 Mb/s downstream	RM/year	3,290.00	2,476.59	2,291.08	2,265.38
Line Rental					
384 kb/s downstream	RM/month	-	-	9.77	9.41
512 kb/s downstream	RM/month	-	-	11.56	11.13
1 Mb/s downstream	RM/month	-	-	17.34	16.70
2 Mb/s downstream	RM/month	-	-	26.02	25.05
4 Mb/s downstream	RM/month	-	-	39.02	37.58

Source: Fixed Access Model, Fixed Core Model version 42, default settings

Table 48: Bitstream Network Service Calculated Prices

NxE1 Transmission

	Units	2012	2013	2014	2015
Aggregation Network					
Through-Connection	RM/year	1,035	962	902	850
Above 0 to 5 km	RM/year	2,173	1,895	1,689	1,544
Above 5 km to 10 km	RM/year	4,402	3,722	3,232	2,906
Above 10 km to 20 km	RM/year	7,815	6,520	5,593	4,989
Above 20 km to 30 km	RM/year	12,365	10,250	8,741	7,766
Above 30 km to 40 km	RM/year	16,915	13,980	11,889	10,544
Above 40 km to 50 km	RM/year	21,466	17,710	15,037	13,322
Above 50 km to 60 km	RM/year	26,016	21,440	18,185	16,099
Above 60 km	RM/km/year	455	373	315	278

STM-1 Transmission

	Units	2012	2013	2014	2015
Aggregation Network					
Through-Connection	RM/year	11,684	10,861	10,185	9,594
Above 0 to 5 km	RM/year	24,523	21,385	19,067	17,431
Above 5 km to 10 km	RM/year	49,686	42,012	36,476	32,792
Above 10 km to 20 km	RM/year	88,202	73,585	63,123	56,304
Above 20 km to 30 km	RM/year	139,556	115,682	98,651	87,653
Above 30 km to 40 km	RM/year	190,911	157,779	134,180	119,002
Above 40 km to 50 km	RM/year	242,265	199,876	169,708	150,351
Above 50 km to 60 km	RM/year	293,620	241,973	205,237	181,699
Above 60 km	RM/km/year	5,135	4,210	3,553	3,135

Gigabit Ethernet (1000 Mb/s)

	Units	2012	2013	2014	2015
Aggregation Network					
Through-Connection	RM/year	34,447	32,019	30,027	28,286
Above 0 to 5 km	RM/year	72,298	63,047	56,214	51,392
Above 5 km to 10 km	RM/year	146,486	123,862	107,540	96,679
Above 10 km to 20 km	RM/year	260,040	216,945	186,099	165,997
Above 20 km to 30 km	RM/year	411,444	341,057	290,846	258,420
Above 30 km to 40 km	RM/year	562,848	465,168	395,592	350,844
Above 40 km to 50 km	RM/year	714,253	589,280	500,338	443,267
Above 50 km to 60 km	RM/year	865,657	713,391	605,085	535,691
Above 60 km	RM/km/year	15,140	12,411	10,475	9,242

10 Gigabit Ethernet (10,000 Mb/s)

	Units	2012	2013	2014	2015
Aggregation Network					
Through-Connection	RM/year	132,469	123,133	115,473	108,776
Above 0 to 5 km	RM/year	278,029	242,453	216,176	197,632
Above 5 km to 10 km	RM/year	563,325	476,321	413,553	371,789
Above 10 km to 20 km	RM/year	1,000,004	834,282	715,661	638,356
Above 20 km to 30 km	RM/year	1,582,243	1,311,564	1,118,472	993,778
Above 30 km to 40 km	RM/year	2,164,481	1,788,845	1,521,283	1,349,200
Above 40 km to 50 km	RM/year	2,746,720	2,266,127	1,924,094	1,704,623
Above 50 km to 60 km	RM/year	3,328,958	2,743,408	2,326,905	2,060,045
Above 60 km	RM/km/year	58,224	47,728	40,281	35,542

Source: Fixed Core Model, default settings

12.5.2 Proposed regulated prices

As noted earlier, Bitstream Service is a primary means by which broadband service providers without fixed access facilities gain access to customers. As broadband or data services grow in popularity, there is likely to be significant service innovation as customers take up higher DSL rates. Setting regulated prices for all possible bitstream rates would therefore run the risk of introducing regulatory distortion into the market.

The SKMM therefore proposes to set maximum regulated prices only for the currently most popular DSL rates of 512 kb/s and 1 Mb/s downstream. This will set a price point for commercial negotiations on other rates.

For the bitstream network service (which essentially provides network backhaul to the access seeker's premises), the SKMM proposes to set the same regulated prices as for other transmission services.

The proposed maximum regulated prices for bitstream services are shown in the following tables. Bitstream without Network Service incurs only the bitstream port and line charges shown in the first table. Bitstream with Network Services incurs the additional network service charges shown in the second table.

Bitstream line charges are not calculated in the Fixed Access model for 2013, as the revised forecast provided by Telekom Malaysia does not show demand in that year. The SKMM therefore proposes to use the calculated line charges for 2014 in 2013, as a proxy for the cost-based charges. These charges are shown in the following table.

Table 49: Bitstream Service without Network Service Proposed Prices

Bitstream Line Charges

	Units	2013	2014	2015
Installation	RM	655.25	597.12	539.05
Port Rental				
512 kb/s downstream	RM/year	605.46	543.95	522.33
1 Mb/s downstream	RM/year	1,538.38	1,409.47	1,380.25
Line Rental				
512 kb/s downstream	RM/month	11.56	11.56	11.13
1 Mb/s downstream	RM/month	17.34	17.34	16.70

Source: Table 47, modified for 2013, 2 rates only

Table 50: Bitstream Network Service Proposed Prices

NxE1 Transmission

	Units	2013	2014	2015
Aggregation Network				
Through-Connection	RM/year	962	902	850
Above 0 to 5 km	RM/year	1,895	1,689	1,544
Above 5 km to 10 km	RM/year	3,722	3,232	2,906
Above 10 km to 20 km	RM/year	6,520	5,593	4,989
Above 20 km to 30 km	RM/year	10,250	8,741	7,766
Above 30 km to 40 km	RM/year	13,980	11,889	10,544
Above 40 km to 50 km	RM/year	17,710	15,037	13,322
Above 50 km to 60 km	RM/year	21,440	18,185	16,099
Above 60 km	RM/km/year	373	315	278

STM-1 Transmission

	Units	2013	2014	2015
Aggregation Network				
Through-Connection	RM/year	10,861	10,185	9,594
Above 0 to 5 km	RM/year	21,385	19,067	17,431
Above 5 km to 10 km	RM/year	42,012	36,476	32,792
Above 10 km to 20 km	RM/year	73,585	63,123	56,304
Above 20 km to 30 km	RM/year	115,682	98,651	87,653
Above 30 km to 40 km	RM/year	157,779	134,180	119,002
Above 40 km to 50 km	RM/year	199,876	169,708	150,351
Above 50 km to 60 km	RM/year	241,973	205,237	181,699
Above 60 km	RM/km/year	4,210	3,553	3,135

Gigabit Ethernet (1000 Mb/s)

	Units	2013	2014	2015
Aggregation Network				
Through-Connection	RM/year	32,019	30,027	28,286
Above 0 to 5 km	RM/year	63,047	56,214	51,392
Above 5 km to 10 km	RM/year	123,862	107,540	96,679
Above 10 km to 20 km	RM/year	216,945	186,099	165,997
Above 20 km to 30 km	RM/year	341,057	290,846	258,420
Above 30 km to 40 km	RM/year	465,168	395,592	350,844
Above 40 km to 50 km	RM/year	589,280	500,338	443,267
Above 50 km to 60 km	RM/year	713,391	605,085	535,691
Above 60 km	RM/km/year	12,411	10,475	9,242

10 Gigabit Ethernet (10,000 Mb/s)

	Units	2013	2014	2015
Aggregation Network				
Through-Connection	RM/year	123,133	115,473	108,776
Above 0 to 5 km	RM/year	242,453	216,176	197,632
Above 5 km to 10 km	RM/year	476,321	413,553	371,789
Above 10 km to 20 km	RM/year	834,282	715,661	638,356
Above 20 km to 30 km	RM/year	1,311,564	1,118,472	993,778
Above 30 km to 40 km	RM/year	1,788,845	1,521,283	1,349,200
Above 40 km to 50 km	RM/year	2,266,127	1,924,094	1,704,623
Above 50 km to 60 km	RM/year	2,743,408	2,326,905	2,060,045
Above 60 km	RM/km/year	47,728	40,281	35,542

Source: Table 48

Question 19

The SKMM seeks comments on its proposed approach to regulating prices for Bitstream Services and on the appropriateness of the proposed prices for some Bitstream Services.

The previous regulated prices for Bitstream Service without Network Service (the Bitstream line charges) were set using LRIC methodology. The SKMM recognizes that some of the proposed cost-based prices produced by the present cost models are above some current retail rates and hence may be inconsistent with the development of a wholesale market.

The SKMM is therefore seeking views on using the alternative of a retail-minus methodology for setting the regulated prices for Bitstream Service without Network Service. In this methodology, the SKMM would use the weighted average retail prices of Telekom Malaysia's equivalent retail DSL services as the current retail price level. The SKMM has data on the aggregate retail, wholesale and other expenditures by Telekom Malaysia and could use this data to estimate the "minus" component of avoidable retail costs in calculating a retail-minus price. The SKMM could use cost data specific to DSL and Bitstream services if it were made available.

Question 20

The SKMM seeks comments on the alternative of using a retail-minus methodology for setting regulated prices for Bitstream Services and requests information on what would be the appropriate "minus" factor to be used in this methodology.

12.6 Sensitivity analysis

This section provides some additional results from the models to demonstrate how the final calculated prices change with modifications to key parameters. Only the Bitstream line charges (installation, port rental and line rental) are shown, as the Bitstream network charges are the same as for Transmission Service: the variations in calculated transmission costs are detailed in section 10.6 above.

12.6.1 WACC value

The following tables show the effect on service prices of increasing the pre-tax WACC by 2 percentage points.

Table 51: Bitstream Service without Network Service

Bitstream Line Charges

	Units	2012	2013	2014	2015
Installation	RM	-	655.25	597.12	539.05
Port Rental					
384 kb/s downstream	RM/year	484.61	355.34	319.53	306.93
512 kb/s downstream	RM/year	858.74	629.66	566.22	543.88
1 Mb/s downstream	RM/year	2,139.58	1,599.89	1,467.18	1,437.20
2 Mb/s downstream	RM/year	2,775.45	2,087.75	1,926.04	1,898.02
4 Mb/s downstream	RM/year	3,411.32	2,575.61	2,384.89	2,358.84
Line Rental					
384 kb/s downstream	RM/month	-	-	10.11	9.63
512 kb/s downstream	RM/month	-	-	11.96	11.39
1 Mb/s downstream	RM/month	-	-	17.94	17.09
2 Mb/s downstream	RM/month	-	-	26.91	25.63
4 Mb/s downstream	RM/month	-	-	40.36	38.44

Source: Fixed Access Model, WACC=10.39%; Fixed Core Model, WACC=10.65%

12.6.2 Proportion of IP traffic

The Fixed Core and Transmission model assumes an increase in IP core network over the regulatory period. Setting the IP core traffic to be the same as the current level results in different port charges for Bitstream service. Other charges remain the same. The results are shown in the following table.

Table 52: Bitstream Service without Network Service

Bitstream Line Charges

	Units	2012	2013	2014	2015
Installation	RM	-	655.25	597.12	539.05
Port Rental					
384 kb/s downstream	RM/year	467.26	341.15	306.16	293.67
512 kb/s downstream	RM/year	828.00	604.53	542.52	520.40
1 Mb/s downstream	RM/year	2,062.98	1,536.04	1,405.77	1,375.14
2 Mb/s downstream	RM/year	2,676.09	2,004.43	1,845.42	1,816.07
4 Mb/s downstream	RM/year	3,289.19	2,472.82	2,285.07	2,256.99
Line Rental					
384 kb/s downstream	RM/month	-	-	9.77	9.41
512 kb/s downstream	RM/month	-	-	11.56	11.13
1 Mb/s downstream	RM/month	-	-	17.34	16.70
2 Mb/s downstream	RM/month	-	-	26.02	25.05
4 Mb/s downstream	RM/month	-	-	39.02	37.58

Source: Fixed Access Model, default; Fixed Core Model, IP traffic=10.12%

12.6.3 Placement offset

The Fixed Access model includes an option to offset new annual expenditures from the start of the year. This affects the line rental charges for Bitstream service, but not port rental charges. The result of offsetting new expenditures by 6 months is shown in the following table.

Table 53: Bitstream Service without Network Service

Bitstream Line Charges

	Units	2012	2013	2014	2015
Installation	RM	-	655.25	597.12	539.05
Port Rental					
384 kb/s downstream	RM/year	467.38	341.68	306.96	294.76
512 kb/s downstream	RM/year	828.20	605.46	543.95	522.33
1 Mb/s downstream	RM/year	2,063.49	1,538.38	1,409.47	1,380.25
2 Mb/s downstream	RM/year	2,676.74	2,007.49	1,850.27	1,822.81
4 Mb/s downstream	RM/year	3,290.00	2,476.59	2,291.08	2,265.38
Line Rental					
384 kb/s downstream	RM/month	-	-	9.87	9.60
512 kb/s downstream	RM/month	-	-	11.68	11.36
1 Mb/s downstream	RM/month	-	-	17.53	17.04
2 Mb/s downstream	RM/month	-	-	26.29	25.55
4 Mb/s downstream	RM/month	-	-	39.44	38.33

Source: Fixed Access Model, Offset=6; Fixed Core Model, default

12.6.4 Depreciation schedules

The Fixed Access model uses straight-line depreciation as the standard depreciation schedule and the Fixed Core and Transmission model uses tilted annuity. This is one of 15 options possible for the pricing of Bitstream Services.

The alternative of most use in making regulatory comparisons is to use tilted straight-line depreciation in both models, which is consistent with the depreciation schedules used in previous pricing decisions. The results for Bitstream service using tilted straight-line depreciation is shown in the following table.

Table 54: Bitstream Service without Network Service

Bitstream Line Charges

	Units	2012	2013	2014	2015
Installation	RM	-	655.25	597.12	539.05
Port Rental					
384 kb/s downstream	RM/year	510.35	374.05	336.08	322.50
512 kb/s downstream	RM/year	904.35	662.83	595.55	571.47
1 Mb/s downstream	RM/year	2,253.22	1,684.16	1,543.17	1,510.11
2 Mb/s downstream	RM/year	2,922.86	2,197.71	2,025.79	1,994.31
4 Mb/s downstream	RM/year	3,592.50	2,711.27	2,508.41	2,478.50
Line Rental					
384 kb/s downstream	RM/month	-	-	9.99	10.03
512 kb/s downstream	RM/month	-	-	11.82	11.87
1 Mb/s downstream	RM/month	-	-	17.73	17.81
2 Mb/s downstream	RM/month	-	-	26.59	26.71
4 Mb/s downstream	RM/month	-	-	39.89	40.06

Source: Fixed Access Model and Fixed Core Model, both with tilted straight-line depreciation

13 HSBB Services

13.1 Wholesale Layer 2 services

The HSBB is a new fixed access network providing high-speed broadband access to homes and businesses to provide the communications foundation for IP-based services such as IPTV and Internet access service. It is based primarily on a roll-out of fibre to the premises (usually called FTTH, Fibre to the Home) but with an option for VDSL and Ethernet access.

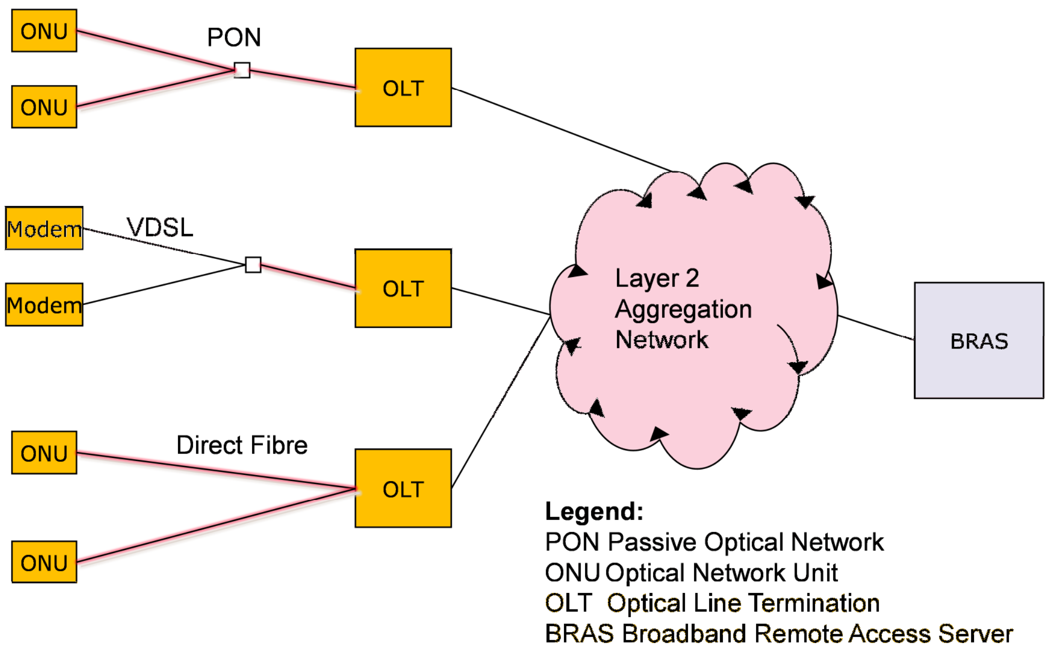
Wholesale HSBB services have been on the Access List since January 2009 but no regulated prices have been set. The Access List defines the regulated HSBB services as Layer 2 (Data Link Layer, but specifically Media Access Control ("MAC")) services specified by pre-defined speeds (meaning specific downstream and upstream transmission rates), QoS classes and contention ratios. That is, the Access List parameters define the access communications platform on which an Access Seeker could build an IP-based (Layer 3) service.

The SKMM has built an HSBB model, which uses the building-block methodology, to determine the cost of providing the HSBB Layer 2 services (and their Layer 3 equivalents). Since the Access List defines the services in terms of several parameters, there is a large number of options. For the model, as described below, the SKMM has chosen a smaller set of typical parameter combinations. These provide the platform for a range of IP-based services.

13.2 HSBB Network Model

The regulated HSBB services are at Layer 2, the MAC layer. The cost model therefore encompasses the facilities at Layer 1 (the Physical layer) and Layer 2. The underlying network model is shown in the following figure.

Figure 3: HSBB Network



Source: Ovum

The network has the following components:

- An Optical Network Unit ("ONU") or a VDSL modem at the customer's premises;
- An access network, which may consist of a Passive Optical Network ("PON"), a VDSL/fibre network, or direct optical fibre. The most common option is a PON. The access network also includes infrastructure components, such as ducts and pipes, or poles;
- An Optical Line Termination unit ("OLT") at the local exchange site or an exchange site further into the network, to terminate the fibre access;
- A Layer 2 aggregation network to aggregate services in a region;
- A Broadband Remote Access Server ("BRAS"). An Access Seeker gains access to the HSBB Layer 2 network at the BRAS (and may require, in addition, a transmission service to provide backhaul from the BRAS location to a point of interconnection).

The model assumes that all future growth will be on PONs. Telekom Malaysia has deployed some VDSL/fibre combinations in the past but the growth in this technology has slowed and will be capped. PONs and direct fibre access represent the future-proof growth path for high-speed access.

13.3 HSBB Services

The Access List defines the regulated HSBB services in terms of three sets of parameters: line speed, QoS class, and contention ratio. The following tables show the parameter sets provided in the Access List.

