

A Study of Wholesale Costing Methodologies in Selected Countries

October 2, 2012

**Prepared for the
Canadian Radio-television and Telecommunications
Commission ("CRTC")**

Wall Communications Inc.

NOTE: *the views expressed in this document are solely those of Wall Communications Inc. and do not necessarily represent the views of the Canadian Radio-television and Telecommunications Commission.*

TABLE OF CONTENTS

1.0	INTRODUCTION.....	1
2.0	METHODOLOGY.....	2
3.0	OVERVIEW OF WHOLESALE COSTING APPROACHES BY COUNTRY	4
3.1	AUSTRALIA.....	4
	Background.....	4
	Definitions.....	5
	Costing Approaches.....	6
	Summary.....	13
3.2	EUROPEAN UNION MEMBER COUNTRIES.....	14
	Background.....	14
	The EC's Access Directive.....	15
	The EC's Interconnection Recommendation.....	16
	The EC's Next Generation Access Recommendation.....	16
	EC Review of Costing Methodologies.....	20
	Summary.....	21
3.3	THE UNITED KINGDOM.....	22
	Background.....	22
	Access Costing Methodology.....	24
	Interconnection Costing Methodology.....	27
	Support Structure Costing Methodology.....	29
	Summary.....	30
3.4	FRANCE.....	32
	Background.....	32
	Access Costing Methodology.....	32
	Interconnection Costing Methodology.....	35
	Support Structure Costing Methodology.....	36
	Summary.....	36
3.5	GERMANY.....	37
	Background.....	37
	Access & Interconnection Costing Approach.....	37
	Support Structures.....	40
	Summary.....	40
3.6	SWEDEN.....	41
	Background.....	41
	Costing Approaches.....	42
	Wholesale Access.....	44
	Interconnection.....	45
	Support Structures.....	46
	Summary.....	46
3.6	THE UNITED STATES.....	48
	Background.....	48
	Costing Methodology.....	49
	Support Structures.....	51
	Summary.....	52

4.0	COMPARATIVE ANALYSIS	54
	Wholesale Access Services	55
	Interconnection Services	60
	Support Structure Services	62
	Summary	65
	ACRONYM LIST	66

1.0 INTRODUCTION

Costing methodologies perform a critical function in ensuring that mandated wholesale service rates are just and reasonable, and are thereby integral to developing and sustaining a competitive retail marketplace. As technologies and markets advance, the costing tools used by regulators need to be periodically examined and, if necessary, updated to ensure wholesale service rates continue to be just and reasonable as required by the *Telecommunications Act*.

The Phase II costing methodology relied on by the Canadian Radio-television and Telecommunications Commission (the Commission or CRTC) has been in place for over 30 years.¹ When first introduced the Phase II costing was used for determining the appropriate rates for regulated retail services offered by the incumbent local exchange carriers (ILECs). In this respect, Phase II costing procedures were originally designed to estimate (over a multi-year period) future revenue and cost streams associated with the introduction of a new service. As such, Phase II costs are forward looking and are not intended to include fixed common costs. The Phase II costing methodology has been modified from time to time since first introduced (including recently in 2008).²

In recent years, many of the ILECs retail services have been forborne from regulation; consequently, many retail rates are no longer regulated by the CRTC. At the same time, however, the importance of mandated wholesale services has become an essential part of ensuring a competitive telecommunications services market, and the Phase II costing methodology is now applied by the Commission largely to mandated wholesale rather than retail services. As well the scope and complexity of mandated wholesale services has increased in that such services now include ILEC as well as cable company provisioned wholesale services. It should also be noted that the complexity of networks has increased as networks are no longer single purpose, but multi-purpose and are also transitioning from copper to fibre.

As a result of market and technological changes, it is increasingly difficult to assess and compare costing information for mandated wholesale services to ensure that their rates are just and reasonable.

This issue of course is not unique to Canada. Regulators in foreign jurisdictions are struggling with similar issues relating to the costing and pricing of mandated wholesale services. The objective of this study, therefore, is to review the costing approaches used in a sample of relevant foreign jurisdictions in order to

¹ First set out in Telecom Decision CRTC 79-16, *Inquiry into Telecommunications Carriers' Costing and Accounting Procedures – Phase II: Information Requirements for New Service Tariff Filings*, 28 August 1979.