Table 55: HSBB Line Speeds

Bitrate Class	Downstream	Upstream
0	Unconstrained	
1	135 kb/s	135 kb/s
2	1 Mb/s	256 kb/s
3	6 Mb/s	1 Mb/s
4	10 Mb/s	1 Mb/s

Source: Access List, para. 6(25)(c)(i)

Table 56: HSBB Quality of Service Parameters

QoS Class	Latency max. (ms)	Jitter max. (ms)	Packet Loss Ratio max.
0	100	50	0.1%
1	400	50	0.1%
2	100		0.1%
3	400		0.1%
4	1,000		0.1%
5	Best Effort		

Source: Access List, para. 6(25)(c)(ii)

Table 57: HSBB Contention Ratios

Contention Ratio Class	Downstream	Upstream
0	1:1	1:1
1	1:1	10:1
2	10:1	10:1
3	20:1	20:1

Source: Access List, para. 6(25)(c)(iii)

The Access List provides for two types of regulated HSBB service:

1. HSBB Network Service with QoS: this service can have any of the QoS classes listed above;

2. HSBB Network Service without QoS: this service can have only QoS class 5, best effort.

For the cost model, the SKMM has combined the above parameters into a set of typical service offerings for the regulated HSBB services. The combinations chosen for the HSBB cost model are shown in the following tables. These combinations span a range of end-user services, as shown in the **Typical (Layer 3) Service** column of each table.

Table 58: HSBB Network Services with QoS

HSBB Service with QoS Type	Typical (Layer 3) Service	Bit Rate Class	QoS Class	Contention Ratio Class
1	VoIP	1	0	0
2	Transactional	1	2	0
3	Entry-level Business Quality Internet	2	4	2
4	Entry-level Residential Quality Internet	2	4	3
5	Video on Demand Subscription	3	1	1

HSBB Service with QoS Type	Typical (Layer 3) Service	Bit Rate Class	QoS Class	Contention Ratio Class
6	Mid-level Business Internet	3	4	2
7	Standard IPTV	4	1	1
8	Full high-speed Business Internet	4	4	2

Source: Ovum

Table 59: HSBB Network Services without QoS

HSBB Service without QoS Type	Typical (Layer 3) Service	Bit Rate Class	QoS Class	Contention Ratio Class
1	Standard Internet	0	5	3
2	Entry-level Internet	2	5	3
3	Mid-level Internet	3	5	2
4	Full high-speed Internet	4	5	2

Source: Ovum

The HSBB cost model provides costs and prices for the above services.

13.4 HSBB network rollout and take-up

Telekom Malaysia is rolling out the HSBB network in high priority areas under an agreement with the Government. In these areas, it is projected that there will be approximately 2.3 million premises in 2016. The Government has set a target of 1.3 million premises passed by the HSBB network by the end of 2012. The rollout is on target.

For the HSBB model, the SKMM has extended the rollout targets using a logarithmic trend line. This results in a forecast of approximately 1.7 million homes passed by the beginning of 2016. This represents more than 70% of premises in the rollout region.

It is assumed that not all customers passed by the HSBB will take up HSBB services and therefore, a forecast of take-up that begins at the current rates and approaches 60% by 2020 was developed. The forecast is S-shaped, meaning that the take-up rate increases in the early years and declines again in later years. This represents a typical profile of subscriptions to new high-speed networks. Having chosen to be connected to the HSBB network, customers will then choose a variety of services, as described in the next section.

The capital expenditures required for the HSBB are determined by the extent of the network, that is, the number of premises passed. In the model, the past expenditures per premises passed in 2010 and 2011 have been projected forward linearly to give a forecast of expenditures per premises passed and hence the required annual capital additions. The forecast of future operational expenditures is based on the cumulative capital investments, that is, the total size of the network.

13.5 HSBB services take-up and demand

Once a customer has decided to connect to the HSBB, then he/she is faced with choosing which specific services to take up. For the HSBB model, the SKMM has assumed that all HSBB customers will take an Internet service of some type. The initial take-up is based broadly on the range of Internet downstream speeds provided in the Access List and shown in Table 55: HSBB Line Speeds. These proportions are kept constant for the future.

For other services, the SKMM has developed forecasts of take-up that are all S-shaped curves starting from a low take-up in 2010 and reaching saturation in 2020. The assumption is that 30% of HSBB customers will take a voice service by 2020 and 60% of HSBB customers will take IPTV or a video service by 2020. The voice take-up assumption is based on SKMM’s view that the copper access network will remain alongside the HSBB network for the period of this study.

The HSBB model also requires the average data volumes generated by each user of a service. For this purpose, the data provided by IP service providers was analysed to develop a forecast of average data usage per subscriber. For voice, the average data usage declines over time. For Internet services, the average data volume per user rises logarithmically – that is, the demand rises towards an upper limit dependent on the Internet downstream speed.

The HSBB model also contains a forecast of installation activity each year, based on service growth (new installations) and churn (changes in service).

The SKMM notes that the service demand and take-up forecasts were not provided by Telekom Malaysia to this Access Pricing review.

Question 21

The SKMM seeks comments on the forecast take-up and service demands for the HSBB network.

13.6 Building blocks and asset base

The building blocks used in the HSBB model are the categories of cost used by Telekom Malaysia in its monthly reports to Government. The SKMM recognizes that this HSBB cost data was compiled for another purpose and was not provided directly to this Access Pricing review by Telekom Malaysia. The data does, however, appear to provide a comprehensive view of the costs for the HSBB. The "live-to-date" figures – that is, the total investments reported to date – are used as the initial asset base for these building blocks. (This overestimates the depreciated value of the assets slightly, as some assets will be up to two years old by 2011, the starting date for the model.) The asset lives and other building-block parameters needed by the HSBB model are taken from the data for similar items in the data responses from Telekom Malaysia and other fixed service providers. The common cost mark-up is taken to be the same as the mark-up calculated in the Fixed Core and Transmission model.

Of the building blocks, some are classified as Access and some as Network. The costs from these categories contribute to the costs of the regulated HSBB services. Other building blocks are classified as Retail costs, which are excluded from the costing of wholesale regulated services.

Of the core network investments, some will be for Layer 1 and Layer 2 components (physical and MAC, respectively), while the remainder will be for IP (Layer 3) and related components. In order to include only costs up to Layer 2 in the HSBB service costs, the annual proportions of core investments in an IP network for Layer 2 components are taken from a calculation in the Fixed Core and Transmission model.

With these settings, the HSBB building-block model is a form of Fully Allocated Cost model.

The Government contribution to support the HSBB rollout – a total of RM 2.4 billion – is assumed to support the capital expenditures incurred. This has the effect of reducing the required return on capital for investments (but not the depreciation) made in the early years of the rollout.

Question 22

The SKMM seeks comments on the asset base used for setting HSBB costs and the adjustments made to account for the Government contribution.

13.7 Depreciation profile for HSBB assets

The HSBB largely represents a replacement for or alternative to the fixed copper access network for broadband services. There is a case, therefore, for pricing services that use these alternative technologies in the same way. This reduces the possibility of introducing regulatory distortion into the market by setting inconsistent prices for fibre-based and copper-based services. The SKMM has therefore used straight-line depreciation in the HSBB model, consistent with the Fixed Access (copper) cost model.

There is a case, however, for using a tilted-annuity schedule in the HSBB model, based on two considerations. The first is that the majority of investment to date (about 60%) is in core network expansion, where unit costs of equipment are decreasing. The second is that the HSBB is being built now for services that will be taken up in the future: thus, it is appropriate to consider a recovery schedule that defers full recovery of costs to a later date.

Using a tilted annuity calculation will have a significant effect on calculated service prices. For example, for mid-level business Internet (HSBB service with QoS, type 6 in the model), the calculated line rental price falls by 27% in 2012 and 16% in 2015, if tilted annuity is used in place of straight-line depreciation.

In considering this issue, the SKMM has come to the preliminary conclusion to use straight-line depreciation. As the take-up and usage of HSBB services are quite uncertain, given the recent development of the HSBB, the tilted-annuity schedule imposes greater risk of under-recovery of costs by Telekom Malaysia. On the other hand, if service take-up and revenues are strong, then this will encourage Telekom Malaysia to undertake a wider rollout, to the benefit of the National Policy Objectives.

Question 23

The SKMM seeks comments on the appropriate depreciation schedule to be used in the HSBB cost model and its preliminary choice of straight-line depreciation.

13.8 HSBB WACC

The SKMM has used a WACC value of 9.70% for HSBB assets. This value comes from disaggregating the estimated WACC for all of Telekom Malaysia, as described in section 8.3.7 and noted in Table 8.

13.9 Responses to model viewing

The following are a summary of comments received after the model viewing period.

1. Regulation of prices for HSBB Services: Some expressed support for regulation, some proposed the regulation to be for incumbent HSBB providers only, while others believed that the prices should not be regulated as the services were all new and the demand forecasts were uncertain.

2. SKMM should recognize the common provisioning of voice services over any platform, including the HSBB, in its regulated prices.

3. Since the regulated services were all at Layer 2, only Layer 2 network costs should be included.

4. The core network investments had been overstated and SKMM should cross-check with Telekom Malaysia's reported depreciation costs.

5. Modelling only 20 out of 96 possible services could lead to service pricing "loopholes".

6. Government contribution: The Government's contribution towards Telekom Malaysia's investments in the HSBB should be taken into account in the HSBB model.

7. Assumptions and other parameters: Comments received on this include the take-up and churn parameters used in the model, assumptions about the evolution of services, the demand forecasts being too optimistic both in the early years and at saturation of service maturity, and the rollout estimates being too pessimistic. The SKMM also received some comparative data from Japan and the US.

13.10 Changes after model viewing

In response to the comments received after model viewing, a number of changes have been made to the model.

The Government contribution to the rollout of the HSBB network is now explicitly included in the model. The contribution is assumed to support capital expenditures and its presence reduces the required return on capital (but not depreciation). The total Government contribution of RM 2.4 billion is assumed to be provided by the end of 2012.

The regulated HSBB services are at layer 2 (the MAC layer). The model now explicitly adjusts the core asset costs to include only cost for layer 2 and below for the HSBB service costing. The proportions of IP core costs that are associated with layer 2 (and below) are calculated in the updated Fixed Core and Transmission model and these proportions are then used in the HSBB model to reduce the relevant capital expenditures for core assets.

As an addition to the basic HSBB model, the costs at Layer 3 are also rolled forward and the additional costs at Layer 3 are added to the regulated service costs to provide estimates of the equivalent IP service costs.

In the version available for model viewing, demand for some services was not forecast. In the updated HSBB model, all services now have forecasts on the same basis of S-shaped curves of take-up applied to the forecast of gross HSBB customers. Given that the SKMM believes that the copper network will remain in place for the time being, the VoIP service is no longer forecast as a PSTN replacement service but is seen as an optional service to be taken up by HSBB customers.

The VoIP service on the HSBB is now costed on a "traffic only" basis, consistent with the costing of voice in the Fixed Core and Transmission model. This means that the VoIP service makes no contribution to supporting the access network costs.

13.11 HSBB prices produced by the model

The HSBB model with default settings provides the standard service prices as shown in the following tables. For each of the HSBB Network Service with QoS, in addition to the prices in Table 60 below, there is also a transmission service component to provide backhaul to the POI. The transmission prices have already been described in section 10.5 and shown in Table 19: Transmission Service Calculated Prices.

Table 60: HSBB Network Service with QoS Calculated Prices

HSBB Service with QOS -- Type 1

	Units	2012	2013	2014	2015
Installation & Setup	RM	0.08	0.06	0.07	0.08
Port Rental (per port)	RM/month	0.05	0.02	0.01	0.01
Line Rental	RM/month	-	-	-	-

HSBB Service with QOS -- Type 2

	Units	2012	2013	2014	2015
Installation & Setup	RM	0.06	0.06	0.08	0.12
Port Rental (per port)	RM/month	0.03	0.01	0.01	0.01
Line Rental	RM/month	-	-	-	-

HSBB Service with QOS -- Type 3

	Units	2012	2013	2014	2015
Installation & Setup	RM	112.14	113.08	142.81	175.19
Port Rental (per port)	RM/month	2.00	0.95	0.63	0.52
Line Rental	RM/month	53.48	28.79	21.30	18.45

HSBB Service with QOS -- Type 4

	Units	2012	2013	2014	2015
Installation & Setup	RM	110.09	111.26	140.65	172.64
Port Rental (per port)	RM/month	0.85	0.40	0.27	0.22
Line Rental	RM/month	53.48	28.79	21.30	18.45

HSBB Service with QOS -- Type 5

	Units	2012	2013	2014	2015
Installation & Setup	RM	141.30	145.56	179.39	223.33
Port Rental (per port)	RM/month	63.97	37.31	27.84	24.52
Line Rental	RM/month	53.48	28.79	21.30	18.45

HSBB Service with QOS -- Type 6

	Units	2012	2013	2014	2015
Installation & Setup	RM	118.74	118.93	149.72	183.40
Port Rental (per port)	RM/month	5.71	2.70	1.81	1.49
Line Rental	RM/month	53.48	28.79	21.30	18.45

HSBB Service with QOS -- Type 7

	Units	2012	2013	2014	2015
Installation & Setup	RM	349.94	332.49	395.43	458.56
Port Rental (per port)	RM/month	188.98	85.64	55.25	43.30
Line Rental	RM/month	53.48	28.79	21.30	18.45

HSBB Service with QOS -- Type 8

	Units	2012	2013	2014	2015
Installation & Setup	RM	122.28	122.07	153.43	187.80
Port Rental (per port)	RM/month	7.69	3.64	2.44	2.00
Line Rental	RM/month	53.48	28.79	21.30	18.45

Source: HSBB Model, default settings

Table 61: HSBB Network Service without QoS Calculated Prices

HSBB Service without QOS -- Type 1

	Units	2012	2013	2014	2015
Installation & Setup	RM	110.09	111.26	140.65	172.65
Port Rental (per port)	RM/month	0.85	0.40	0.27	0.22
Line Rental	RM/month	53.48	28.79	21.30	18.45

HSBB Service without QOS -- Type 2

	Units	2012	2013	2014	2015
Installation & Setup	RM	110.09	111.26	140.65	172.64
Port Rental (per port)	RM/month	0.85	0.40	0.27	0.22
Line Rental	RM/month	53.48	28.79	21.30	18.45

HSBB Service without QOS -- Type 3

	Units	2012	2013	2014	2015
Installation & Setup	RM	117.19	117.55	148.09	181.46
Port Rental (per port)	RM/month	4.83	2.28	1.53	1.26
Line Rental	RM/month	53.48	28.79	21.30	18.45

HSBB Service without QOS -- Type 4

	Units	2012	2013	2014	2015
Installation & Setup	RM	120.19	120.21	151.23	185.18
Port Rental (per port)	RM/month	6.52	3.08	2.06	1.70
Line Rental	RM/month	53.48	28.79	21.30	18.45

Source: HSBB Model, default settings

13.12 Proposed regulated prices

As explained in section 13.3, the SKMM has not attempted to model all potential HSBB wholesale services defined in the Access List. Instead, it has defined four (4) typical HSBB network services without QoS and eight (8) typical HSBB network services with QoS.

The HSBB represents an enduring bottleneck facility in that it is unlikely that an alternative operator would duplicate HSBB facilities at the same location. Given the significance of the HSBB for the future of fixed networks, there is a strong case for ensuring that alternative service providers have competitive access to HSBB facilities.

It is likely that there will be significant service innovation, based on international trends, as service developers exploit the network performance available through the HSBB. This will lead to a variety of commercial outcomes in negotiations for wholesale access to the network. It would be inappropriate to set maximum wholesale prices for a large variety of HSBB service levels, as this could lead to significant regulatory distortion as the market for services develops.

The SKMM proposes to set maximum wholesale prices only for the service that could be used to provide a compelling residential broadband Internet service (called "HSBB Service without QoS, type 4" in the model). This provides 10 Mb/s downstream with 10:1 contention ratio in the aggregation network. By setting a regulated price for this service, the SKMM is providing a price point from which commercial negotiations on other HSBB-provided services can proceed.

However, the SKMM notes that the calculated prices are dependent on the service demand and take-up assumptions. As such, these prices are preliminary and subject to change depending on the industry feedback to this Public Inquiry.

The proposed regulated prices for the specific HSBB service are shown in the following table.

Table 62: HSBB Layer 2 Service at 10 Mb/s Downstream and 10:1 Contention Proposed Prices

HSBB Service without QOS -- Type 4

	Units	2013	2014	2015
Installation & Setup	RM	120.21	151.23	185.18
Port Rental (per port)	RM/month	3.08	2.06	1.70
Line Rental	RM/month	28.79	21.30	18.45

Source: Table 61: HSBB Network Service without QoS Calculated Prices (HSBB Network Service without QoS Type 4)

Question 24

The SKMM seeks comments on its proposed approach to regulating prices on the HSBB network and on the appropriateness of the proposed prices for residential broadband Internet service.

13.13 HSBB Layer 3 costs

The HSBB model also calculates the additional costs at Layer 3 of the core network. These costs are then allocated to services to estimate the costs of the Layer 3 (IP) equivalents of the Layer 2 services. The IP costs are added to the monthly port rental charges. The IP equivalents are referred to by the typical use names given in Table 58 and Table 59.

The calculated service costs for the Layer 3 services on the HSBB are shown in the following table.

Table 63: HSBB Layer 3 Calculated Service Costs

VoIP

	Units	2012	2013	2014	2015
Installation & Setup	RM	0.08	0.06	0.07	0.08
IP Port Rental	RM/month	0.08	0.03	0.02	0.01
Line Rental	RM/month	-	-	-	-

Transactional

	Units	2012	2013	2014	2015
Installation & Setup	RM	0.06	0.06	0.08	0.12
IP Port Rental	RM/month	0.06	0.02	0.01	0.01
Line Rental	RM/month	-	-	-	-

Entry-level Business Quality Internet

	Units	2012	2013	2014	2015
Installation & Setup	RM	112.14	113.08	142.81	175.19
IP Port Rental	RM/month	3.47	1.64	1.09	0.90
Line Rental	RM/month	53.48	28.79	21.30	18.45

Entry-level Residential Quality Internet

	Units	2012	2013	2014	2015
Installation & Setup	RM	110.09	111.26	140.65	172.64
IP Port Rental	RM/month	1.47	0.69	0.46	0.38
Line Rental	RM/month	53.48	28.79	21.30	18.45

Video on Demand Subscription

	Units	2012	2013	2014	2015
Installation & Setup	RM	141.30	145.56	179.39	223.33
IP Port Rental	RM/month	110.94	64.58	48.02	42.19
Line Rental	RM/month	53.48	28.79	21.30	18.45

Mid-level Business Internet

	Units	2012	2013	2014	2015
Installation & Setup	RM	118.74	118.93	149.72	183.40
IP Port Rental	RM/month	9.89	4.67	3.12	2.56
Line Rental	RM/month	53.48	28.79	21.30	18.45

Standard IPTV

	Units	2012	2013	2014	2015
Installation & Setup	RM	349.94	332.49	395.43	458.56
IP Port Rental	RM/month	327.73	148.22	95.28	74.49
Line Rental	RM/month	53.48	28.79	21.30	18.45

Full high-speed Business Internet

	Units	2012	2013	2014	2015
Installation & Setup	RM	122.28	122.07	153.43	187.80
IP Port Rental	RM/month	13.34	6.29	4.20	3.45
Line Rental	RM/month	53.48	28.79	21.30	18.45

Standard Internet

	Units	2012	2013	2014	2015
Installation & Setup	RM	110.09	111.26	140.65	172.65
IP Port Rental	RM/month	1.47	0.69	0.46	0.38
Line Rental	RM/month	53.48	28.79	21.30	18.45

Entry-level Internet

	Units	2012	2013	2014	2015
Installation & Setup	RM	110.09	111.26	140.65	172.64
IP Port Rental	RM/month	1.47	0.69	0.46	0.38
Line Rental	RM/month	53.48	28.79	21.30	18.45

Mid-level Internet

	Units	2012	2013	2014	2015
Installation & Setup	RM	117.19	117.55	148.09	181.46
IP Port Rental	RM/month	8.38	3.95	2.64	2.16
Line Rental	RM/month	53.48	28.79	21.30	18.45

Full high-speed Internet

	Units	2012	2013	2014	2015
Installation & Setup	RM	120.19	120.21	151.23	185.18
IP Port Rental	RM/month	11.30	5.33	3.56	2.92
Line Rental	RM/month	53.48	28.79	21.30	18.45

Source: HSBB Model, default settings

13.14 Sensitivity analysis

This section provides some additional results from the model to demonstrate how the final calculated prices change with modifications to key parameters.

13.14.1 WACC value

The WACC value is a key parameter in determining the return on capital required for a suitable return to investors. The following tables show the effect on all HSBB service prices of increasing the WACC by 2 percentage points to 11.70%.

Table 64: HSBB Network Service with QoS

HSBB Service with QOS -- Type 1

	Units	2012	2013	2014	2015
Installation & Setup	RM	0.08	0.06	0.07	0.08
Port Rental (per port)	RM/month	0.05	0.02	0.01	0.01
Line Rental	RM/month	-	-	-	-

HSBB Service with QOS -- Type 2

	Units	2012	2013	2014	2015
Installation & Setup	RM	0.06	0.06	0.08	0.12
Port Rental (per port)	RM/month	0.03	0.01	0.01	0.01
Line Rental	RM/month	-	-	-	-

HSBB Service with QOS -- Type 3

	Units	2012	2013	2014	2015
Installation & Setup	RM	112.14	113.08	142.81	175.19
Port Rental (per port)	RM/month	2.09	0.99	0.66	0.54
Line Rental	RM/month	56.16	30.23	22.47	19.48

HSBB Service with QOS -- Type 4

	Units	2012	2013	2014	2015
Installation & Setup	RM	110.09	111.26	140.65	172.64
Port Rental (per port)	RM/month	0.89	0.42	0.28	0.23
Line Rental	RM/month	56.16	30.23	22.47	19.48

HSBB Service with QOS -- Type 5

	Units	2012	2013	2014	2015
Installation & Setup	RM	141.30	145.56	179.39	223.33
Port Rental (per port)	RM/month	66.85	38.96	29.10	25.59
Line Rental	RM/month	56.16	30.23	22.47	19.48

HSBB Service with QOS -- Type 6

	Units	2012	2013	2014	2015
Installation & Setup	RM	118.74	118.93	149.72	183.40
Port Rental (per port)	RM/month	5.96	2.82	1.89	1.55
Line Rental	RM/month	56.16	30.23	22.47	19.48

HSBB Service with QOS -- Type 7

	Units	2012	2013	2014	2015
Installation & Setup	RM	349.94	332.49	395.43	458.56
Port Rental (per port)	RM/month	197.48	89.42	57.73	45.19
Line Rental	RM/month	56.16	30.23	22.47	19.48

HSBB Service with QOS -- Type 8

	Units	2012	2013	2014	2015
Installation & Setup	RM	122.28	122.07	153.43	187.80
Port Rental (per port)	RM/month	8.04	3.80	2.55	2.09
Line Rental	RM/month	56.16	30.23	22.47	19.48

Source: HSBB Model; WACC=11.70%

Table 65: HSBB Network Service without QoS

HSBB Service without QOS -- Type 1

	Units	2012	2013	2014	2015
Installation & Setup	RM	110.09	111.26	140.65	172.65
Port Rental (per port)	RM/month	0.89	0.42	0.28	0.23
Line Rental	RM/month	56.16	30.23	22.47	19.48

HSBB Service without QOS -- Type 2

	Units	2012	2013	2014	2015
Installation & Setup	RM	110.09	111.26	140.65	172.64
Port Rental (per port)	RM/month	0.89	0.42	0.28	0.23
Line Rental	RM/month	56.16	30.23	22.47	19.48

HSBB Service without QOS -- Type 3

	Units	2012	2013	2014	2015
Installation & Setup	RM	117.19	117.55	148.09	181.46
Port Rental (per port)	RM/month	5.05	2.39	1.60	1.31
Line Rental	RM/month	56.16	30.23	22.47	19.48

HSBB Service without QOS -- Type 4

	Units	2012	2013	2014	2015
Installation & Setup	RM	120.19	120.21	151.23	185.18
Port Rental (per port)	RM/month	6.81	3.22	2.16	1.77
Line Rental	RM/month	56.16	30.23	22.47	19.48

Source: HSBB Model; WACC =11.70%

13.14.2 Placement offset

The default placement offset in the HSBB model is 6 months, providing mid-year prices for a growing and expanding network. The placements can be set to the beginning of the year by setting the placement offset to 0. The effect of doing this is shown in the following tables.

Table 66: HSBB Network Service with QoS

HSBB Service with QOS -- Type 1

	Units	2012	2013	2014	2015
Installation & Setup	RM	0.08	0.06	0.07	0.08
Port Rental (per port)	RM/year	0.05	0.02	0.01	0.01
Line Rental	RM/year	-	-	-	-

HSBB Service with QOS -- Type 2

	Units	2012	2013	2014	2015
Installation & Setup	RM	0.06	0.06	0.08	0.12
Port Rental (per port)	RM/year	0.03	0.01	0.01	0.01
Line Rental	RM/year	-	-	-	-

HSBB Service with QOS -- Type 3

	Units	2012	2013	2014	2015
Installation & Setup	RM	112.14	113.08	142.81	175.19
Port Rental (per port)	RM/year	2.17	1.00	0.66	0.54
Line Rental	RM/year	59.68	31.98	22.71	19.36

HSBB Service with QOS -- Type 4

	Units	2012	2013	2014	2015
Installation & Setup	RM	110.09	111.26	140.65	172.64
Port Rental (per port)	RM/year	0.92	0.42	0.28	0.23
Line Rental	RM/year	59.68	31.98	22.71	19.36

HSBB Service with QOS -- Type 5

	Units	2012	2013	2014	2015
Installation & Setup	RM	141.30	145.56	179.39	223.33
Port Rental (per port)	RM/year	69.36	39.59	28.87	25.19
Line Rental	RM/year	59.68	31.98	22.71	19.36

HSBB Service with QOS -- Type 6

	Units	2012	2013	2014	2015
Installation & Setup	RM	118.74	118.93	149.72	183.40
Port Rental (per port)	RM/year	6.19	2.86	1.87	1.53
Line Rental	RM/year	59.68	31.98	22.71	19.36

HSBB Service with QOS -- Type 7

	Units	2012	2013	2014	2015
Installation & Setup	RM	349.94	332.49	395.43	458.56
Port Rental (per port)	RM/year	204.92	90.88	57.28	44.47
Line Rental	RM/year	59.68	31.98	22.71	19.36

HSBB Service with QOS -- Type 8

	Units	2012	2013	2014	2015
Installation & Setup	RM	122.28	122.07	153.43	187.80
Port Rental (per port)	RM/year	8.34	3.86	2.53	2.06
Line Rental	RM/year	59.68	31.98	22.71	19.36

Source: HSBB Model; Offset=0

Table 67: HSBB Network Service without QoS

HSBB Service without QOS -- Type 1

	Units	2012	2013	2014	2015
Installation & Setup	RM	110.09	111.26	140.65	172.65
Port Rental (per port)	RM/year	0.92	0.42	0.28	0.23
Line Rental	RM/year	59.68	31.98	22.71	19.36

HSBB Service without QOS -- Type 2

	Units	2012	2013	2014	2015
Installation & Setup	RM	110.09	111.26	140.65	172.64
Port Rental (per port)	RM/year	0.92	0.42	0.28	0.23
Line Rental	RM/year	59.68	31.98	22.71	19.36

HSBB Service without QOS -- Type 3

	Units	2012	2013	2014	2015
Installation & Setup	RM	117.19	117.55	148.09	181.46
Port Rental (per port)	RM/year	5.24	2.42	1.59	1.29
Line Rental	RM/year	59.68	31.98	22.71	19.36

HSBB Service without QOS -- Type 4

	Units	2012	2013	2014	2015
Installation & Setup	RM	120.19	120.21	151.23	185.18
Port Rental (per port)	RM/year	7.07	3.27	2.14	1.74
Line Rental	RM/year	59.68	31.98	22.71	19.36

Source: HSBB Model; Offset=0

13.14.3 Depreciation schedules

The default method for depreciation is straight-line. This corresponds to depreciation schedules usually applied to fixed access assets. On a forward-looking basis, however, it may be preferable to consider economic depreciation – or, as a close approximation, tilted annuity. This will "tilt" the depreciation of HSBB assets to correspond to the periods during which HSBB revenue will be increasing. In past costing studies, the SKMM has used tilted straight-line depreciation. The following tables show the effect on calculated prices for all HSBB services assuming the different depreciation schedules.

Table 68: HSBB Network Service with QoS

HSBB Service with QOS -- Type 1

	Units	2012	2013	2014	2015
Installation & Setup	RM	0.08	0.06	0.07	0.08
Port Rental (per port)	RM/year	0.06	0.02	0.01	0.01
Line Rental	RM/year	-	-	-	-

HSBB Service with QOS -- Type 2

	Units	2012	2013	2014	2015
Installation & Setup	RM	0.06	0.06	0.08	0.12
Port Rental (per port)	RM/year	0.04	0.02	0.01	0.01
Line Rental	RM/year	-	-	-	-

HSBB Service with QOS -- Type 3

	Units	2012	2013	2014	2015
Installation & Setup	RM	112.14	113.08	142.81	175.19
Port Rental (per port)	RM/year	2.40	1.08	0.69	0.54
Line Rental	RM/year	45.94	25.32	19.23	17.07

HSBB Service with QOS -- Type 4

	Units	2012	2013	2014	2015
Installation & Setup	RM	110.09	111.26	140.65	172.64
Port Rental (per port)	RM/year	1.02	0.46	0.29	0.23
Line Rental	RM/year	45.94	25.32	19.23	17.07

HSBB Service with QOS -- Type 5

	Units	2012	2013	2014	2015
Installation & Setup	RM	141.30	145.56	179.39	223.33
Port Rental (per port)	RM/year	76.89	42.54	30.12	25.19
Line Rental	RM/year	45.94	25.32	19.23	17.07

HSBB Service with QOS -- Type 6

	Units	2012	2013	2014	2015
Installation & Setup	RM	118.74	118.93	149.72	183.40
Port Rental (per port)	RM/year	6.86	3.08	1.96	1.53
Line Rental	RM/year	45.94	25.32	19.23	17.07

HSBB Service with QOS -- Type 7

	Units	2012	2013	2014	2015
Installation & Setup	RM	349.94	332.49	395.43	458.56
Port Rental (per port)	RM/year	227.15	97.64	59.76	44.49
Line Rental	RM/year	45.94	25.32	19.23	17.07

HSBB Service with QOS -- Type 8

	Units	2012	2013	2014	2015
Installation & Setup	RM	122.28	122.07	153.43	187.80
Port Rental (per port)	RM/year	9.25	4.15	2.64	2.06
Line Rental	RM/year	45.94	25.32	19.23	17.07

Source: HSBB Model; tilted straight-line depreciation

Table 69: HSBB Network Service without QoS

HSBB Service without QOS -- Type 1

	Units	2012	2013	2014	2015
Installation & Setup	RM	110.09	111.26	140.65	172.65
Port Rental (per port)	RM/year	1.02	0.46	0.29	0.23
Line Rental	RM/year	45.94	25.32	19.23	17.07

HSBB Service without QOS -- Type 2

	Units	2012	2013	2014	2015
Installation & Setup	RM	110.09	111.26	140.65	172.64
Port Rental (per port)	RM/year	1.02	0.46	0.29	0.23
Line Rental	RM/year	45.94	25.32	19.23	17.07

HSBB Service without QOS -- Type 3

	Units	2012	2013	2014	2015
Installation & Setup	RM	117.19	117.55	148.09	181.46
Port Rental (per port)	RM/year	5.81	2.60	1.65	1.29
Line Rental	RM/year	45.94	25.32	19.23	17.07

HSBB Service without QOS -- Type 4

	Units	2012	2013	2014	2015
Installation & Setup	RM	120.19	120.21	151.23	185.18
Port Rental (per port)	RM/year	7.83	3.51	2.23	1.74
Line Rental	RM/year	45.94	25.32	19.23	17.07

Source: HSBB Model; tilted straight-line depreciation

Table 70: HSBB Network Service with QoS

HSBB Service with QOS -- Type 1

	Units	2012	2013	2014	2015
Installation & Setup	RM	0.08	0.06	0.07	0.08
Port Rental (per port)	RM/year	0.04	0.02	0.01	0.01
Line Rental	RM/year	-	-	-	-

HSBB Service with QOS -- Type 2

	Units	2012	2013	2014	2015
Installation & Setup	RM	0.06	0.06	0.08	0.12
Port Rental (per port)	RM/year	0.03	0.01	0.01	0.01
Line Rental	RM/year	-	-	-	-

HSBB Service with QOS -- Type 3

	Units	2012	2013	2014	2015
Installation & Setup	RM	112.14	113.08	142.81	175.19
Port Rental (per port)	RM/year	1.70	0.83	0.58	0.50
Line Rental	RM/year	44.17	24.49	18.70	16.70

HSBB Service with QOS -- Type 4

	Units	2012	2013	2014	2015
Installation & Setup	RM	110.09	111.26	140.65	172.64
Port Rental (per port)	RM/year	0.72	0.35	0.25	0.21
Line Rental	RM/year	44.17	24.49	18.70	16.70

HSBB Service with QOS -- Type 5

	Units	2012	2013	2014	2015
Installation & Setup	RM	141.30	145.56	179.39	223.33
Port Rental (per port)	RM/year	54.26	32.84	25.48	23.35
Line Rental	RM/year	44.17	24.49	18.70	16.70

HSBB Service with QOS -- Type 6

	Units	2012	2013	2014	2015
Installation & Setup	RM	118.74	118.93	149.72	183.40
Port Rental (per port)	RM/year	4.84	2.37	1.65	1.42
Line Rental	RM/year	44.17	24.49	18.70	16.70

HSBB Service with QOS -- Type 7

	Units	2012	2013	2014	2015
Installation & Setup	RM	349.94	332.49	395.43	458.56
Port Rental (per port)	RM/year	160.28	75.38	50.57	41.23
Line Rental	RM/year	44.17	24.49	18.70	16.70

HSBB Service with QOS -- Type 8

	Units	2012	2013	2014	2015
Installation & Setup	RM	122.28	122.07	153.43	187.80
Port Rental (per port)	RM/year	6.52	3.20	2.23	1.91
Line Rental	RM/year	44.17	24.49	18.70	16.70

Source: HSBB Model; annuity depreciation

Table 71: HSBB Network Service without QoS

HSBB Service without QOS -- Type 1

	Units	2012	2013	2014	2015
Installation & Setup	RM	110.09	111.26	140.65	172.65
Port Rental (per port)	RM/year	0.72	0.35	0.25	0.21
Line Rental	RM/year	44.17	24.49	18.70	16.70

HSBB Service without QOS -- Type 2

	Units	2012	2013	2014	2015
Installation & Setup	RM	110.09	111.26	140.65	172.64
Port Rental (per port)	RM/year	0.72	0.35	0.25	0.21
Line Rental	RM/year	44.17	24.49	18.70	16.70

HSBB Service without QOS -- Type 3

	Units	2012	2013	2014	2015
Installation & Setup	RM	117.19	117.55	148.09	181.46
Port Rental (per port)	RM/year	4.10	2.01	1.40	1.20
Line Rental	RM/year	44.17	24.49	18.70	16.70

HSBB Service without QOS -- Type 4

	Units	2012	2013	2014	2015
Installation & Setup	RM	120.19	120.21	151.23	185.18
Port Rental (per port)	RM/year	5.53	2.71	1.89	1.62
Line Rental	RM/year	44.17	24.49	18.70	16.70

Source: HSBB Model; annuity depreciation

Table 72: HSBB Network Service with QoS

HSBB Service with QOS -- Type 1

	Units	2012	2013	2014	2015
Installation & Setup	RM	0.08	0.06	0.07	0.08
Port Rental (per port)	RM/year	0.05	0.02	0.01	0.01
Line Rental	RM/year	-	-	-	-

HSBB Service with QOS -- Type 2

	Units	2012	2013	2014	2015
Installation & Setup	RM	0.06	0.06	0.08	0.12
Port Rental (per port)	RM/year	0.03	0.01	0.01	0.01
Line Rental	RM/year	-	-	-	-

HSBB Service with QOS -- Type 3

	Units	2012	2013	2014	2015
Installation & Setup	RM	112.14	113.08	142.81	175.19
Port Rental (per port)	RM/year	2.01	0.95	0.63	0.52
Line Rental	RM/year	38.74	21.87	17.06	15.53

HSBB Service with QOS -- Type 4

	Units	2012	2013	2014	2015
Installation & Setup	RM	110.09	111.26	140.65	172.64
Port Rental (per port)	RM/year	0.85	0.40	0.27	0.22
Line Rental	RM/year	38.74	21.87	17.06	15.53

HSBB Service with QOS -- Type 5

	Units	2012	2013	2014	2015
Installation & Setup	RM	141.30	145.56	179.39	223.33
Port Rental (per port)	RM/year	64.42	37.37	27.77	24.38
Line Rental	RM/year	38.74	21.87	17.06	15.53

HSBB Service with QOS -- Type 6

	Units	2012	2013	2014	2015
Installation & Setup	RM	118.74	118.93	149.72	183.40
Port Rental (per port)	RM/year	5.75	2.70	1.80	1.48
Line Rental	RM/year	38.74	21.87	17.06	15.53

HSBB Service with QOS -- Type 7

	Units	2012	2013	2014	2015
Installation & Setup	RM	349.94	332.49	395.43	458.56
Port Rental (per port)	RM/year	190.31	85.78	55.09	43.05
Line Rental	RM/year	38.74	21.87	17.06	15.53

HSBB Service with QOS -- Type 8

	Units	2012	2013	2014	2015
Installation & Setup	RM	122.28	122.07	153.43	187.80
Port Rental (per port)	RM/year	7.75	3.64	2.43	1.99
Line Rental	RM/year	38.74	21.87	17.06	15.53

Source: HSBB Model; tilted annuity

Table 73: HSBB Network Service without QoS

HSBB Service without QOS -- Type 1

	Units	2012	2013	2014	2015
Installation & Setup	RM	110.09	111.26	140.65	172.65
Port Rental (per port)	RM/year	0.85	0.40	0.27	0.22
Line Rental	RM/year	38.74	21.87	17.06	15.53

HSBB Service without QOS -- Type 2

	Units	2012	2013	2014	2015
Installation & Setup	RM	110.09	111.26	140.65	172.64
Port Rental (per port)	RM/year	0.85	0.40	0.27	0.22
Line Rental	RM/year	38.74	21.87	17.06	15.53

HSBB Service without QOS -- Type 3

	Units	2012	2013	2014	2015
Installation & Setup	RM	117.19	117.55	148.09	181.46
Port Rental (per port)	RM/year	4.87	2.29	1.53	1.25
Line Rental	RM/year	38.74	21.87	17.06	15.53

HSBB Service without QOS -- Type 4

	Units	2012	2013	2014	2015
Installation & Setup	RM	120.19	120.21	151.23	185.18
Port Rental (per port)	RM/year	6.56	3.08	2.06	1.69
Line Rental	RM/year	38.74	21.87	17.06	15.53

Source: HSBB Model; tilted annuity

PART D: MOBILE AND WIMAX SERVICES

14 Mobile Services

14.1 Services

There are two sets of mobile services on the Access List:

- Mobile Network Origination Service
- Mobile Network Termination Service

The individual service costs and prices include voice origination and termination, SMS and MMS origination and termination, and Video origination and termination.

In the current state of the market, the most critical price is for the Mobile voice termination service. This price (Mobile Termination Rate or "MTR") is the amount a mobile network operator can charge another mobile network operator or a fixed network operator to terminate a voice call on its mobile network. Each mobile network operator has a monopoly on terminating calls to customers on its own network.

Due to the high level of termination traffic (equivalent to 30% of the volume of on-net call minutes for a typical operator), small changes in the value of the MTR can have a large effect on the income and expenses of a mobile network operator. The SKMM has therefore developed a detailed model of Mobile (and WiMAX) network operations based on extensive data from operators.