² Telecom Decision CRTC 2008-14: *Review of Certain Phase II Costing Issues*, 21 February 2008.

better understand best practices adopted worldwide, including whether there are different approaches for traditional services versus newer services/technologies. The specific countries covered in the study are Australia, France, Germany, Sweden, the United Kingdom (UK) and the United States (US).

2.0 METHODOLOGY

The approach we have taken in this study is to review and summarize the costing approaches that regulators in the above-noted countries have followed to set rates for select mandated wholesale services. In this respect, we have relied largely on various regulatory decisions in each of the specified countries, supplemented by other materials (such as the European Commission consultation filings and documents) as well as communications (email or telephone) with appropriate regulatory authorities in various countries.

The wholesale services categories considered for each specified country, as applicable, include:

- 1) local access
- 2) interconnection
- 3) support structures

As a general point, we would note that while access and interconnection share certain commonalities, they are different from a regulatory perspective.

From a regulatory standpoint, the term interconnection is probably defined in every country in the world, and there are no significant differences among existing definitions. For higher accuracy, though, it is important to distinguish between interconnection among networks and access to a network. From the regulatory point of view, interconnection and access serve different purposes and therefore require different regulatory approaches. The purpose of interconnection is to ensure end-to-end service connectivity and to enable end user customers of interconnected operators to establish communications with each other. Access, on the other hand, enables an operator to utilize the facilities of another operator in order to further its own business plans and provide its service to customers.³

Further, there is widespread recognition that interconnection (and access) will pose different problems when considering a traditional Public Switched Telephone Network (PSTN) versus a Next Generation Network (NGN). That is, it may be preferable to adopt different costing approaches for traditional services versus newer services/technologies. Some of the issues related to utilizing

³ See the ITU, http://www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR09/doc/GSR09_IP-interconnection-Gelvanovska-Alden.pdf.

traditional networks versus NGNs were recently considered by the Commission.⁴ In particular, the substantially different cost implications of building, operating and interconnecting IP networks versus traditional PSTN was explored (although it was recognized that IP interconnection is not yet prevalent in the industry).

The country-specific reviews provided in the following sections include a description of the actual costing practice (including exact formulas and definitions if available), the underlying rationale for adopting the approach (including both theoretical and practical considerations), the date the approach was adopted and any updates or reviews that have been conducted, and pricing examples where appropriate and available (e.g., wholesale service prices in expressed local currency and also converted to Canadian dollars).⁵

In order to address the concern with traditional versus emerging technologies/services and the costing approaches employed, each service will be examined to identify if technologically-distinct services receive distinct costing treatments. For example, where available, we have noted any differences in the costing treatment of a copper-based and fibre-based access services.

As well, each wholesale service category can be sub-divided into smaller sub-categories. For example, access services can be provided over copper, fibre, coax or other types of facilities. Support structures may include poles, ducts and other structures. Interconnection services may include switched interconnection (origination, termination, transit, international traffic exchange, etc.), unbundled network components (copper, fibre and coax access plus transport) and IP interconnection (different types of peering and interconnection of different vendor technologies or network interface facilities). We have typically examined one sub-category in each service category, recognizing that sub-category services are often subject to similar regulatory cost treatments but may in some instances differ.

Given the scope of this study, we have focused primarily on unbundled local loops, call origination/termination services and, in the case of support structures, access to poles and/or ducts. In addition, we have noted where regulators require the provision of wholesale broadband or bitstream services as well.

Lastly, we note that we have focused on access obligations placed on incumbent telecommunications carriers rather than cable companies. In the surveyed countries, regulators have not imposed access obligations on cable companies since their network coverage is generally limited relative to the incumbent telecommunications carriers.

⁴ Telecom Regulatory Policy CRTC 2012-24, *Network interconnection for voice services*, 19 January 2012.

⁵ All currency conversions have been made using current exchange rates (using www.xe.com). Note that, unless indicated otherwise, all dollar (\$) amounts are in Canadian dollars.

3.0 OVERVIEW OF WHOLESALE COSTING APPROACHES BY COUNTRY

3.1 AUSTRALIA

Background

The Australian Competition and Consumer Commission (ACCC) is responsible for the economic regulation of the communications sector in Australia,⁶ including regulating access to essential telecommunications infrastructure which is presently mainly supplied by Telstra (Australia's dominant incumbent local exchange carrier) via its fixed line network.