14.2 Service demands and traffic

The Mobile and WiMAX model uses the number of *active* subscribers (customers) as the basic demand unit. Due to the high number of pre-paid subscribers in the mobile market, this number may be substantially less than total number of subscribers. According to the SKMM Pocket Book of Statistics, the mobile penetration rate is 128.7% in the first quarter 2012,[20] and the number of active subscribers is approximately 26 million.

Four mobile network operators – Celcom, DiGi, Maxis and U Mobile – provided data for the mobile cost model. The data included forecasts of active subscribers to 2016. Taken

20 SKMM, *Pocket Book of Statistics*, Communications & Multimedia, Q1 2012, table 2, p. 3.

together, these forecasts provide a view of the evolution of the mobile market. A smoothed version of this aggregate forecast for the total market was used. The model is mainly concerned with a “standard mobile operator”, which has 30% market share. This represents an efficient level of demand in a market with 3 major operators and one or more aspirants. In the overall market, the growth of subscribers declines in later years but still maintains a healthy growth of 4-5%.

The operators also provided data on network demand –minutes of voice calls, numbers of messages for SMS and MMS, and megabytes of data for data services – generated by the mobile customers. This data was cross-checked with actual billing data in past years and data provided by fixed network operators and mobile network operators for traffic carried between fixed and mobile networks.

The model uses the aggregate of the operators' forecasts, suitably smoothed as necessary, for a view of the total mobile market. Voice traffic continues to grow but at rates of only 1-2% *per annum* in later years. Data traffic, however, exhibits strong growth with rates above 15% *per annum* in all years.

For the “standard mobile operator”, the level is once again 30% of the total market, with traffic incoming from and outgoing to other mobile operators suitably scaled for an operator with this market share.

Since the network model (see next section) does calculations of coverage based on population density, the subscribers and traffic are divided into Urban, Suburban, Rural and Remote regions.

14.3 Spectrum allocations and coverage

The availability of radio spectrum to each operator plays a key role in determining costs of network rollout. Lower frequencies have better propagation characteristics, leading to lower costs for providing coverage.

The “standard mobile operator” in the model has a spectrum allocation similar to that for Maxis: 15 MHz of paired spectrum in the 900 MHz band; 25 MHz of paired spectrum in the 1800 MHz band; and 15 MHz of paired spectrum in the 2 GHz range. The operator is assumed to gain access to 10 MHz of paired spectrum in the 2.6 GHz band for LTE rollout from 2013. Most mobile network operators have similar spectrum allocations in the 1800 MHz band and/or higher frequencies, but one operator, DiGi has only 2 MHz of paired spectrum in the 900 MHz band. The SKMM has therefore examined the effect of this restricted 900 MHz spectrum allocation on the costs of origination and termination and findings show the cost differences are minimal.

Radio network coverage is also dependent on spectrum holdings. For the "standard mobile operator", the geographic coverage of the 2G network by 2016 is assumed to extend over all Urban and Suburban areas, about 90% of Rural areas, and about 30% of Remote areas. In total, the geographical coverage of the 2G network by 2016 is 62% of Peninsular Malaysia and 37% of East Malaysia. For the 3G network, again the coverage by 2016 extends over all Urban and Suburban areas but with a lower rollout to Rural and Remote areas, leading to coverage of 54% of Peninsular Malaysia and 30% of East Malaysia by 2016. There is also the option of a small LTE coverage, up to 3% of Peninsular Malaysia.

The model also contains a dataset for a "large mobile operator", attracting 40% market share. This operator is assumed to have greater coverage in Rural and Remote areas, leading to 75% geographical coverage by a 2G network of Peninsular Malaysia and 48% of East Malaysia by 2016; 67% coverage by a 3G network of Peninsular Malaysia and 41% of East Malaysia; and up to 5% coverage by LTE of Peninsular Malaysia.

Similarly, the model contains a dataset for a "small mobile operator", which provides a 3G network covering Urban and Suburban areas but only minimal coverage of some Rural areas.

14.4 Mobile network model

There are two sets of calculations to determine the quantity of network elements required to provide service. The first is concerned with coverage: that is, the geographical extent of the network. Most mobile network operators have coverage commitments to the SKMM as part of their obligations under their spectrum allocation. The "standard mobile operator" option uses the coverage requirements of the majority of mobile network operators. The calculation is based on how many base stations (cells) of a certain size does it take to cover the required area. The mobile operators have provided their planning assumptions about coverage to SKMM. There is continued expansion of coverage in Malaysia and the mobile operators should expect to recover some of the cost of this expansion through the interconnection rates.

The second set of calculations is concerned with the network quantities required to carry the estimated traffic. In Urban and Suburban areas, one would expect the network size to be driven by peak traffic requirements, not coverage. Here, the calculations begin with the number of transmit-receive antenna elements ("TRXs") required to provide satisfactory service in the busy hour and work into the network determining the quantity of equipment required to support the demand. About 9% of demand is assumed to occur in the busy hour.

The most significant portion of the cost is associated with the radio network and hence it is important to model the cost elements in some detail. There is technology change occurring in mobile radio networks – from GSM (or 2G), through 3G to LTE. Each of these technologies uses different radio network elements and so the dimensioning of the network for each of these technologies is performed separately in the model. The transition from one technology to another is modelled through demand profiles that move traffic from one technology to the next over the regulatory period. These profiles are based on the plans provided by the mobile operators. The models therefore represent a compromise between true efficiency, which might drive to the lowest cost technology immediately, and the current situation of the mobile operators, which is determined largely by customer preferences and the rate at which handsets are updated.

Since LTE plans are still being formulated, the model has an option to exclude LTE from the technology evolution and leave demand with 3G. This has a small impact on the calculated prices.

Question 25

The SKMM seeks comments on the suitability and completeness of the demand and network design assumptions in the Mobile model.

14.5 Radio network costs

In addition to the costs of network elements, mobile providers have additional costs associated with their networks. The most important of these are annual licence and spectrum fees. These costs are included in the cost base by default.

The mobile operators have also received Universal Service Provision (USP) compensations in recent years under Time 3 as the Government supports further coverage of mobile service in extreme rural villages and areas with a population density of less than 80 persons per square kilometre.[21] These compensations cover the mobile operators' capital expenditures. By default, these remunerations are not considered, but the model provides an option to take them into account by reducing the cost base by the expenditures.

21 SKMM, *Universal Service Provision Annual Report 2010*, p. 30.

14.6 Cost mark-ups

The model includes a mark-up on network element costs to account for the indirect network costs. In keeping with the principle of cost reconciliation, this mark-up is calculated by comparing the direct network costs calculated bottom-up with the total network costs determined top-down. For the "standard mobile operator", the top-down costs are averages from the cost data for a mobile operator of the relevant size.

The second mark-up is on service costs to include recovery of common business costs. Common business costs must be spread over all areas of the business, including retail activities and other businesses. To perform the calculation for future years, the retail costs, other business costs and general overheads are projected based on the number of subscribers. The top-down costs used for this calculation are based on the average costs associated with an operator of the relevant size.

14.7 WACC for Mobile operator

14.7.1 WACC analysis

A study of appropriate WACC values for mobile operators was undertaken based on publicly available data for Maxis, Celcom (as part of Axiata) and DiGi. Data for U Mobile was not used as its investment profile is masked by being part of a much larger entity. As described in section 8.3.2, the WACC was estimated using the CAPM. This requires estimates of gearing, taxation, cost of debt and cost of equity.

14.7.2 Gearing

Gearing is defined as the proportion of debt in the total value (debt plus equity) of the enterprise, where equity should be expressed in market terms. For calculating the pre-tax WACC value, forward-looking gearing is required: that is, what the gearing will be over the regulatory period.

Two operators – Maxis and Celcom – have recent gearings in the range of 8-11%, and DiGi with almost no debt. After considering peer operators in the region, it was concluded that a gearing of 10% would be an appropriate forward-looking value.

14.7.3 Taxation

The standard corporate tax rate for all large companies is 25%. This is used for the Mobile Services calculation. As explained in section 8.3.4, no adjustment has been made for domestic investors.

14.7.4 Cost of Debt

As described in section 8.3.5, the period over which the debt should be financed is the average life of the assets in each economic model. In the Mobile model, the average asset life is 7.83 years, so long-term debt with 8-year maturity has been used in the CAPM. The cost of debt to maturity has been estimated using data available from Bloomberg on Malaysian corporate bond yields by maturity period and credit rating. (In undertaking this analysis of Bloomberg data, the period of economic instability from September 2008 to March 2009 after the Lehman Brothers collapse has been excluded.) The estimated cost of debt for a mobile operator with AA rating is estimated to be 5.52%.

14.7.5 Cost of Equity

The cost of equity is calculated from parameters estimated from past time series that are then adjusted for forward-looking values. As described in section 8.3.6, three reference markets were used – Malaysia, ASEAN-5 and World – in the analysis. The estimation of the average reference market is somewhat complicated by the presence of strategic investors in Maxis and DiGi (meaning that some of their shares are not liquid) but an estimate of 70% foreign active investors in a mobile operator is applied. This leads to market weights of 13% for Malaysia, 33% for ASEAN-5 and 54% for World, using the average market weights in Table 4.

The risk-free rate is 3.7%, based on US bonds with 8-year maturity. For estimating asset beta, there was an analysis of time series for Axiata and DiGi, excluding periods of global financial instability. This provides a conservative asset beta value of 0.75 for the Malaysian market. The cost of equity data for a typical mobile operator is given in the following table.

Table 74: Mobile operator: Calculation of cost of equity

	Malaysia	ASEAN-5	World	Weighted Average
Market weights	13%	33%	54%	
Risk-free rate				3.7%
Asset beta	0.75	0.57	0.47	
Equity beta	0.81	0.62	0.50	
Lambda			2.25	
Country risk premium	0.6%	0.9%		
Equity market risk premium	5.6%	5.9%	5.0%	
Cost of Equity (USD estimates)	8.2%	7.0%	7.3%	7.3%
Cost of Equity MYR				**7.75%**

Source: Ovum analysis

14.7.6 Estimated WACC values

With the values derived in the sections above, the final estimated WACC value can be calculated from the formula given in section 8.3.2, repeated here for convenience:

$$\text{Pre-tax WACC} = g.C_D + (1-g)/(1-t).C_E$$

where

C_D is the cost of debt (expressed as a percentage);

C_E is the cost of equity (expressed as a percentage);

g is the gearing, g = Debt/(Debt + Equity), where equity is expressed in market terms;

t is the tax rate.

For a Malaysian mobile operator, the cost of debt is estimated to be 5.52%, the cost of equity 7.75%, the forward-looking gearing 10%, and the tax rate 25%. These figures provide a pre-tax WACC value of 9.86%.

14.8 Responses to model viewing

The comments received following the model viewing are summarised below.

1. Additional details were requested as to how the WACC value was calculated.

2. The relevant increment for the mobile model should be just the capacity component of the network and not the coverage component.

3. The model should only be based on a single radio network technology, namely 3G.

4. With the entrance of a new mobile operator, a standard operator should now be based on a 25% market share. The input standard profile data was too high or low, such as:

    - coverage areas;
    - voice traffic weighting to network technology types;
    - sectors per cell;
    - cell size;
    - conversion factors;
    - network equipment capital costs, particularly TRXs, BTSs and Node Bs;
    - asset lifetimes; and
    - equipment utilisation figures, particularly TRXs, BTSs, BSCs and RNCs.

14.9 Changes after model viewing

While there were no major structural changes made to the model as a result of the comments received after the model viewing, the additional data provided during the model viewing led to significant changes to the input data used in the model.

As for the proposal to model the radio network based on 3G technology only, the SKMM confirms its continued view that the relevant increment is the total network and that the model will reflect the technical and commercial reality in Malaysia, that efficient mobile networks consist of multiple technologies and not just 3G.

In the revised model, the forecast service volumes for mobile services are now based directly on the forecasts provided by the mobile operators. (In the model viewing version, the service volumes were based on an average usage per subscriber.) The new forecasts now match more closely the observed traffic in past years. MVNO subscribers and traffic are included in the overall service data.

USP payments are now included explicitly in the model. They can be excluded from the cost base. License and spectrum fees are now calculated from market shares. Some equipment prices for radio network items have been adjusted after a reconsideration of the data responses.

A number of changes to conversion factors and other parameters that affect network dimensioning have been made in the revised model. The conversion factors used to turn all service volumes into traffic (Erlangs) have been adjusted to conform to international norms and data received from Malaysian operators. Maximum cell radii have been adjusted. A reconsideration of the data responses led to changes in the voice traffic distribution. Fibre/microwave splits are now set for each year. LTE spectrum allocations have been set to 2x10 MHz for each LTE operator.

SKMM would like to clarify that the LTE spectrum has yet to be allocated to date, and as such, the assumptions made in this PI Paper and in the Mobile and WiMAX model is neither indicative nor binding on the spectrum allocation. A separate process will be undertaken to allocate the LTE spectrum.

Since the network dimensioning was affected by parameter changes, the model was recalibrated to match the mobile networks. This led to some relatively minor adjustments to equipment sizes.

The WACC value has been revised to the latest estimate and the transmission prices, calculated in the Fixed Core and Transmission model, have been updated.

In addition, the following data/calculation errors were reported and all fixed in the updated model:

- An error in the 2014 SMS calculation;
- The busy-hour calculation did not account for traffic occurring outside the busy days; and
- An error in the cell area formula.

14.10 Considerations in setting Mobile regulated prices

14.10.1 Standard mobile operator

The following tables show the calculated prices for a standard mobile operator providing origination and termination services.

Table 75: Mobile Network Origination Service Calculated Prices

	Units	2012	2013	2014	2015
Voice					
Local	sen/min	3.51	3.71	3.79	3.89
National	sen/min	3.53	3.73	3.81	3.91
National with Submarine Cable	sen/min	15.38	15.53	15.56	15.63
SMS	sen/message	0.09	0.08	0.08	0.08
MMS	sen/message	5.91	6.08	5.61	5.33
Video					
National	sen/min	65.18	71.67	62.34	56.78
National with Submarine Cable	sen/min	77.03	83.46	74.09	68.50

Source: Mobile Model, Standard mobile inputs; default settings

Table 76: Mobile Network Termination Service Calculated Prices

	Units	2012	2013	2014	2015
Voice					
Local	sen/min	3.29	3.47	3.55	3.65
National	sen/min	3.51	3.70	3.78	3.88
National with Submarine Cable	sen/min	15.36	15.49	15.53	15.60
SMS	sen/message	0.04	0.04	0.04	0.04
MMS	sen/message	7.02	7.23	6.80	6.50
Video					
National	sen/min	65.18	71.67	62.34	56.78
National with Submarine Cable	sen/min	77.03	83.46	74.09	68.50

Source: Mobile Model, Standard mobile inputs; default settings

These numbers provide the “base case” for the consideration of regulated mobile prices.

For the voice services, the calculated prices are generally increasing over time. While demand is increasing, there are still significant investments for 3G expansion over the regulatory period, leading to increases in unit costs (and hence prices). For data-related services, the trends are mixed, depending on the balance between substantially growing demand and ongoing expenditures on network expansion.

14.10.2 Symmetry and Asymmetry in mobile prices

Asymmetry occurs where a regulator sets different prices for the same service or facility provided by different service providers. These rates normally reflect the estimated actual costs of each provider of the service. Costs will differ between providers for a range of reasons, including scale, technology, license fees and other entry costs. There is also a possibility that some of the differences in cost between service providers will result from differences in operational efficiency.

The principle of actual cost recovery may result in efficient service providers subsidising inefficient service providers. Under these circumstances the inefficient service providers will have reduced incentive to catch up with more efficient firms that have been set lower prices. This would result in productive inefficiencies. With higher average costs, prices may also increase, resulting in allocative inefficiencies. Finally, it can be argued that this will result in a lack of incentive for the industry to innovate and drive down costs.

All of these arguments point towards a policy of symmetrical prices, i.e. the same rates applied to the same service regardless of which service provider provides the service. However, there are some alternative arguments in favour of asymmetry:

- That efficiency needs to be assessed relative to scale, and asymmetrical prices especially in termination rates, acknowledge the differences in scale between operators;

- That asymmetrical prices for late entrants to the market, at least for a period, trade off short-term losses of static efficiency for a market that is more competitive in the longer term and likely to have greater potential, by virtue of the additional participants. Asymmetrical prices also trade off short-term losses for dynamic efficiency through investment and innovation in new technologies, processes and systems;

- That, unlike symmetrical prices based on a hypothetical efficient service provider, asymmetrical rates allow some scope for investment and innovation. On this argument, symmetrical prices are based on high efficiency and leave no room to cover the fixed costs of innovation.

The choice between a symmetric or asymmetric basis for setting prices depends on the desired policy outcomes. Although there are strong arguments on both sides there is an emerging consensus among regulators and the telecommunications industry that:

- prices should normally be symmetrical, set at the level of an efficient provider;
- asymmetrical rates require specific justification and should only be permitted as a short-term, transitional measure.

The SKMM is therefore minded to set cost-based prices that are symmetrical and set on an efficient provider basis. This is consistent with regulating the industry towards economic efficiency.

A further argument for asymmetry is based on differences in spectrum allocation resulting in differences in exogenous costs (i.e. costs that are outside the service provider's control and that need to be taken into account because of their significance). This is the approach taken by Ofcom in the United Kingdom. Ofcom has stated that:[22]

> The 1800MHz-only operators face higher coverage costs, other things being equal, as a consequence of the need for a greater number of coverage cells. However, as traffic demand grows, the difference in the required numbers of cells (and by extension other network equipment such as BTSs and BSCs) narrows.

It is clear that, as a minimum, the cost differences derived from differences in spectrum allocation should be understood.

The issues of scale, 3G-only operation and 1800-only spectrum are explored in the following sections. These considerations then lead to conclusions about appropriate regulated prices.

Question 26

The SKMM seeks comments on whether it should continue to set symmetric prices for facilities and services on the Access List.

14.10.3 Large and small operators

In order to provide some insight into scale in the mobile network, the Mobile cost model includes datasets for a "large" and a "small" mobile operator.

The following tables show the calculated values for the large mobile operator with 40% market share. These values are 1%-6% lower than for the standard mobile dataset.

22 Ofcom, Mobile call termination, 13 September 2006, para. 9.58.

(The values for message services are similar but the results are quite sensitive to service demands.) This shows that the economies of scale are not fully exhausted by the standard mobile operator size of 30% market share.

Table 77: Mobile Network Origination Service Calculated Prices

	Units	2012	2013	2014	2015
Voice					
Local	sen/min	3.29	3.50	3.57	3.70
National	sen/min	3.32	3.52	3.59	3.73
National with Submarine Cable	sen/min	15.17	15.31	15.35	15.45
SMS	sen/message	0.08	0.09	0.08	0.08
MMS	sen/message	4.91	5.12	4.70	4.51
Video					
National	sen/min	61.95	68.05	59.29	54.25
National with Submarine Cable	sen/min	73.80	79.84	71.05	65.98

Source: Mobile Model, Large mobile inputs; default settings

Table 78: Mobile Network Termination Service Calculated Prices

	Units	2012	2013	2014	2015
Voice					
Local	sen/min	3.10	3.28	3.35	3.48
National	sen/min	3.31	3.49	3.56	3.71
National with Submarine Cable	sen/min	15.16	15.28	15.31	15.43
SMS		0.03	0.04	0.04	0.04
MMS	sen/message	5.98	6.20	5.80	5.64
Video					
National	sen/min	61.95	68.05	59.29	54.25
National with Submarine Cable	sen/min	73.80	79.84	71.05	65.98

Source: Mobile Model, Large mobile inputs; default settings

If regulated interconnection rates were set using the standard mobile operator rates, then there would be incentive for operators to seek to exceed 30% market share in order to gain from economies of scale. This supports active competition in the mobile market, to the long-term benefit of end users.

The Mobile model also has the option of a small mobile operator dataset. In this dataset, the market share is low (about 4%) in the initial years but grows to 10% by 2016 (and with a trajectory towards 20%). This operator uses 3G only (with some LTE in later years) and covers urban and suburban areas, but has only minimal rural coverage.

The following tables show the calculated values for the small operator. In general, the voice origination and termination costs are 40%-50% lower than for the standard operator. The lower cost is due to the use of 3G technology and the substantially lower coverage.

Table 79: Mobile Network Origination Service Calculated Prices

	Units	2012	2013	2014	2015
Voice					
Local	sen/min	2.05	2.03	1.86	1.77
National	sen/min	2.07	2.05	1.88	1.79
National with Submarine Cable	sen/min	13.92	13.84	13.63	13.51
SMS	sen/message	0.10	0.13	0.12	0.10
MMS	sen/message	15.52	13.32	11.39	9.89
Video					
National	sen/min	65.85	64.42	59.53	57.25
National with Submarine Cable	sen/min	77.70	76.21	71.28	68.98

Source: Mobile Model, Small mobile inputs; default settings

Table 80: Mobile Network Termination Service Calculated Prices

	Units	2012	2013	2014	2015
Voice					
Local	sen/min	1.74	1.72	1.60	1.54
National	sen/min	2.09	2.08	1.91	1.85
National with Submarine Cable	sen/min	13.94	13.87	13.66	13.57
SMS		0.04	0.04	0.04	0.03
MMS	sen/message	16.80	14.60	12.63	11.16
Video					
National	sen/min	65.85	64.42	59.53	57.25
National with Submarine Cable	sen/min	77.70	76.21	71.28	68.98

Source: Mobile Model, Small mobile inputs; default settings

If regulated interconnection rates were set using the standard mobile operator rates, then a small but growing operator would benefit from additional margin from voice termination and origination. This could be used to support further network coverage, to the long-term benefit of end users.

14.10.4 3G only operator

The cost benefits for operators of 3G technology over 2G technology are well known. At least one service provider noted during the model viewing period that the modern equivalent assets for a mobile operator should be entirely 3G equipment. This is true in the strictest sense of LRIC costing.

The major mobile operators in Malaysia, however, are still in the transition from 2G to 3G services and there is a large legacy of 2G handsets among end users. In the standard mobile operator dataset, voice traffic is estimated to be 90% 2G in 2011, declining to about 60% by 2016. (Data traffic, on the other hand, is almost all 3G by 2016.) This suggests that there will be a continuing substantial legacy of 2G technology for the current regulatory period.

In order to estimate the cost advantages of 3G only deployment, the SKMM has considered a standard mobile operator dataset in which all the 2G traffic has been converted to 3G and there is no LTE deployment in later years. The following tables show the calculated results for this case.

Table 81: Mobile Network Origination Service Calculated Prices

	Units	2012	2013	2014	2015
Voice					
Local	sen/min	1.77	1.78	1.75	1.75
National	sen/min	1.80	1.82	1.78	1.78
National with Submarine Cable	sen/min	13.65	13.61	13.53	13.50
SMS	sen/message	0.10	0.10	0.09	0.09
MMS	sen/message	6.16	6.02	5.85	5.83
Video					
National	sen/min	60.09	59.92	57.80	59.18
National with Submarine Cable	sen/min	71.94	71.72	69.55	70.90

Source: Mobile Model (3G only); Standard mobile inputs, no LTE

Table 82: Mobile Network Termination Service Calculated Prices

	Units	2012	2013	2014	2015
Voice					
Local	sen/min	1.62	1.63	1.60	1.61
National	sen/min	1.88	1.90	1.87	1.87
National with Submarine Cable	sen/min	13.73	13.70	13.62	13.60
SMS		0.05	0.05	0.04	0.05
MMS	sen/message	7.44	7.36	7.20	7.16
Video					
National	sen/min	60.09	59.92	57.80	59.18
National with Submarine Cable	sen/min	71.94	71.72	69.55	70.90

Source: Mobile Model (3G only); Standard mobile inputs, no LTE

For voice service, the cost advantage is about 50% over the 2G/3G combination. For video, the advantage is 10%-15% in the early years and declining. The results show that there is considerable incentive for operators to move to 3G technology and services.

The transition to 3G, however, is dependent largely on the willingness of end users to move from 2G only handsets to 3G and beyond, a movement that is only partially under the influence of the mobile operators. While there is strong demand for smart phones and other new handsets by early adopters and the young, globally there has been a slowdown in the rate at which end users are renewing their handsets. It is likely, therefore, that there will still be a significant, if declining, population of 2G users at the end of the regulatory period.

The SKMM is therefore minded to take into account the continuing transition from 2G and to recognize the actual situation of mobile operators during the regulatory period in the costing of mobile origination and termination.

If regulated interconnection rates were set using the standard mobile operator rates, then operators will have clear incentive to move to 3G technologies and services and to provide support for their customers to make the transition. Nevertheless, the SKMM expects that there will still be a significant proportion of 2G traffic at the end of the current regulatory period.

14.10.5 Spectrum at 1800 MHz band

As noted in section 14.10.2, differences in spectrum allocation can affect costs of mobile coverage. While two of the major operators have spectrum holdings in the 900 MHz band and the 1800 MHz band, a third operator has spectrum mainly in the 1800 MHz band (and 2 GHz band), with only 2 MHz of paired spectrum in the 900 MHz band.

In order to assess the effects of this asymmetry in spectrum allocation, the SKMM has considered a mobile model with the standard mobile inputs but with the third operators' spectrum allocation being mainly in the 1800 MHz band. That is, there is some spectrum for coverage in the 900 MHz band but with the great majority of spectrum at 1800 MHz and above. The resulting calculated prices are shown in the following tables.

Table 83: Mobile Network Origination Service Calculated Prices

	Units	2012	2013	2014	2015
Voice					
Local	sen/min	3.62	3.67	3.95	4.06
National	sen/min	3.64	3.70	3.98	4.08
National with Submarine Cable	sen/min	15.49	15.49	15.73	15.81
SMS	sen/message	0.09	0.08	0.08	0.08
MMS	sen/message	6.02	5.74	5.77	5.47
Video					
National	sen/min	67.64	63.60	65.93	60.00
National with Submarine Cable	sen/min	79.49	75.39	77.68	71.72

Source: Mobile Model (1800 spectrum); Standard mobile inputs, DiGi spectrum allocation

Table 84: Mobile Network Termination Service Calculated Prices

	Units	2012	2013	2014	2015
Voice					
Local	sen/min	3.40	3.44	3.71	3.81
National	sen/min	3.62	3.67	3.94	4.04
National with Submarine Cable	sen/min	15.47	15.46	15.69	15.76
SMS		0.04	0.04	0.04	0.04
MMS	sen/message	7.13	6.91	6.95	6.63
Video					
National	sen/min	67.64	63.60	65.93	60.00
National with Submarine Cable	sen/min	79.49	75.39	77.68	71.72

Source: Mobile Model (1800 spectrum); Standard mobile inputs, DiGi spectrum allocation

These calculated prices are about 4% higher for voice services and similar for other services. This suggests that there is little discernible difference in cost in Malaysia for an operator with sparse 900 MHz band spectrum, and as such, there is no case for asymmetric mobile interconnection rates based on spectrum considerations.

14.11 Proposed regulated prices

The considerations of the previous sections suggest that regulated prices for mobile origination and termination should be set using the standard mobile inputs for an operator with 30% market share. Prices at this level provide the right incentives for market competition, investment in new technologies and service innovation to greater 3G usage.

While the SKMM has the ability to set regulated prices for messaging and video services, there is no clear need to do so. For SMS and MMS messaging services, the operators enter agreements that may assume symmetry of traffic and involve no settlements; or may charge for interconnection at a low rate per message. Video services are developing in a number of ways but most video on mobiles is today to and from internet sites, rather than between users. There is likely to be significant service innovation in video and messaging services over the next few years, driven by new handset capabilities and new service concepts. Setting regulated prices for messaging and video services for the period to 2015 therefore risks creating regulatory distortions in the evolving market.

The SKMM proposes to set regulated prices only for voice interconnection. The proposed prices are based on those calculated for the standard mobile inputs to the Mobile model. It is necessary, however, to avoid the anomalous situation of having prices decline steeply from the current 5 sen/minute and then rise again. The SKMM has therefore used a glide path from the current rate to the calculated LRIC rates in 2015. For the submarine cable option, the prices are the calculated rates.

The proposed regulated prices are shown in the following tables.

Table 85: Mobile Network Origination Service Proposed Prices

	Units	2013	2014	2015
Voice				
Local	sen/min	4.63	4.26	3.89
National	sen/min	4.64	4.27	3.91
National with Submarine Cable	sen/min	15.53	15.56	15.63

Source: Table 75 with glide path

Table 86: Mobile Network Termination Service Proposed Prices

	Units	2013	2014	2015
Voice				
Local	sen/min	4.55	4.10	3.65
National	sen/min	4.63	4.25	3.88
National with Submarine Cable	sen/min	15.49	15.53	15.60

Source: Table 76 with glide path

Question 27

The SKMM seeks comments on its final proposed prices for Mobile origination and termination services.

14.12 Use of Pure LRIC costing methodology

One variant on LRIC methodology, called "pure LRIC", has attracted some attention because it has been proposed by the European Commission as an appropriate costing methodology for wholesale mobile voice termination. Pure LRIC differs from traditional LRIC costing in two important ways:

- The increment is taken to be just the wholesale terminating voice traffic. That is, the averaging of costs is performed only over the final increment of cost for the terminating voice traffic.

- There is no mark-up for fixed and common costs on the LRIC costs that are calculated bottom-up. The assumption here is that the common costs are fully recovered from the network provider's own retail services and are not caused by the existence of terminating traffic.

The effect of these changes is generally to produce lower termination rates. As the volume of terminating traffic increases, then the calculated termination rate approaches the value calculated from the traditional LRIC methodology. Lower termination rates discourage unproductive further investments in mobile voice service in a largely saturated market while implicitly encouraging investments in innovative services or competitive facilities.

However, in Malaysia as in other places, scale is important in driving efficiencies for a network provider and all providers must recover their common costs from some service. Whether or not pure LRIC is a suitable costing approach will depend on the details of the individual market.

In the current costing exercise, the SKMM has collected data from service providers as if the final methodology is TSLRIC with common cost mark-up. The data shows that, for most mobile operators, interconnection traffic is a significant proportion of total traffic. The forecasts provided by service providers show continued significant growth in subscribers and traffic. The costing increment should therefore be the whole traffic level.

In addition, if common costs were not partially recovered from termination charges, there would be a detrimental effect on on-net voice retail prices, against the interests of end users. The data also shows a relatively low level of common costs, indicating the general efficiency of mobile service providers: the common costs add a few percent only to the calculated prices. The SKMM has concluded, therefore, that pure LRIC is not an appropriate methodology for Malaysia.

Question 28

The SKMM seeks comments on the appropriateness or otherwise of the "pure LRIC" approach to costing interconnection services in the Malaysian context.

14.13 Sensitivity analysis

This section provides some additional results from the model to demonstrate how the final calculated prices change with modifications to key parameters.

14.13.1 WACC value

The WACC value is a key parameter in determining the return on capital required for a suitable return to investors. The following tables show the effect on mobile interconnection rates for the standard mobile inputs of increasing the WACC by 2 percentage points to 11.86%.

Table 87: Mobile Network Origination Service Prices

	Units	2012	2013	2014	2015
Voice					
Local	sen/min	3.60	3.80	3.88	3.98
National	sen/min	3.62	3.83	3.91	4.01
National with Submarine Cable	sen/min	15.47	15.62	15.66	15.73
SMS	sen/message	0.09	0.09	0.08	0.08
MMS	sen/message	6.07	6.24	5.77	5.47
Video					
National	sen/min	66.80	73.59	64.12	58.49
National with Submarine Cable	sen/min	78.65	85.38	75.88	70.21

Source: Mobile Model; WACC=11.86%

Table 88: Mobile Network Termination Service Prices

	Units	2012	2013	2014	2015
Voice					
Local	sen/min	3.38	3.56	3.63	3.74
National	sen/min	3.60	3.79	3.87	3.97
National with Submarine Cable	sen/min	15.45	15.59	15.62	15.69
SMS		0.04	0.04	0.04	0.04
MMS	sen/message	7.21	7.43	6.98	6.67
Video					
National	sen/min	66.80	73.59	64.12	58.49
National with Submarine Cable	sen/min	78.65	85.38	75.88	70.21

Source: Mobile Model; WACC=11.86%

14.13.2 No LTE rollout

The Mobile model provides an option to exclude a rollout of LTE in the later years. This has a small effect on the overall costs. The following tables show the results of omitting the LTE rollout. This has almost no effect on the calculated rates.

Table 89: Mobile Network Origination Service Prices

	Units	2012	2013	2014	2015
Voice					
Local	sen/min	3.50	3.71	3.79	3.89
National	sen/min	3.53	3.73	3.81	3.92
National with Submarine Cable	sen/min	15.38	15.53	15.57	15.64
SMS	sen/message	0.09	0.08	0.08	0.08
MMS	sen/message	5.91	6.03	5.59	5.32
Video					
National	sen/min	65.20	70.54	61.73	56.61
National with Submarine Cable	sen/min	77.05	82.34	73.48	68.33

Source: Mobile Model; standard mobile inputs, no LTE

Table 90: Mobile Network Termination Service Prices

	Units	2012	2013	2014	2015
Voice					
Local	sen/min	3.29	3.47	3.55	3.65
National	sen/min	3.50	3.70	3.78	3.88
National with Submarine Cable	sen/min	15.35	15.49	15.53	15.60
SMS		0.04	0.04	0.04	0.04
MMS	sen/message	7.01	7.19	6.77	6.49
Video					
National	sen/min	65.20	70.54	61.73	56.61
National with Submarine Cable	sen/min	77.05	82.34	73.48	68.33

Source: Mobile Model; standard mobile inputs, no LTE

14.13.3 USP expenditure

The Mobile model provides an option to exclude expenditure on USP projects: that is, the USP receipts from the SKMM reduce the capital expenditure in the early years. This has a very small effect on the overall costs, as the USP receipts represent 1% or less of the cost base. The following tables show the results of excluding USP expenditure.

Table 91: Mobile Network Origination Service Prices

	Units	2012	2013	2014	2015
Voice					
Local	sen/min	3.51	3.71	3.79	3.89
National	sen/min	3.53	3.73	3.81	3.91
National with Submarine Cable	sen/min	15.38	15.53	15.56	15.63
SMS	sen/message	0.09	0.08	0.08	0.08
MMS	sen/message	5.91	6.08	5.61	5.33
Video					
National	sen/min	65.18	71.67	62.34	56.78
National with Submarine Cable	sen/min	77.03	83.46	74.09	68.50

Source: Mobile Model; standard mobile inputs, exclude USP

Table 92: Mobile Network Termination Service Prices

	Units	2012	2013	2014	2015
Voice					
Local	sen/min	3.29	3.47	3.55	3.65
National	sen/min	3.51	3.70	3.78	3.88
National with Submarine Cable	sen/min	15.36	15.49	15.53	15.60
SMS		0.04	0.04	0.04	0.04
MMS	sen/message	7.02	7.23	6.80	6.50
Video					
National	sen/min	65.18	71.67	62.34	56.78
National with Submarine Cable	sen/min	77.03	83.46	74.09	68.50

Source: Mobile Model; standard mobile inputs, exclude USP

14.13.4 Depreciation schedules

The Mobile model uses tilted annuity depreciation as the standard depreciation schedule. Long-run incremental costs should be calculated using economic depreciation, and tilted annuity depreciation provides the best approximation to economic depreciation (when, as in the present case, a very long time-series of costs for 30-50 years is not available). In past cost studies, however, the SKMM has used tilted straight-line depreciation for LRIC calculations: this has the benefit that annual depreciation costs can be directly calculated.

The models provide an option to choose a depreciation method. In addition to tilted annuity, the models provide for straight-line depreciation, tilted straight-line depreciation and annuity calculations.

The following tables show the effect of varying the depreciation method. The tilted straight-line method increases calculated voice interconnection prices by about 8%.

Table 93: Mobile Network Origination Service Prices

	Units	2012	2013	2014	2015
Voice					
Local	sen/min	3.60	3.83	3.90	4.00
National	sen/min	3.63	3.85	3.93	4.03
National with Submarine Cable	sen/min	15.48	15.65	15.68	15.75
SMS	sen/message	0.09	0.08	0.08	0.08
MMS	sen/message	6.12	6.35	5.88	5.59
Video					
National	sen/min	69.77	77.89	68.35	62.74
National with Submarine Cable	sen/min	81.62	89.69	80.11	74.46

Source: Mobile Model, Straight-line depreciation

Table 94: Mobile Network Termination Service Prices

	Units	2012	2013	2014	2015
Voice					
Local	sen/min	3.38	3.59	3.66	3.76
National	sen/min	3.60	3.82	3.89	3.99
National with Submarine Cable	sen/min	15.45	15.61	15.64	15.71
SMS		0.04	0.04	0.04	0.04
MMS	sen/message	7.23	7.51	7.06	6.76
Video					
National	sen/min	69.77	77.89	68.35	62.74
National with Submarine Cable	sen/min	81.62	89.69	80.11	74.46

Source: Mobile Model, Straight-line depreciation

Table 95: Mobile Network Origination Service Prices

	Units	2012	2013	2014	2015
Voice					
Local	sen/min	3.79	4.00	4.08	4.18
National	sen/min	3.82	4.03	4.11	4.20
National with Submarine Cable	sen/min	15.67	15.82	15.86	15.93
SMS	sen/message	0.10	0.09	0.09	0.09
MMS	sen/message	6.38	6.54	6.04	5.72
Video					
National	sen/min	69.26	76.16	66.41	60.58
National with Submarine Cable	sen/min	81.11	87.95	78.16	72.30

Source: Mobile Model, Tilted straight-line depreciation

Table 96: Mobile Network Termination Service Prices

	Units	2012	2013	2014	2015
Voice					
Local	sen/min	3.56	3.74	3.82	3.92
National	sen/min	3.80	3.99	4.07	4.17
National with Submarine Cable	sen/min	15.65	15.79	15.82	15.89
SMS		0.05	0.04	0.04	0.04
MMS	sen/message	7.59	7.80	7.32	6.98
Video					
National	sen/min	69.26	76.16	66.41	60.58
National with Submarine Cable	sen/min	81.11	87.95	78.16	72.30

Source: Mobile Model, Tilted straight-line depreciation

Table 97: Mobile Network Origination Service Prices

	Units	2012	2013	2014	2015
Voice					
Local	sen/min	3.38	3.59	3.67	3.77
National	sen/min	3.40	3.62	3.69	3.79
National with Submarine Cable	sen/min	15.25	15.41	15.44	15.51
SMS	sen/message	0.08	0.08	0.08	0.08
MMS	sen/message	5.72	5.94	5.50	5.23
Video					
National	sen/min	65.57	72.89	63.69	58.27
National with Submarine Cable	sen/min	77.41	84.68	75.44	69.99

Source: Mobile Model, Annuity depreciation

Table 98: Mobile Network Termination Service Prices

	Units	2012	2013	2014	2015
Voice					
Local	sen/min	3.17	3.36	3.44	3.54
National	sen/min	3.37	3.58	3.65	3.75
National with Submarine Cable	sen/min	15.22	15.37	15.41	15.47
SMS		0.04	0.04	0.04	0.04
MMS	sen/message	6.75	7.02	6.61	6.33
Video					
National	sen/min	65.57	72.89	63.69	58.27
National with Submarine Cable	sen/min	77.41	84.68	75.44	69.99

Source: Mobile Model, Annuity depreciation

15 WiMAX Services

15.1 Services

There are two sets of WiMAX services on the Access List:

- Mobile Network Origination Service
- Mobile Network Termination Service

These services are the same categories as for mobile operators. The costing of interconnection for WiMAX operators is carried out in the same model (the Mobile and WiMAX cost model) as for mobile operators but with a different dataset for a "standard WiMAX" operator.