In the near future, wholesale infrastructure services will be supplied through the National Broadband Network (or NBN Co), which was recently established when Telstra's Structural Separation Undertaking and Migration Plan was accepted by the ACCC.⁷ NBN Co will deploy a national fibre-to-the-home (FTTH) and broadband wireless/satellite network over the course of the coming years which will be operated on a wholesale-only, open access basis, subject to ACCC oversight. The full structural separation of Telstra and NBN Co is to be completed by 2018. During the transition period, Telstra will implement measures that provide equivalence and transparency in the supply of regulated fixed network services to its wholesale customers (effectively, representing a form functional separation of its retail and wholesale operations).

Under the Australian Competition and Consumer Act, ACCC has the authority to issue "access determinations" (or "declarations") and set wholesale service price ceilings and non-price terms of service for "declared" services.

In mid 2011, the ACCC issued a final access determination (FAD) covering the following services (ACCC's 2011 FAD Decision):⁸

- unconditioned local loop service (ULLS)
- wholesale line rental (WLR)
- line sharing services (LSS)
- public switched telephone network originating and terminating access (PSTN OTA)
- local carriage service (LCS).

⁶ <http://www.accc.gov.au/content/index.phtml/itemId/3881>.

⁷ Telstra's Structural Separation Undertaking and Migration Plan came into force on 6 March 2012 and 7 March 2012 respectively.

⁸ ACCC, *Inquiry to make final access determinations for the declared fixed line services, Final Report*, July 2011. See: <http://www.accc.gov.au/content/index.phtml/itemId/1044279>.

The ACCC's 2011 FAD Decision also sets out prices for the above-noted services, including a newly adopted costing methodology used for this purpose.

The ACCC is also in the process finalizing access determinations for wholesale ADSL service (including access and transport)⁹ and local bitstream access service (LBAS) over the NBN Co's fibre access network.¹⁰ The pricing methodologies for these wholesale services are under review by the ACCC at this time.

Support structures (e.g., poles and ducts) are considered "facilities" under Australian legislation and, therefore, are subject to an access dispute arbitration process rather than *ex ante* price regulation. The ACCC is responsible for addressing any access disputes that may arise in such instances.

Definitions

To help with the discussion that follows, definitions of each of the above-noted wholesale services are provided:¹¹

- **ULLS** provides access to unconditioned cable, usually a copper wire pair, between an end-user and a telephone exchange and allows the access seeker to use its own equipment in an exchange to provide a range of services, including traditional voice services and high speed internet access. ULLS has been a declared (or mandated) service since 1999.
- **WLR** allows access seekers to resell the basic line rental service which allows an end-user to connect to the traditional voice network. WLR has been a declared service since 2006.
- **LSS** allows two separate carriers provide separate services over a single "shared" copper line so that one provides the voice services over the line and the other provides high speed internet services, through the use of its own DSL technology over the higher frequency part of the copper line. LSS has been a declared service since 2002.
- **PSTN OTA** provides carriage of telephone calls from the calling party to a point of interconnection (POI) within an access seeker's network and the carriage of telephone calls from a POI within an access seeker's network to the party receiving the call allowing for the carriage of national long-

⁹ ACCC, *Public inquiry to make a final access determination for the wholesale ADSL service Issues Paper* (a Second Discussion Paper), July 2012.

¹⁰ ACCC, *Local bitstream access service - interim access determination and proposal for the final access determination*, July 2012. A detailed description of the service as provided through NBN Co and other service providers is provided in ACCC, *Layer 2 bitstream service declaration*, Final Report, February 2012.

¹¹ Additional service definitional information is available in the ACCC's 2011 FAD Decision.

distance calls, international calls, mobile phone to fixed network calls, fixed network to mobile network calls, and local calls. PSTN OTA has been a declared service since 1997.