While the WiMAX operators are ostensibly comparable to the standard mobile operators (deploying 2G/3G/LTE) and potentially offer similar services, there are key differences, explored in the next section, that lead to different conclusions with regard to regulated interconnection prices.

15.2 Differences from mobile operators

The WiMAX operators in the current state of the market are niche players. They represent less than 1% of "mobile" subscribers and even with forecast growth will be less than 5% of subscribers by 2016.

Forecasts of subscribers and traffic were received from Packet One and YTL. The standard WiMAX inputs for the model use a smoothed version of these forecasts for an operator that starts at less than 1% of the size (in terms of subscribers) of the standard mobile operator and increases to nearly 16% of the size of the standard mobile operator by 2016.

The service offerings of a WiMAX operator are different from those of a mobile operator. WiMAX service for the most part offers untethered "nomadic" access in the WiMAX coverage areas. The emphasis is on providing an alternative to high-speed data access. Technological advances in WiMAX will support "true" mobility, with the possibility of continuous communication while moving. The attractiveness of these offerings and the associated end-user equipment is still largely unknown.

The forecasts of traffic on the WiMAX networks are dominated by data traffic, not voice. In the forecasts of traffic used in the standard WiMAX inputs, the data traffic represents more than 99.8% of total traffic (when all service traffic is converted to the common units of Erlangs) in all years. Hence, voice represents only a tiny fraction of the usage of the WiMAX networks.

While a WiMAX network appears to have the same structure as a standard cellular mobile network, its equipment is different. The costs and capacities for network elements used for the WiMAX cost model are drawn from the data responses of the WiMAX operators. There were a number of meetings with the WiMAX operators to discuss the structure and planning of a WiMAX network and the results are reflected in the Mobile and WiMAX cost model. The same basic structure of calculations is used for both networks.

In terms of spectrum, WiMAX operates in "3G-like" bands and higher frequencies, leading to potentially higher costs for coverage. The standard WiMAX operator is assumed to have 30 MHz of spectrum in the 2.3 GHz band and the same availability for LTE as for other mobile operators from 2013.

As clarified above, the LTE spectrum has yet to be allocated to date, hence, the assumptions made in this PI Paper and in the Mobile and WiMAX model is neither indicative nor binding on the spectrum allocation. A separate process will be undertaken to allocate the LTE spectrum.

The coverage assumptions used in the cost model are modest. It is assumed that by 2016 coverage is available in all urban areas and about 90% of suburban areas. LTE rollout is included in later years to 100% of urban areas and about 20% of suburban areas by 2016. Given the current size and growth prospects of WiMAX operators, it is unlikely that there will be an extensive rollout of the technology outside the main population centres.

The overall effect of these assumptions is that the WiMAX operators will remain niche players in the market for the next few years with an emphasis on high-speed data services.

15.3 WACC for WiMAX operator

15.3.1 WACC analysis

A study of appropriate WACC values for WiMAX operators based on publicly available data was undertaken. Little data on specific WiMAX operators is available: Green Packet, the parent company of Packet One, is listed on the Bursa Malaysia; YTL is part of a larger conglomerate and represents less than 3% of total revenues of the parent company. The study therefore relied on data concerning Green Packet and comparisons with other IP and WiMAX providers in the region.

As described in section 8.3.2, the WACC was estimated using the CAPM. This requires estimates of gearing, taxation, cost of debt and cost of equity.

15.3.2 Gearing

Gearing is defined as the proportion of debt in the total value (debt plus equity) of the enterprise, where equity should be expressed in market terms. A gearing of 5% for a WiMAX operator was assumed. This is less than Green Packet's most recent gearing but higher than its 2-year average. For regional WiMAX operators, gearing is quite volatile and variable.

15.3.3 Taxation

The standard corporate tax rate for all large companies is 25%. This is used for the WiMAX calculation, because it is assumed that the WiMAX operator will be part of a larger operation. As explained in section 8.3.4, no adjustment has been made for domestic investors.

15.3.4 Cost of Debt

As described in section 8.3.5, the period over which the debt should be financed is the average life of the assets in each economic model. In the WiMAX model, the average asset life is 8.15 years, so long-term debt with 8-year maturity has been used in the CAPM. The cost of debt to maturity has been estimated using data available from Bloomberg on Malaysian corporate bond yields by maturity period and credit rating. (In undertaking this analysis of Bloomberg data, the period of economic instability from September 2008 to March 2009 after the Lehman Brothers collapse was excluded.) It has been assumed that a WiMAX operator would have a lower credit rating than a large mobile operator, leading to a higher cost of debt of 13.96%.

15.3.5 Cost of Equity

The cost of equity is calculated from parameters estimated from past time series that are then adjusted for forward-looking values. As described in section 8.3.6, three reference markets – Malaysia, ASEAN-5 and World – were used in the analysis. The estimation of the average reference market for WiMAX is complicated by the fact that Green Packet has a high market capitalization compared to its peers and YTL is part of a much larger consortium. Ultimately, the assumptions are foreign active investors of 35%, leading to market weights of 27% for Malaysia, 47% for ASEAN-5 and 27% for World, using the average market weights in Table 4 for a small service provider. The risk-free rate is 3.7%, based on US bonds with 8-year maturity.

For estimating asset beta, an analysis of time series for Green Packet, excluding periods of financial instability were undertaken. Values have been quite stable (with some recent declines), leading to a conservative asset beta value of 1.20 for the market.

The cost of equity data for a typical WiMAX operator is given in the following table.

Table 99: WiMAX operator: Calculation of cost of equity

	Malaysia	ASEAN-5	World	Weighted Average
Market weights	27%	47%	27%	
Risk-free rate				3.7%
Asset beta	1.20	0.91	0.74	
Equity beta	1.25	0.95	0.77	
Lambda			2.25	
Country risk premium	0.6%	0.9%		
Equity market risk premium	5.6%	5.9%	5.0%	
Cost of Equity (USD estimates)	10.6%	9.0%	8.7%	9.4%
Cost of Equity MYR				**9.80%**

Source: Ovum analysis

15.3.6 Estimated WACC values

With the values derived in the sections above, the final estimated WACC value can be calculated from the formula given in section 8.3.2, repeated here for convenience:

$$\text{Pre-tax WACC} = g.C_D + (1-g)/(1-t).C_E$$

where

C_D is the cost of debt (expressed as a percentage);

C_E is the cost of equity (expressed as a percentage);

g is the gearing, g = Debt/(Debt + Equity), where equity is expressed in market terms;

t is the tax rate.

For a WiMAX operator, the cost of debt is estimated to be 13.96%, the cost of equity is estimated to be 9.80%, the forward-looking gearing is estimated to be 5%, and the tax rate is 25%. These figures provide a pre-tax WACC value of 13.11%.

15.4 Responses to model viewing

The hybrid Mobile/WiMAX model contains a majority of calculations that are the same for both network technology types, with the differences accounted for through a mix of different input profile data and calculations that changed depending on the network technology. Therefore, some of the feedback provided within the context of the Mobile model was also applicable to the WiMAX model, and changes made in response to the Mobile model also flowed through to the WiMAX model calculations.

Due to confidentiality concerns with the WiMAX input data profiles, a full set of input data was not provided for industry viewing. While this limited some of the areas on which feedback could be received, the salient comments received are on the reasons for WiMAX being modelled separately from mobile networks when the access price should be technology neutral.

15.5 Changes after model viewing

The main model changes are described in section 14.9 above. The adjustments in conversion factors have some effect on WiMAX calculated prices, as does the change in WACC value. The splits between fibre and microwave backhaul also have some effect. As for modelling WiMAX separately from mobile networks, the SKMM wanted to understand the cost differences of both the technology choice and scale in considering the appropriate wholesale rates to set for this review period.

15.6 Proposed regulated prices

15.6.1 WiMAX prices calculated by the model

The WiMAX prices calculated by the Mobile and WiMAX model with standard WiMAX inputs are shown in the following tables. These prices show a decline for voice and messaging to below the standard mobile operator rates as the traffic volumes increase. Costs for video services remain substantially above the costs calculated for the standard mobile operator.

Table 100: WiMAX Network Origination Service Calculated Prices

	Units	2012	2013	2014	2015
Voice					
		-	-	-	-
National	sen/min	1.67	1.54	1.18	0.90
National with Submarine Cable	sen/min	13.52	13.33	12.93	12.63
		0.00	0.00	0.00	0.00
MMS	sen/message	5.13	4.73	3.62	2.78
Video					
National	sen/min	98.42	90.90	69.49	53.44
National with Submarine Cable	sen/min	110.27	102.69	81.24	65.16

Source: WiMAX Model, standard WiMAX inputs

Table 101: WiMAX Network Termination Service Calculated Prices

	Units	2012	2013	2014	2015
Voice					
		-	-	-	-
National	sen/min	1.67	1.54	1.18	0.90
National with Submarine Cable	sen/min	13.52	13.33	12.93	12.63
		0.00	0.00	0.00	0.00
MMS	sen/message	5.13	4.73	3.62	2.78
Video					
National	sen/min	98.42	90.90	69.49	53.44
National with Submarine Cable	sen/min	110.27	102.69	81.24	65.16

Source: WiMAX Model, standard WiMAX inputs

15.6.2 Proposed regulated prices

As noted earlier, the WiMAX operators remain a niche player in the provision of mobile voice services. With sufficient service volume, the costs for WiMAX operators to provide voice service are below the cost-based regulated prices proposed in section 14.11 above.

The SKMM therefore proposes to set regulated prices for WiMAX voice origination and termination services at the same levels as for mobile operators. The prices are given in Table 85 and Table 86. These prices will provide incentives for WiMAX operators to seek sufficient scale in voice services while not distorting the market to any significant degree.

Question 29

The SKMM seeks comments on its proposed approach to regulating prices for WiMAX services.

15.7 Sensitivity analysis

This section provides some additional results from the model to demonstrate how the final calculated prices change with modifications to key parameters.

15.7.1 WACC value

The WACC value is a key parameter in determining the return on capital required for a suitable return to investors. The following tables show the effect on mobile interconnection rates for the standard WiMAX inputs of increasing the WACC by 2 percentage points to 15.11%.

Table 102: Mobile Network Origination Service Prices

	Units	2012	2013	2014	2015
Voice					
		-	-	-	-
National	sen/min	1.70	1.57	1.20	0.92
National with Submarine Cable	sen/min	13.55	13.36	12.95	12.64
SMS		0.00	0.00	0.00	0.00
MMS	sen/message	5.24	4.82	3.68	2.83
Video					
National	sen/min	100.52	92.56	70.65	54.29
National with Submarine Cable	sen/min	112.37	104.36	82.40	66.01

Source: Mobile Model; WiMAX inputs, WACC=15.11%

Table 103: Mobile Network Termination Service Prices

	Units	2012	2013	2014	2015
Voice					
		-	-	-	-
National	sen/min	1.70	1.57	1.20	0.92
National with Submarine Cable	sen/min	13.55	13.36	12.95	12.64
SMS		0.00	0.00	0.00	0.00
MMS	sen/message	5.24	4.82	3.68	2.83
Video					
National	sen/min	100.52	92.56	70.65	54.29
National with Submarine Cable	sen/min	112.37	104.36	82.40	66.01

Source: Mobile Model; WiMAX inputs, WACC=15.11%

15.7.2 Depreciation schedules

The Mobile and WiMAX model uses tilted annuity depreciation as the standard depreciation schedule. Long-run incremental costs should be calculated using economic depreciation, and tilted annuity depreciation provides the best approximation to economic depreciation (when, as in the present case, a very long time-series of costs for 30-50 years is not available). In past cost studies, however, the SKMM has used tilted straight-line depreciation for LRIC calculations: this has the benefit that annual depreciation costs can be directly calculated.

The model provides an option to choose a depreciation method. In addition to tilted annuity, it provides for straight-line depreciation, tilted straight-line depreciation and annuity calculations.

The following tables show the effect of varying the depreciation method.

Table 104: Mobile Network Origination Service Prices

	Units	2012	2013	2014	2015
Voice					
		-	-	-	-
National	sen/min	1.72	1.58	1.21	0.93
National with Submarine Cable	sen/min	13.57	13.38	12.96	12.65
SMS		0.00	0.00	0.00	0.00
MMS	sen/message	5.30	4.88	3.72	2.86
Video					
National	sen/min	101.82	93.61	71.49	55.00
National with Submarine Cable	sen/min	113.67	105.40	83.25	66.72

Source: WiMAX Model, Straight-line depreciation

Table 105: Mobile Network Termination Service Prices

	Units	2012	2013	2014	2015
Voice					
		-	-	-	-
National	sen/min	1.72	1.58	1.21	0.93
National with Submarine Cable	sen/min	13.57	13.38	12.96	12.65
SMS		0.00	0.00	0.00	0.00
MMS	sen/message	5.30	4.88	3.72	2.86
Video					
National	sen/min	101.82	93.61	71.49	55.00
National with Submarine Cable	sen/min	113.67	105.40	83.25	66.72

Source: WiMAX Model, Straight-line depreciation

Table 106: Mobile Network Origination Service Prices

	Units	2012	2013	2014	2015
Voice					
		-	-	-	-
National	sen/min	1.80	1.64	1.25	0.96
National with Submarine Cable	sen/min	13.65	13.44	13.00	12.68
SMS		0.00	0.00	0.00	0.00
MMS	sen/message	5.54	5.06	3.85	2.95
Video					
National	sen/min	106.32	97.16	73.84	56.64
National with Submarine Cable	sen/min	118.17	108.95	85.60	68.36

Source: WiMAX Model, Tilted straight-line depreciation

Table 107: Mobile Network Termination Service Prices

	Units	2012	2013	2014	2015
Voice					
		-	-	-	-
National	sen/min	1.80	1.64	1.25	0.96
National with Submarine Cable	sen/min	13.65	13.44	13.00	12.68
SMS		0.00	0.00	0.00	0.00
MMS	sen/message	5.54	5.06	3.85	2.95
Video					
National	sen/min	106.32	97.16	73.84	56.64
National with Submarine Cable	sen/min	118.17	108.95	85.60	68.36

Source: WiMAX Model, Tilted straight-line depreciation

Table 108: Mobile Network Origination Service Prices

	Units	2012	2013	2014	2015
Voice					
		-	-	-	-
National	sen/min	1.61	1.50	1.15	0.89
National with Submarine Cable	sen/min	13.46	13.29	12.90	12.61
SMS		0.00	0.00	0.00	0.00
MMS	sen/message	4.96	4.61	3.54	2.73
Video					
National	sen/min	95.31	88.45	67.90	52.35
National with Submarine Cable	sen/min	107.16	100.25	79.65	64.07

Source: WiMAX Model, Annuity depreciation

Table 109: Mobile Network Termination Service Prices

	Units	2012	2013	2014	2015
Voice					
		-	-	-	-
National	sen/min	1.61	1.50	1.15	0.89
National with Submarine Cable	sen/min	13.46	13.29	12.90	12.61
SMS		0.00	0.00	0.00	0.00
MMS	sen/message	4.96	4.61	3.54	2.73
Video					
National	sen/min	95.31	88.45	67.90	52.35
National with Submarine Cable	sen/min	107.16	100.25	79.65	64.07

Source: WiMAX Model, Annuity depreciation

PART E: CO-LOCATION AND INFRASTRUCTURE SHARING

16 Co-location and Infrastructure Sharing Cost Model

16.1 Purpose

The Co-location and Infrastructure Sharing model is used to calculate costs and prices for the following facilities and services on the Access List:

- Infrastructure Sharing
- Network Co-Location Service

As with the other models, the resulting prices are averages that could be de-averaged in a number of ways. For the present model, costs and prices are de-averaged for Urban, Rural and Remote areas but not in other dimensions.

16.2 Building-block approach

The Co-location and Infrastructure Sharing model uses a building block methodology. That is, it rolls forward an asset base for future years, calculates annual charges, and allocates annual costs to services using allocation factors. The model has a simplified form, however, because it starts from unit costs instead of total investments, as explained below.

16.2.1 Infrastructure Sharing

For Infrastructure Sharing, the SKMM has analysed the cost data provided by tower companies (comprising mainly state-backed companies or SBCs). Twelve of the thirteen tower companies provided capital and operational costs for 2010 and 2011 (part year), providing an extensive dataset. Classifying tower companies according to the principal land use in the states they operate in provided a clear separation of costs into Urban, Rural and Remote categories.

The business model of the tower companies is primarily to build facilities (towers and poles) and lease space for antennas on them. A standard allocation is space for 3 service antennas with 2 backhaul microwave antennas and a share of the common systems building. The model uses cost per antenna space (for service antennas) as the basic unit. Thus, a tower company would charge an access seeker three times the calculated price of antenna space for a standard allocation of antenna space covering 3 service antennas and 2 backhaul antennas.

There are also operational costs associated with a shared facility. These are recovered through a charge for "Access to common systems" in the equipment room. This charge would also be incurred if an access seeker provided its own equipment room. Electrical power is also provided: in the model, the cost is derived from a standard power tariff.

The building blocks used in the model are then Antenna Space, which carries the capital costs of the installation, and Access to Common Systems, which carries the operational costs. The capital items are assumed by default to have an economic lifetime of 20 years, which is common with building facilities in the other models. The SKMM has undertaken some sensitivity analysis around this number, because the tower companies are generally committed to writing down their assets in shorter periods.

Since the model uses unit costs (cost per antenna space), there are no capital additions or service demands in the model. The unit capital costs are rolled forward in time, taking into account the required return on capital and the depreciation charge. The tilted annuity method could be used to calculate depreciation in order to approximate economic depreciation or the model could use straight-line depreciation to follow the accounting practice of the tower companies.

For operational expenditure, the cost per site was calculated from the aggregate tower companies data. This cost is recovered through charges to all access seekers who share the site. By default, the model assumes an average of 3.4 access seekers per site (that is, 80% of sites with 3 access seekers and 20% of sites with 5 access seekers).

The tower companies' accounts included two other categories of operational cost:

- Overhead costs: these are recovered through a mark-up on the operational costs per site. The mark-up is about 30%.

- Financing costs: these are not explicitly included in the model. By setting an appropriate WACC, the model calculates a return on capital and depreciation that cover the cost of financing the business and provide an adequate return to equity investors.

An analysis by the SKMM of the data responses from tower companies suggests that some or all of the assets acquired through USP have been omitted from the asset values. If USP assets were fully included in the cost base, the Infrastructure Sharing calculated prices shown in section 17.3 below would be 2.5%-15% higher.

16.2.2 Co-location

For Co-location services, the SKMM has analysed the space and costs provided by some licensees for mobile and transmission services. This has provided a dataset from which the costs incurred per square meter of co-location space could be estimated.

The SKMM has not attempted to estimate the costs of virtual co-location, where there are many possible configurations, and co-location in roadside cabinets, for which there is little data.

The model uses two building blocks: one for co-location space (per square meter), which carries the capital cost; and one for co-location services, which carries the operational costs. Because the model uses unit costs, there is no requirement for capital additions or service demand forecasts in the model. The unit capital costs are rolled forward in time, taking into account the required return on capital and the depreciation charge. The tilted annuity method is used to calculate depreciation, in order to approximate economic depreciation.

The same power costs are used as for Infrastructure Sharing.

Question 30
The SKMM seeks comments on the completeness of the models for co-location and infrastructure sharing.

16.3 Costing options

As described in section 7.1, the costs to be included in the pricing of these facilities and services depend on the access provider. There are therefore a number of options in the model.

16.3.1 Infrastructure Sharing

For Infrastructure Sharing, there are two main options. The principal one is where a tower company provides facilities to be shared among several mobile operators. In this case, the tower company should be able to recover all its legitimately incurred costs.

This means that the model includes a mark-up for common business costs and uses a WACC applicable to tower companies.

The other option is where a mobile network operator provides space on its own facilities for another operator. As has been described in section 7.1, the appropriate cost allocation does not include the common business cost. The appropriate WACC is that for a mobile operator.

16.3.2 Co-location

As described in section 7.1, the common business cost should not be included in the cost base for co-location and the model provides an option for excluding the common business cost mark-up.

The appropriate WACC depends on the operator providing the co-location space. For a mobile operator, this is the mobile WACC. For a fixed network operator or a transmission provider, this is the fixed WACC.

16.4 Responses to model viewing

Most responses were primarily concerned with Infrastructure Sharing services, although many comments also had relevance to Co-location services. The comments are summarised below.

1. Location: There should be more location types than just urban, rural and remote areas. Costs differed by location and cost allocation factors should also differ by location. The emphasis should be on rural areas, where most co-location and infrastructure sharing were located. Special consideration should be given to Sarawak and Sabah. All prices should depend on location not just calculated antenna space prices.

2. Prices for tower space were dependent on the height of the space provided.

3. Full cost recovery: Concerns about full cost recovery were expressed. The model, it was noted, could not include demand-based reconciliation, leading to the possibility of over-recovery or under-recovery of costs. Operational costs, in particular, should be forecast to increase in future years. The calculated installation costs were too high.

4. Financing: For infrastructure financing, the standard agreement between a tower company and mobile operators were for a 10-year term with an optional further 5 years. The useful economic life of a tower may not be 20 years and agreements usually wrote off capital costs over 7 years.

5. Depreciation: Land should not be depreciated. Reservations were expressed over the use of tilted annuity depreciation.

6. Mark-ups: The basis for the 30% mark-up proposed for common business costs in tower companies, and the efficiency of the proposed mark-ups were questioned.

7. The asymmetric effect of regulated prices on mobile service providers and tower companies were noted: while the operational costs of infrastructure sharing represented only 1%-4% of the main mobile operators' operational expenditure (according to the feedback), the revenue from infrastructure sharing was the total business of most tower companies. A lowering of prices would therefore have a disproportionate effect on tower companies without significantly benefiting mobile service providers.

Most respondents did not comment on whether or not Co-location and Infrastructure Sharing wholesale prices should be regulated, it being assumed that the SKMM was minded to regulate prices.

16.5 Changes after model viewing

Operational costs for infrastructure sharing and power are now assumed to increase at the general rate for labour cost increases of 3.1%. The installation charges for Infrastructure Sharing services have been removed from the model. All costs are now assumed to be recovered through charges for antenna space and access to common systems. Power costs are now marked up with the common cost mark-up for each access provider.

For tower companies, a site utilisation factor is now included in the model. This recognizes that not all tower companies' facilities will be occupied by access seekers at any given time. The site utilization factor is consistent with utilization factors in the other models. In addition, the user controls have been simplified. As described in section 16.3, there are a number of different costing options, involving different WACC values and mark-ups that are used to set prices. The model controls now include a selection of access provider type, which enables the selection of the relevant WACC value and mark-ups.

The SKMM continues to believe, based on the data provided, that the differentiation between urban, rural and remote regions sufficiently captures the variation in average costs for Co-location and Infrastructure Sharing services.

The SKMM, recognizing that the depreciation profile is an issue for Infrastructure Sharing Service, has undertaken some sensitivity analysis on this parameter – see section 17.3. The SKMM is proposing to use straight-line depreciation for the capital costs incurred by tower companies.

17 Infrastructure Sharing

17.1 Services

As described in section 16.2.1 above, the primary business model of the tower companies is to build facilities (towers and poles) and lease space on them for antennas. A standard lease configuration is for 3 service antennas with 2 backhaul antennas and a share of the common systems building.

For a mobile operator providing infrastructure sharing facilities to another operator, the same type of lease arrangement applies: space for some number of service antennas, space for one or more backhaul antennas and a share of common systems.

In both cases, power costs may be added, if electricity is supplied by the access provider.

17.2 WACC for a Tower Company

17.2.1 WACC analysis

To estimate the costs for a tower company (namely SBCs) providing Infrastructure Sharing facilities, a WACC value is required. For Mobile and Fixed service providers, the WACC values have already been described earlier in this PI Paper.

A study of appropriate WACC values for tower companies was undertaken based on publicly available data. Of the tower companies, Sacofa is the largest but it presents a mixed business of both infrastructure provision and transmission services. Data for Sacofa must therefore be adjusted when considering the WACC for infrastructure sharing alone. Four tower companies have ratings from either the Malaysian Rating Corporation or the Rating Agency Malaysia. For the assessment of parameters related to market values, comparable tower companies in Indonesia and the US have been studied.

As described in section 8.3.2, the WACC was estimated using the CAPM. This requires estimates of gearing, taxation, cost of debt and cost of equity.

17.2.2 Gearing

Gearing is defined as the proportion of debt in the total value (debt plus equity) of the enterprise, where equity should be expressed in market terms. For calculating the pre-tax WACC value, forward-looking gearing is required: that is, what the gearing will be over the regulatory period.

The tower companies provided book gearing as part of their data responses. Average book gearing was about 74%. This must be adjusted for market value of equity. When this is done, the gearing becomes 57%, which is close to the sector average. A value of 57% has therefore been used.

17.2.3 Taxation

While the standard corporate tax rate for all large companies is 25%, the tax authorities consider that the tower companies are passive investors in their towers and so cannot claim a tax deduction for their capital assets. This makes their tax rate effectively 10 basis points higher. Therefore, for the tax rate, a value of 35% was used.

As explained in section 8.3.4, no adjustment has been made for domestic investors.

17.2.4 Cost of Debt

As described in section 8.3.5, the period over which the debt should be financed is the average life of the assets in each economic model. In the Infrastructure Sharing model, the asset lives are set to 20 years. This would be too long for the satisfactory pricing of debt. Instead, in line with the tower companies' current practice, a maturity of 10 years is assumed and then a return to the debt market after 10 years at the same price as today.

Available credit ratings for tower companies range from AA to AA3. By choosing the lowest of these, AA3, a conservative estimate is made that may over-value the cost of debt.

With a 10-year maturity (and return to the market after 10 years) and an AA3 rating, the cost of debt is estimated to be 9.36%.

17.2.5 Cost of Equity

The cost of equity is calculated from parameters estimated from past time series that are then adjusted for forward-looking values. As described in section 8.3.6, three reference markets were used – Malaysia, ASEAN-5 and World – in the analysis. For tower companies, it is reasonable to assume that there are domestic-only active investors.

This means that the average market weights in Table 4 for domestic investors in small service providers apply: 30% for Malaysia, 50% for ASEAN-5, and 20% for World.

The risk-free rate is 4.8%, based on US bonds with 20-year maturity.

The cost of equity data for a typical tower company is given in the following table.

Table 110: Tower Companies: Calculation of cost of equity

	Malaysia	ASEAN-5	World	Weighted Average
Market weights	30%	50%	20%	
Risk-free rate				4.8%
Asset beta	0.52	0.40	0.32	
Tax rate	35%			
Equity beta	0.97	0.74	0.60	
Lambda			2.25	
Equity market risk premium	5.0%	5.0%	5.0%	
Cost of Equity (USD estimates)	9.6%	6.8%	6.4%	7.6%
Cost of Equity MYR				**7.88%**

Source: Ovum analysis

17.2.6 Estimated WACC values

With the values derived in the sections above, the final estimated WACC value can be calculated from the formula given in section 8.3.2, repeated here for convenience:

$$\text{Pre-tax WACC} = g.C_D + (1-g)/(1-t).C_E$$

where

C_D is the cost of debt (expressed as a percentage);

C_E is the cost of equity (expressed as a percentage);

g is the gearing, g = Debt/(Debt + Equity), where equity is expressed in market terms;

t is the tax rate.

For a typical tower company, the cost of debt is estimated to be 9.36%, the cost of equity 7.88%, the forward-looking gearing 57%, and the tax rate 35%. These figures provide a pre-tax WACC value of 10.55%.

17.3 Infrastructure Sharing by tower companies

As described in section 16.2.1, the principal business of a tower company is to provide towers and poles and lease antenna space on them to mobile operators. For costing purposes, straight-line depreciation, which is the method used by tower companies, can be used. The common business costs of the tower companies must also be recovered.

The Infrastructure Sharing cost model with these settings calculates the prices shown in the following table.

Table 111: Tower Companies: Infrastructure Sharing Calculated Prices

Antenna Space

	Units	2012	2013	2014	2015
Antenna Space: Urban Area	RM/year	2,474.23	2,387.35	2,300.47	2,213.59
Antenna Space: Rural Area	RM/year	4,948.46	4,774.70	4,600.94	4,427.19
Antenna Space: Remote Area	RM/year	5,478.65	5,286.28	5,093.90	4,901.53

Equipment Room

	Units	2012	2013	2014	2015
Access to common systems: Urban Area	RM/year	20,869.72	21,516.68	22,183.70	22,871.40
Access to common systems: Rural Area	RM/year	20,869.72	21,516.68	22,183.70	22,871.40
Access to common systems: Remote Area	RM/year	20,869.72	21,516.68	22,183.70	22,871.40
Common Power	RM/kWH	0.42	0.43	0.44	0.46

Source: Infrastructure Sharing Model, straight-line depreciation, tower company provider

Tower companies have submitted that their business cases depend on an economic lifetime of no more than 10 years. The SKMM has therefore considered the case of asset lifetimes of 10 years. This requires changing the building-block lives in the Infrastructure Sharing Model. The calculated results are shown in the following table.

Table 112: Tower Companies: Infrastructure Sharing (10 year lives)

Antenna Space

	Units	2012	2013	2014	2015
Antenna Space: Urban Area	RM/year	2,048.12	2,252.93	2,478.22	2,726.04
Antenna Space: Rural Area	RM/year	4,096.23	4,505.85	4,956.44	5,452.08
Antenna Space: Remote Area	RM/year	4,535.11	4,988.62	5,487.49	6,036.24

Equipment Room

	Units	2012	2013	2014	2015
Access to common systems: Urban Area	RM/year	20,869.72	21,516.68	22,183.70	22,871.40
Access to common systems: Rural Area	RM/year	20,869.72	21,516.68	22,183.70	22,871.40
Access to common systems: Remote Area	RM/year	20,869.72	21,516.68	22,183.70	22,871.40
Common Power	RM/kWH	0.42	0.43	0.44	0.46

Source: Infrastructure Sharing Model, straight-line depreciation, tower company provider, 10 year asset lives

The change in asset lives does not affect the operational costs but the cost of antenna space varies from -27% to +23% of the costs with 20-year asset lives.

17.4 Infrastructure Sharing by Mobile operators

Infrastructure sharing by one mobile operator to another operator involves the provision of space for antennas and common systems. As described in section 7.1 above, the appropriate arrangement is to provide the space at marginal cost: the mobile operator's common business costs are recovered through its wholesale and retail services. For a mobile operator, the tilted annuity calculation should be used in line with the costing of other services.

The Infrastructure Sharing cost model with these settings calculates the prices shown in the following table.

Table 113: Mobile Operator: Infrastructure Sharing Calculated Prices

Antenna Space

	Units	2012	2013	2014	2015
Antenna Space: Urban Area	RM/year	835.58	919.14	1,011.05	1,112.16
Antenna Space: Rural Area	RM/year	1,671.16	1,838.28	2,022.10	2,224.31
Antenna Space: Remote Area	RM/year	1,850.21	2,035.23	2,238.76	2,462.63

Equipment Room

	Units	2012	2013	2014	2015
Access to common systems: Urban Area	RM/year	13,645.59	14,068.60	14,504.73	14,954.37
Access to common systems: Rural Area	RM/year	13,645.59	14,068.60	14,504.73	14,954.37
Access to common systems: Remote Area	RM/year	13,645.59	14,068.60	14,504.73	14,954.37
Common Power	RM/kWH	0.33	0.34	0.35	0.36

Source: Infrastructure Sharing Model, tilted annuity, Mobile provider, marginal cost

If the costs were marked up with the standard mobile common cost mark-up, they would be 2-3% higher.

17.5 Other Infrastructure Sharing options

A fixed network operator may also provide infrastructure sharing facilities to other operators. For a fixed network provider, with marginal costing, the Infrastructure cost model calculates the values shown in the following table.

Table 114: Fixed Operator: Infrastructure Sharing Calculated Prices

Antenna Space

	Units	2012	2013	2014	2015
Antenna Space: Urban Area	RM/year	757.61	833.38	916.71	1,008.38
Antenna Space: Rural Area	RM/year	1,515.23	1,666.75	1,833.43	2,016.77
Antenna Space: Remote Area	RM/year	1,677.57	1,845.33	2,029.86	2,232.85

Equipment Room

	Units	2012	2013	2014	2015
Access to common systems: Urban Area	RM/year	13,645.59	14,068.60	14,504.73	14,954.37
Access to common systems: Rural Area	RM/year	13,645.59	14,068.60	14,504.73	14,954.37
Access to common systems: Remote Area	RM/year	13,645.59	14,068.60	14,504.73	14,954.37
Common Power	RM/kWH	0.34	0.35	0.36	0.37

Source: Infrastructure Sharing Model, tilted annuity, Fixed provider, marginal cost

Including the common cost mark-up would add about 5% to the above prices.

The Access List also includes provision of access to in-building common antenna systems and physical access to central equipment room.

The SKMM has not attempted to calculate average costs for these items. The access to in-building common antenna systems and central equipment room depends on the specific arrangements in a building and may involve access charges by a building owner or non-price terms and conditions. These make site averages largely meaningless.

17.6 Regulation of Infrastructure Sharing Services

Infrastructure sharing refers to a variety of configurations, as described above, where the facilities owned or operated by one licensee are made available to other service providers. The primary situation, however, is the sharing of tower space for mobile antennas. Towers and their related systems may be provided by a network operator or by a tower company, primarily the latter.

The SKMM's cost models have estimated the average costs of providing infrastructure sharing services over a large population of facilities. The SKMM is confident that these average costs represent the true costs of provision. The SKMM recognizes, however, that the costs for a specific facility may vary widely from the average due to the height of the tower and local factors such as the terrain or access issues. In addition, tower costs are dependent on the height of the tower. Setting regulated prices at the average cost level (with suitable mark-ups), however, should recover the costs over the full population of facilities but would involve significant variation in net return on individual facilities.

The SKMM proposes to set regulated prices for infrastructure sharing facilities and services based on the average costs incurred by tower companies. These are well founded estimates of the average cost of provision of these services.

The proposed regulated prices are shown in the following table. For the avoidance of doubt, note that the standard configuration charge would be for 3 service antennas and hence 3 times the antenna costs shown in the table.

Table 115: Infrastructure Sharing Service Proposed Prices

Antenna Space

	Units	2013	2014	2015
Antenna Space: Urban Area	RM/year	2,387.35	2,300.47	2,213.59
Antenna Space: Rural Area	RM/year	4,774.70	4,600.94	4,427.19
Antenna Space: Remote Area	RM/year	5,286.28	5,093.90	4,901.53

Equipment Room

	Units	2013	2014	2015
Access to common systems: Urban Area	RM/year	21,516.68	22,183.70	22,871.40
Access to common systems: Rural Area	RM/year	21,516.68	22,183.70	22,871.40
Access to common systems: Remote Area	RM/year	21,516.68	22,183.70	22,871.40
Common Power	RM/kWH	0.43	0.44	0.46

Source: Table 111: Tower Companies: Infrastructure Sharing Calculated Prices

Question 31

The SKMM seeks comments on its proposed approach to infrastructure sharing services and whether these services should be subject to regulated prices.

17.7 Sensitivity analysis

This section provides some additional results from the model to demonstrate how the final calculated prices change with modifications to key parameters.

17.7.1 WACC value

The WACC value is a key parameter in determining the return on capital required for a suitable return to investors.

The following table shows the result for Infrastructure Sharing prices of adding 2 percentage points to the tower companies' WACC.

Table 116: Tower Companies: Infrastructure Sharing

Antenna Space

	Units	2012	2013	2014	2015
Antenna Space: Urban Area	RM/year	2,787.17	2,683.82	2,580.47	2,477.12
Antenna Space: Rural Area	RM/year	5,574.34	5,367.64	5,160.94	4,954.24
Antenna Space: Remote Area	RM/year	6,171.59	5,942.75	5,713.90	5,485.06

Equipment Room

	Units	2012	2013	2014	2015
Access to common systems: Urban Area	RM/year	20,869.72	21,516.68	22,183.70	22,871.40
Access to common systems: Rural Area	RM/year	20,869.72	21,516.68	22,183.70	22,871.40
Access to common systems: Remote Area	RM/year	20,869.72	21,516.68	22,183.70	22,871.40
Common Power	RM/kWH	0.42	0.43	0.44	0.46

Source: Infrastructure Sharing Model, straight-line depreciation, tower company provider, WACC=12.55%

The following table shows the calculated Infrastructure Sharing prices calculated for a mobile operator at marginal cost with a WACC of 11.86% (2 percentage points higher than standard).

Table 117: Mobile Operator: Infrastructure Sharing

Antenna Space

	Units	2012	2013	2014	2015
Antenna Space: Urban Area	RM/year	1,005.19	1,105.71	1,216.28	1,337.90
Antenna Space: Rural Area	RM/year	2,010.37	2,211.41	2,432.55	2,675.81
Antenna Space: Remote Area	RM/year	2,225.77	2,448.35	2,693.18	2,962.50

Equipment Room

	Units	2012	2013	2014	2015
Access to common systems: Urban Area	RM/year	13,645.59	14,068.60	14,504.73	14,954.37
Access to common systems: Rural Area	RM/year	13,645.59	14,068.60	14,504.73	14,954.37
Access to common systems: Remote Area	RM/year	13,645.59	14,068.60	14,504.73	14,954.37
Common Power	RM/kWH	0.33	0.34	0.35	0.36

Source: Infrastructure Sharing Model, tilted annuity, Mobile provider, marginal cost, WACC=11.86%

Including the common business cost mark-up would add about 2% to the above figures.

17.7.2 Sharing of infrastructure facilities

The Infrastructure cost model includes a parameter for the average number of service providers sharing a facility. This is only relevant for tower companies providing facilities. The default value is 3.4. The following table shows the calculated values if this number is reduced to 3 service providers only.

Table 118: Tower Companies: Infrastructure Sharing

Antenna Space

	Units	2012	2013	2014	2015
Antenna Space: Urban Area	RM/year	2,474.23	2,387.35	2,300.47	2,213.59
Antenna Space: Rural Area	RM/year	4,948.46	4,774.70	4,600.94	4,427.19
Antenna Space: Remote Area	RM/year	5,478.65	5,286.28	5,093.90	4,901.53

Equipment Room

	Units	2012	2013	2014	2015
Access to common systems: Urban Area	RM/year	23,652.35	24,385.58	25,141.53	25,920.92
Access to common systems: Rural Area	RM/year	23,652.35	24,385.58	25,141.53	25,920.92
Access to common systems: Remote Area	RM/year	23,652.35	24,385.58	25,141.53	25,920.92
Common Power	RM/kWH	0.42	0.43	0.44	0.46

Source: Infrastructure Sharing Model, straight-line depreciation, tower company provider, sharing=3

The result is to increase the operational costs – and hence the charges for access to common systems – by 13%.

17.7.3 Depreciation schedules

The Infrastructure cost model, like the other models, provides for 4 types of depreciation. For a tower company, the standard depreciation schedule is straight-line depreciation. The following tables show the results for tilted straight-line, annuity and tilted annuity calculations. Tilted annuity would provide values that more closely approximate economic depreciation of the asset base.