- **LCS** provides end-to-end voice grade carriage service between two points within a standard zone allowing access seekers to resell local calls to end-users without the need for deploying substantial alternative infrastructure. Commercially, LCS is generally sold with the WLR. LCS has been a declared service since 1999.
- **Wholesale ADSL** is an internet-grade, best efforts point to point service for the carriage of communications in digital form between a point of interconnection and an end-user network boundary that (a) is supplied by means of ADSL technology over a twisted metallic pair that runs from the end-user network boundary to the nearest upstream exchange or remote integrated multiplexer; and (b) uses a static layer 2 tunneling protocol over a transport layer to aggregate communications to the point of interconnection. Wholesale ADSL has been a declared service since February 2012; however, the ACCC's FAD for the service is pending (which includes pricing terms and methodology).
- **Local Bitstream Access Service (LBAS)** is a point to point service for the carriage of communications in digital form between a network-network interface and a user-network interface supplied using a designated superfast telecommunications network (i.e., fibre network facilities provided by NBN Co) that is (a) a Layer 2 bitstream service; and (b) a superfast carriage service. LBAS has been a declared service since February 2012; however, the ACCC's FAD for the service is pending (which includes pricing terms and methodology).

Costing Approaches

The ACCC issued initial guidelines on wholesale access pricing principles in 1997.¹² It adopted the following broad pricing principles – i.e., that wholesale access prices should:

- be based on the cost of providing the service;
- not discriminate in a way which reduces efficient competition;
- not be inflated to reduce competition in dependent markets; and
- not be predatory.

While recognizing that a variety of costing approaches could be followed, at the time, the ACCC determined that wholesale service prices should, in general, be based on total service long-run incremental costs (TSLRIC).

¹² ACCC, *Access Pricing Principles— Telecommunications: A Guide*, 1997.

As summarized by the ACCC:

TSLRIC is the incremental or additional costs the firm incurs in the long term in providing the service, assuming all of its other production activities remain unchanged. It is the cost the firm would avoid in the long term if it ceased to provide the service. As such, TSLRIC represents the costs the firm necessarily incurs in providing the service and captures the value of society's resources used in its production.

TSLRIC consists of the operating and maintenance costs the firm incurs in providing the service, as well as a normal commercial return on capital. TSLRIC also includes common costs that are causally related to the access service....

TSLRIC is based on forward-looking costs. These are the ongoing costs of providing the service in the future using the most efficient means possible and commercially available. In practice this often means basing costs on the best-in-use technology and production practices and valuing inputs using current prices.

An access price based on TSLRIC is consistent with the price that would prevail if the access provider faced effective competition, and usually best promotes the long-term interests of end-users.¹³ (footnotes excluded)

Further, the ACCC also concluded that it would be appropriate to include a contribution to or mark-up for the recovery of common costs – consequently, the ACCC's adopted costing methodology can more correctly be defined as a TSLRIC+ approach.¹⁴

The ACCC also indicated at the time that while it did not consider it appropriate to specify a specific costing methodology for all declared wholesale services, it planned to do in cases where:

- i) the declared service is well developed,
- ii) it was necessary for competition in dependent markets, and
- iii) where the forces of competition or the threat of competition worked poorly in constraining prices to efficient levels.¹⁵

¹³ Ibid, page 28.

¹⁴ Ibid, page 39.

¹⁵ Ibid, page 35.

The ACCC has also used a "retail minus retail costs" (RMRC) approach for pricing some declared services in the past (e.g., WLR and LCS).¹⁶ RMRC is a "top-down" approach which takes the retail price for declared services and deducts the avoidable costs of retailing the service to end-users to calculate an access price. A cost-based approach (such as TSLRIC+) in comparison, is a "bottom-up" approach that models the costs of the various network elements necessary for use in the service (and includes a contribution to common costs). Where the retail service and wholesale service are the same product, and where retail prices are strictly cost-based, the two pricing approaches should lead to (approximately) the same access price. However, the ACCC recognized that the approaches will more often lead to divergent prices.¹⁷

In 2009, the ACCC initiated a review of its wholesale service pricing approaches, especially given that it had recognized for some time that that using a forward looking TSLRIC+ approach with revaluation at every regulatory reset may not be appropriate given the enduring bottleneck nature of fixed services. The ACCC indicated at the time that it was open to considering other pricing approaches, including the possibility of "locking in" some of the inputs for the cost estimates of certain services (e.g., the value of the assets used to provide the services as a "regulated asset base").¹⁸

The ACCC issued a draft report in 2010 on the results of its review of the 1997 pricing principles for wholesale fixed line services. In the report, the ACCC provided several arguments against the continued use of the forward looking TSLRIC+ approach, including:¹⁹

- The continual revaluation of network assets meant that there was ongoing uncertainty over the level of access prices and, as a result, increased the risk of over- or under-recovery of costs by the access provider.

¹⁶ ACCC, *Pricing principles and indicative prices Local carriage service, wholesale line rental and PSTN originating and terminating access services*, Final Determination and Explanatory Statement, 29 November 2006.

¹⁷ ACCC noted for instance that (i) If retail prices are held below costs (which may be the case due to the government's retail price control regime), a RMRC approach will lead to lower access prices than a cost-based approach. And (ii) If retail prices are above total (wholesale + retail) costs, then the access seeker is making some level of economic profits. A RMRC price will be higher than cost-based prices because it will reflect this level of economic profit. The access provider would accordingly retain these profits from the RMRC price at the expense of access seekers and/or access seekers' end-user customers. A cost-based approach would not preserve this profit. Consequently, the ACCC noted that the relative levels of price and cost is clearly a crucial factor in determining whether a RMRC or cost-based pricing approach is most appropriate under the reasonableness criteria.

¹⁸ ACCC, *Pricing principles and indicative prices for LCS, WLR, PSTN OTA, ULLS, LSS*, December 2009.

¹⁹ ACCC, *Review of the 1997 telecommunications access pricing principles for fixed line services*, Draft Report, September 2010, page 15-16.

- Given that existing assets were revalued at optimized replacement cost, the current implementation of TSLRIC+ may have resulted in past depreciation of existing asset values not being taken into account in the revaluation of network assets in each regulatory period, which may have resulted in over-recovery of costs by the access provider.
- Calculating forward looking costs involves estimating the cost of providing the relevant service using modern equivalent assets (MEA); however, there is considerable debate regarding what constitutes a MEA.
- Given that the cost of "bypassing" the access provider's fixed network has been rising, rather than falling, the likelihood of investment by the access seeker in its own fixed network has fallen – consequently, Telstra's copper customer access network appears to display enduring bottleneck characteristics, rather than being a network likely to be bypassed through technological and market developments.

In addition, the ACCC noted that it had historically adopted a "scorched node" approach in modeling the cost of a replacement network, whereas a fully optimized TSLRIC+ model should be based on a "scorched earth" approach under which all network elements would be subject to most efficient/best practice analysis. This latter approach would produce a lower estimate of TSLRIC+ by removing all inefficiencies resulting from the historical development of the network. According to the ACCC, using the scorched node approach is therefore likely to have generated higher estimates of TSLRIC+, and thus higher access prices, compared to the optimal approach.²⁰

In its 2010 draft report, the ACCC indicated a consensus had been reached among industry participants that a "Building Block Model" (BBM) approach should replace TSLRIC+ as the pricing approach for telecommunications services. The ACCC noted that the BBM approach is an established costing approach used to determine the revenue required by regulated businesses and has been widely adopted by Australian regulators in other sectors. The main difference between the BBM and TSLRIC+ is that under the BBM asset values are "locked-in" using an initial "regulatory asset base" (RAB) as the basis for setting prices.

According to the ACCC, an advantage of the BBM is that it allows the access provider to recover its efficiently incurred actual costs as well as a reasonable rate of return on, and a return of, its investments in existing sunk assets.

²⁰ Ibid., page 16.

Summary of the ACCC's BBM Costing Approach²¹

According to the ACCC, by locking-in a value for the RAB, the BBM costing approach improves certainty for both the access provider and access seekers. It enables them to make efficient decisions regarding their future investment patterns and general business plans, thereby promoting economically efficient investment in infrastructure. Locking-in the value of the RAB promotes predictable revenue and price paths and minimizes the prospect of windfall gains or losses. It reduces the risk that efficient expenditure will not be recovered, which will in turn promote efficient investment in infrastructure and promote competitive entry and competition in the relevant markets.

The ACCC considers that the BBM pricing approach meets the objective of ensuring that the access provider is adequately compensated for its costs over time. As noted above, the BBM calculates the revenue required to cover the access provider's efficient costs, including a commercial return on investments. This is also consistent with the general regulatory principle that a regulated business should expect to receive sufficient revenue to allow it to cover all expected prudent expenditure necessary to maintain a given level of service at each period into the future.