Table 119: Tower Companies: Infrastructure Sharing

Antenna Space

	Units	2012	2013	2014	2015
Antenna Space: Urban Area	RM/year	1,091.06	1,194.69	1,308.14	1,432.33
Antenna Space: Rural Area	RM/year	2,182.13	2,389.39	2,616.28	2,864.65
Antenna Space: Remote Area	RM/year	2,415.93	2,645.39	2,896.60	3,171.58

Equipment Room

	Units	2012	2013	2014	2015
Access to common systems: Urban Area	RM/year	20,869.72	21,516.68	22,183.70	22,871.40
Access to common systems: Rural Area	RM/year	20,869.72	21,516.68	22,183.70	22,871.40
Access to common systems: Remote Area	RM/year	20,869.72	21,516.68	22,183.70	22,871.40
Common Power	RM/kWH	0.42	0.43	0.44	0.46

Source: Infrastructure Sharing Model, tilted straight-line depreciation, tower company provider

Table 120: Tower Companies: Infrastructure Sharing

Antenna Space

	Units	2012	2013	2014	2015
Antenna Space: Urban Area	RM/year	2,007.70	2,007.70	2,007.70	2,007.70
Antenna Space: Rural Area	RM/year	4,015.40	4,015.40	4,015.40	4,015.40
Antenna Space: Remote Area	RM/year	4,445.62	4,445.62	4,445.62	4,445.62

Equipment Room

	Units	2012	2013	2014	2015
Access to common systems: Urban Area	RM/year	20,869.72	21,516.68	22,183.70	22,871.40
Access to common systems: Rural Area	RM/year	20,869.72	21,516.68	22,183.70	22,871.40
Access to common systems: Remote Area	RM/year	20,869.72	21,516.68	22,183.70	22,871.40
Common Power	RM/kWH	0.42	0.43	0.44	0.46

Source: Infrastructure Sharing Model, annuity, tower company provider

Table 121: Tower Companies: Infrastructure Sharing

Antenna Space

	Units	2012	2013	2014	2015
Antenna Space: Urban Area	RM/year	1,049.57	1,154.53	1,269.98	1,396.98
Antenna Space: Rural Area	RM/year	2,099.14	2,309.06	2,539.96	2,793.96
Antenna Space: Remote Area	RM/year	2,324.05	2,556.46	2,812.10	3,093.31

Equipment Room

	Units	2012	2013	2014	2015
Access to common systems: Urban Area	RM/year	20,869.72	21,516.68	22,183.70	22,871.40
Access to common systems: Rural Area	RM/year	20,869.72	21,516.68	22,183.70	22,871.40
Access to common systems: Remote Area	RM/year	20,869.72	21,516.68	22,183.70	22,871.40
Common Power	RM/kWH	0.42	0.43	0.44	0.46

Source: Infrastructure Sharing Model, tilted annuity, tower company provider

For a mobile provider, the standard depreciation schedule is tilted annuity. The following tables show the results for the other forms of depreciation calculation.

Table 122: Mobile Operator: Infrastructure Sharing

Antenna Space

	Units	2012	2013	2014	2015
Antenna Space: Urban Area	RM/year	2,011.14	1,942.13	1,873.12	1,804.12
Antenna Space: Rural Area	RM/year	4,022.27	3,884.26	3,746.24	3,608.23
Antenna Space: Remote Area	RM/year	4,453.23	4,300.43	4,147.63	3,994.83

Equipment Room

	Units	2012	2013	2014	2015
Access to common systems: Urban Area	RM/year	13,645.59	14,068.60	14,504.73	14,954.37
Access to common systems: Rural Area	RM/year	13,645.59	14,068.60	14,504.73	14,954.37
Access to common systems: Remote Area	RM/year	13,645.59	14,068.60	14,504.73	14,954.37
Common Power	RM/kWH	0.33	0.34	0.35	0.36

Source: Infrastructure Sharing Model, straight-line depreciation, Mobile provider

Table 123: Mobile Operator: Infrastructure Sharing

Antenna Space

	Units	2012	2013	2014	2015
Antenna Space: Urban Area	RM/year	826.25	910.08	1,002.41	1,104.10
Antenna Space: Rural Area	RM/year	1,652.50	1,820.15	2,004.81	2,208.20
Antenna Space: Remote Area	RM/year	1,829.55	2,015.17	2,219.61	2,444.79

Equipment Room

	Units	2012	2013	2014	2015
Access to common systems: Urban Area	RM/year	13,645.59	14,068.60	14,504.73	14,954.37
Access to common systems: Rural Area	RM/year	13,645.59	14,068.60	14,504.73	14,954.37
Access to common systems: Remote Area	RM/year	13,645.59	14,068.60	14,504.73	14,954.37
Common Power	RM/kWH	0.33	0.34	0.35	0.36

Source: Infrastructure Sharing Model, tilted straight-line depreciation, Mobile provider

Table 124: Mobile Operator: Infrastructure Sharing

Antenna Space

	Units	2012	2013	2014	2015
Antenna Space: Urban Area	RM/year	1,628.54	1,628.54	1,628.54	1,628.54
Antenna Space: Rural Area	RM/year	3,257.09	3,257.09	3,257.09	3,257.09
Antenna Space: Remote Area	RM/year	3,606.06	3,606.06	3,606.06	3,606.06

Equipment Room

	Units	2012	2013	2014	2015
Access to common systems: Urban Area	RM/year	13,645.59	14,068.60	14,504.73	14,954.37
Access to common systems: Rural Area	RM/year	13,645.59	14,068.60	14,504.73	14,954.37
Access to common systems: Remote Area	RM/year	13,645.59	14,068.60	14,504.73	14,954.37
Common Power	RM/kWH	0.33	0.34	0.35	0.36

Source: Infrastructure Sharing Model, annuity, Mobile provider

18 Co-location Services

18.1 Services and options

Co-location services are the provision of space and facilities by one operator for another to place equipment. Physical co-location is when physical space is provided by the access provider. The costs can include site preparation and the provision of space.

The SKMM received data responses from a variety of licensees on network co-location. As described in section 16.2.2, this has permitted the SKMM to build a dataset of the average cost per square metre of co-location space. The data did not show any appreciable cost differences between urban, rural or remote areas but the SKMM recognizes that there may be cost differences that are not discernible in the data. See section 18.2.2 for further discussion of this point.

Power costs may also be charged by an access provider. These costs are calculated from a standard power tariff.

In addition to physical co-location, the Access List also includes virtual co-location, where an access provider also provides functional equipment to an access seeker. The SKMM has not attempted to provide average costs for this configuration, as the costs critically depend on the equipment provided and average costs would be essentially meaningless.

The Access List also includes co-location in roadside cabinets. There was no data available on the cost of this service and it is likely that it has been rarely used, if at all. It would be potentially important if an alternative VDSL provider were seeking to gain access to Telekom Malaysia's copper loop. However, with the rollout of the HSBB in high density areas, this is an unlikely scenario. The SKMM has not attempted to cost this configuration.

It should also be noted that an operator seeking access to a submarine cable landing station may also be required to pay co-location charges. The costs are equivalent to those for physical co-location.

18.2 Proposed regulated prices

18.2.1 Calculated prices based on cost

The Co-location cost model can calculate prices for either a mobile network operator or a fixed network operator as the access provider. In each case, the marginal cost of provision is appropriate. The following tables show the calculated prices for a mobile network operator and a fixed network operator.

The site preparation prices are the same for both operators but the fixed co-location space is approximately 5% cheaper than the mobile co-location space.

Table 125: Mobile Operator: Co-location Service Calculated Prices

Physical Co-Location

	Units	2012	2013	2014	2015
Site Preparation: Urban Area	RM	27.15	30.71	34.75	39.31
Site Preparation: Rural Area	RM	27.15	30.71	34.75	39.31
Site Preparation: Remote Area	RM	27.15	30.71	34.75	39.31
Space (inc. services): Urban Area	RM/sqrm/year	188.41	201.92	216.73	233.00
Space (inc. services): Rural Area	RM/sqrm/year	188.41	201.92	216.73	233.00
Space (inc. services): Remote Area	RM/sqrm/year	188.41	201.92	216.73	233.00

Power

	Units	2012	2013	2014	2015
Common Power	RM/kWH	0.33	0.34	0.35	0.36

Source: Co-location Model, tilted annuity, Mobile provider, marginal cost

Table 126: Fixed Operator: Co-location Service Calculated Prices

Physical Co-Location

	Units	2012	2013	2014	2015
Site Preparation: Urban Area	RM	27.15	30.71	34.75	39.31
Site Preparation: Rural Area	RM	27.15	30.71	34.75	39.31
Site Preparation: Remote Area	RM	27.15	30.71	34.75	39.31
Space (inc. services): Urban Area	RM/sqrm/year	178.62	191.72	206.11	221.94
Space (inc. services): Rural Area	RM/sqrm/year	178.62	191.72	206.11	221.94
Space (inc. services): Remote Area	RM/sqrm/year	178.62	191.72	206.11	221.94

Power

	Units	2012	2013	2014	2015
Common Power	RM/kWH	0.34	0.35	0.36	0.37

Source: Co-location Model, tilted annuity, Fixed provider, marginal cost

18.2.2 Proposed regulated prices

Given the variety of configurations for network co-location, it would be inappropriate and unwieldy for the SKMM to set regulated prices for all possibilities. The SKMM has, however, established through its cost models appropriate prices for the physical co-location space (including common services but excluding power costs) provided by one service provider to another service provider. The price is based on the marginal cost of providing the space.

Given that the Mobile provider prices are higher than the Fixed provider prices, the SKMM proposes to set the maximum regulated prices for physical co-location provided by a service provider based on the Mobile results. The SKMM does not propose to set regulated prices for other network co-location options such as virtual co-location or co-location in roadside cabinets. By setting the prices in this way, the SKMM will encourage physical co-location where it is appropriate and provide incentives for operators to make suitable spare space available.

The proposed regulated prices for physical co-location space at switching sites, submarine cable landing centres, earth stations and exchange buildings are shown in the following table.

Table 127: Physical Co-location Space from a Network Service Provider

Physical Co-Location

	Units	2013	2014	2015
Site Preparation: Urban Area	RM	30.71	34.75	39.31
Site Preparation: Rural Area	RM	30.71	34.75	39.31
Site Preparation: Remote Area	RM	30.71	34.75	39.31
Space (inc. services): Urban Area	RM/sqrm/year	201.92	216.73	233.00
Space (inc. services): Rural Area	RM/sqrm/year	201.92	216.73	233.00
Space (inc. services): Remote Area	RM/sqrm/year	201.92	216.73	233.00

Power costs are additional to the above.

Source: Table 125

Question 32

The SKMM seeks comments on its proposed approach to regulating prices for Co-location Service and on the appropriateness of the proposed prices.

The Co-location Service prices proposed above do not differentiate between Urban, Rural and Remote areas. The SKMM had no data that showed appreciable cost differences between these areas. However, the SKMM recognizes that there may be cost differences on average between areas, especially for Remote areas. The SKMM therefore specifically seeks views on whether costs should be set with a regulatory gradient to provide higher prices in Remote areas.

To set different Co-location Service prices for each area, the SKMM could use the cost differentials seen in the Infrastructure Sharing prices (e.g. in Table 113: Mobile Operator: Infrastructure Sharing Calculated Prices). This would mean, for example, that the regulated price for Co-location Service in Rural areas would be double the price for Urban areas.

Question 33

The SKMM seeks comments on whether there should be separate prices for Co-location Service in Urban, Rural and Remote areas and, if so, the basis on which the prices should be set.

18.3 Sensitivity analysis

This section provides some additional results from the model to demonstrate how the final calculated prices change with modifications to key parameters.

18.3.1 WACC value

The WACC value is a key parameter in determining the return on capital required for a suitable return to investors.

The following table shows the result for Co-location prices of adding 2 percentage points to the Mobile WACC.

Table 128: Mobile Operator: Co-location Service

Physical Co-Location

	Units	2012	2013	2014	2015
Site Preparation: Urban Area	RM	27.15	30.71	34.75	39.31
Site Preparation: Rural Area	RM	27.15	30.71	34.75	39.31
Site Preparation: Remote Area	RM	27.15	30.71	34.75	39.31
Space (inc. services): Urban Area	RM/sqrm/year	209.08	223.45	239.15	256.36
Space (inc. services): Rural Area	RM/sqrm/year	209.08	223.45	239.15	256.36
Space (inc. services): Remote Area	RM/sqrm/year	209.08	223.45	239.15	256.36

Power

	Units	2012	2013	2014	2015
Common Power	RM/kWH	0.33	0.34	0.35	0.36

Source: Co-location Model, tilted annuity, Mobile provider, marginal cost, WACC=11.86%

The following table shows the result for Co-location prices of adding 2 percentage points to the Fixed WACC.

Table 129: Fixed Operator: Co-location Service

Physical Co-Location

	Units	2012	2013	2014	2015
Site Preparation: Urban Area	RM	27.15	30.71	34.75	39.31
Site Preparation: Rural Area	RM	27.15	30.71	34.75	39.31
Site Preparation: Remote Area	RM	27.15	30.71	34.75	39.31
Space (inc. services): Urban Area	RM/sqrm/year	198.55	212.48	227.73	244.46
Space (inc. services): Rural Area	RM/sqrm/year	198.55	212.48	227.73	244.46
Space (inc. services): Remote Area	RM/sqrm/year	198.55	212.48	227.73	244.46

Power

	Units	2012	2013	2014	2015
Common Power	RM/kWH	0.34	0.35	0.36	0.37

Source: Co-location Model, tilted annuity, Fixed provider, marginal cost, WACC=10.86%

18.3.2 Depreciation schedules

The default depreciation schedule for both Mobile and Fixed network providers is tilted annuity, in line with the costing of other services. The Co-location model also provides other depreciation options.

The following tables show the calculated prices for a Mobile provider assuming straight-line, tilted straight-line and annuity depreciation schedules. Power costs are not shown because they do not vary with depreciation type.

Table 130: Mobile Operator: Co-location Service

Physical Co-Location

	Units	2012	2013	2014	2015
Site Preparation: Urban Area	RM	27.15	30.71	34.75	39.31
Site Preparation: Rural Area	RM	27.15	30.71	34.75	39.31
Site Preparation: Remote Area	RM	27.15	30.71	34.75	39.31
Space (inc. services): Urban Area	RM/sqrm/year	261.59	263.11	265.71	269.55
Space (inc. services): Rural Area	RM/sqrm/year	261.59	263.11	265.71	269.55
Space (inc. services): Remote Area	RM/sqrm/year	261.59	263.11	265.71	269.55

Source: Co-location Model, straight-line depreciation, Mobile provider, marginal cost

Table 131: Mobile Operator: Co-location Service

Physical Co-Location

	Units	2012	2013	2014	2015
Site Preparation: Urban Area	RM	27.15	30.71	34.75	39.31
Site Preparation: Rural Area	RM	27.15	30.71	34.75	39.31
Site Preparation: Remote Area	RM	27.15	30.71	34.75	39.31
Space (inc. services): Urban Area	RM/sqrm/year	216.14	226.52	237.90	250.42
Space (inc. services): Rural Area	RM/sqrm/year	216.14	226.52	237.90	250.42
Space (inc. services): Remote Area	RM/sqrm/year	216.14	226.52	237.90	250.42

Source: Co-location Model, tilted straight-line depreciation, Mobile provider, marginal cost

Table 132: Mobile Operator: Co-location Service

Physical Co-Location

	Units	2012	2013	2014	2015
Site Preparation: Urban Area	RM	27.15	30.71	34.75	39.31
Site Preparation: Rural Area	RM	27.15	30.71	34.75	39.31
Site Preparation: Remote Area	RM	27.15	30.71	34.75	39.31
Space (inc. services): Urban Area	RM/sqrm/year	223.88	232.19	241.60	252.24
Space (inc. services): Rural Area	RM/sqrm/year	223.88	232.19	241.60	252.24
Space (inc. services): Remote Area	RM/sqrm/year	223.88	232.19	241.60	252.24

Source: Co-location Model, annuity, Mobile provider, marginal cost

The following tables show the calculated prices for a Fixed provider assuming straight-line, tilted straight-line and annuity depreciation schedules. Power costs are not shown because they do not vary with depreciation type.

Table 133: Fixed Operator: Co-location Service

Physical Co-Location

	Units	2012	2013	2014	2015
Site Preparation: Urban Area	RM	27.15	30.71	34.75	39.31
Site Preparation: Rural Area	RM	27.15	30.71	34.75	39.31
Site Preparation: Remote Area	RM	27.15	30.71	34.75	39.31
Space (inc. services): Urban Area	RM/sqrm/year	248.46	250.67	253.96	258.49
Space (inc. services): Rural Area	RM/sqrm/year	248.46	250.67	253.96	258.49
Space (inc. services): Remote Area	RM/sqrm/year	248.46	250.67	253.96	258.49

Source: Co-location Model, straight-line depreciation, Fixed provider, marginal cost

Table 134: Fixed Operator: Co-location Service

Physical Co-Location

	Units	2012	2013	2014	2015
Site Preparation: Urban Area	RM	27.15	30.71	34.75	39.31
Site Preparation: Rural Area	RM	27.15	30.71	34.75	39.31
Site Preparation: Remote Area	RM	27.15	30.71	34.75	39.31
Space (inc. services): Urban Area	RM/sqrm/year	202.46	213.03	224.63	237.41
Space (inc. services): Rural Area	RM/sqrm/year	202.46	213.03	224.63	237.41
Space (inc. services): Remote Area	RM/sqrm/year	202.46	213.03	224.63	237.41

Source: Co-location Model, tilted straight-line depreciation, Fixed provider, marginal cost

Table 135: Fixed Operator: Co-location Service

Physical Co-Location

	Units	2012	2013	2014	2015
Site Preparation: Urban Area	RM	27.15	30.71	34.75	39.31
Site Preparation: Rural Area	RM	27.15	30.71	34.75	39.31
Site Preparation: Remote Area	RM	27.15	30.71	34.75	39.31
Space (inc. services): Urban Area	RM/sqrm/year	212.98	221.30	230.71	241.35
Space (inc. services): Rural Area	RM/sqrm/year	212.98	221.30	230.71	241.35
Space (inc. services): Remote Area	RM/sqrm/year	212.98	221.30	230.71	241.35

Source: Co-location Model, annuity, Fixed provider, marginal cost

ANNEXURE 1: PRE-INQUIRY CONSULTATIONS AND RESPONSES RECEIVED

A. Responses to the SKMM's data requests were received from the following stakeholders:

- Celcom Axiata Bhd
- Celcom Timur (Sabah) Sdn Bhd
- DiGi Telecommunications Sdn Bhd
- Fiberail Sdn Bhd
- Fibrecomm Network (M) Sdn Bhd
- Jaring Communications Sdn Bhd
- Maxis Bhd
- Packet One Networks (Malaysia) Sdn Bhd
- Telekom Malaysia Bhd
- TIME dotcom Bhd
- U Mobile Sdn Bhd
- YTL Communications Sdn Bhd

And from the following Tower Companies:

- Common Tower Technologies Sdn Bhd
- Desabina Industries Sdn Bhd
- D'Harmoni Telco Infra Sdn Bhd
- Infra Quest Sdn Bhd
- Konsortium Jaringan Selangor Sdn Bhd
- Melaka ICT Holdings Sdn Bhd
- PDC Telecommunication Services Sdn Bhd
- Perlis Comm Sdn Bhd
- Perak Integrated Network Services Sdn Bhd
- Rangkaian Minang Sdn Bhd
- Sacofa Sdn Bhd
- Yiked Bina Sdn Bhd

B: Responses to the initial model viewing period were received from the following stakeholders:

- Celcom Axiata Bhd
- DiGi Telecommunications Sdn Bhd
- Fiberail Sdn Bhd
- Fibrecomm Network (M) Sdn Bhd
- Jaring Communications Sdn Bhd
- Maxis Bhd
- Packet One Networks (Malaysia) Sdn Bhd
- Persatuan Penyedia Infrastruktur Telekomunikasi Malaysia (PPIT) on behalf of the tower companies as a whole
- Sacofa Sdn Bhd
- Telekom Malaysia Bhd
- TIME dotcom Bhd
- U Mobile Sdn Bhd
- YTL Communications Sdn Bhd

C: Individual, confidential meetings were held with the following stakeholders:

- Celcom Axiata Bhd
- Celcom Timur (Sabah) Sdn Bhd
- DiGi Telecommunications Sdn Bhd
- Fiberail and Fibrecomm together
- Fibrecomm Network (M) Sdn Bhd
- Jaring Communications Sdn Bhd
- Maxis Bhd
- Packet One Networks (Malaysia) Sdn Bhd
- Persatuan Penyedia Infrastruktur Telekomunikasi Malaysia (PPIT)
- PPIT and the tower companies as a group
- Telekom Malaysia Bhd
- TIME dotcom Bhd
- U Mobile Sdn Bhd
- YTL Communications Sdn Bhd