The ACCC described the key implementation steps of the BBM approach as follows:

Step 1: Setting the opening RAB

The initial opening RAB is locked-in and rolled-forward from one year to the next. The rolled-forward RAB includes capital expenditures, depreciation and asset disposals.

In setting the initial opening RAB value, the ACCC considered a suitable range of RAB values which were bounded by the depreciated actual cost value of Telstra's investments in network assets at the low-end and by the depreciated optimized replacement cost value at the high-end. The ACCC ultimately set the initial opening RAB value in this range; consequently, the asset valuation approach can be considered a hybrid historical/current cost accounting (HCA/CCA) methodology.²²

²¹ Described in ACCC's 2010 Draft Report in greater detail.

²² Further details of the initial RAB valuation approach are provided in ACCC, *Inquiry to make final access determinations for the declared fixed line services*, Final Report, July 2011, Section 5.1.

Step 2: Calculation of the revenue requirement

The aggregate revenue required to provide services through the network is calculated by determining the amounts required under each cost block. The formula for calculating the revenue requirement is:

$$RR = OPEX + (RAB * WACC) + DEP + TAX$$

where:

OPEX = operating expenditures

WACC = weighted average cost of capital

DEP = depreciation,

TAX = (Pre-tax RR - (DEP + INT + OPEX)) * corporate tax rate

INT = interest

Step 3: Allocation of a share of the revenue requirement to specific services

A share of the revenue requirement is allocated to each declared fixed line service using cost allocation factors.

Step 4: Determination of unit prices for each declared fixed line service

The revenue requirement allocated to each declared fixed line service is divided by the forecast demand for that service to calculate an average unit price.

Step 5: Determination of the price structure for each declared fixed line service

The average unit prices calculated in step 4 may be de-aggregated into more detailed price structures.

In 2011, the ACCC issued its FAD with respect to fixed line services (the ACCC's 2011 FAD Decision). In the decision, the ACCC used its finalized BBM model to set prices for declared fixed line services, namely ULLS, WLR, PSTN OTA, LCS and LSS services.

The ACCC did not make any specific adjustments to the design or inputs of the BBM to take into account the impacts of the NBN roll-out.²³ It considered that the impact from the roll-out of the NBN on Telstra's forecast expenditures and demand for the declared fixed services would be limited during the regulatory period covered by its decision (i.e., to mid-2014). It also noted in this respect that

²³ ACCC's 2011 Final Report, Section 4.4.

NBN Co's forecasts indicated that the expected number of fibre connected premises annually would be low in 2011-12 and 2012-13 and only become significant during 2013-14.

In the 2011 FAD Decision, the ACCC set wholesale access prices for a three year regulatory period ending on 30 June 2014. The established prices apply where there is no commercial agreement between an access seeker and the infrastructure operator, Telstra. They create a benchmark prices that the parties can fall back on when they have not negotiated alternative access terms.

Table 1 below summarizes the FAD rates (in \$AUS) and includes a comparison of those rates with earlier indicative prices approved by the ACCC (which had been set largely using the TSLRIC+ costing approach).

**Table 1
Wholesale / Declared Service Prices in Australia (\$AUS)**

	Previous indicative prices	Interim (IAD) prices, 1 January to 30 June 2011	Draft FAD prices, 1 July 2011 to 30 June 2016 ^a	Final FAD prices, 1 July 2011 to 30 June 2014 ^a
ULSS Band 1 (per line per month)	\$6.60			
ULSS Band 2 (per line per month)	\$16.00	\$16.00	\$16.75	\$16.21
ULSS Band 3 (per line per month)	\$31.30			
ULSS Band 4 (per line per month)		\$48.00	\$50.11	\$48.19
WLR (per line per month)	\$25.57 (HomeLine) \$26.93 (BusinessLine)	\$22.10 (nationally averaged)	\$22.47 (nationally averaged)	\$22.84 (nationally averaged)
LSS (per line per month)	\$2.50	\$1.80	\$1.80	\$1.80
PSTN OA and TA (per minute)	1.0c (headline rate)	1.0c (headline rate)	1.0c (national average rate)	0.95c (national average rate)
LCS (per call)	17.36c	9.1c	8.7c	8.9c

^aThe draft FAD prices averaged nominal prices over a five-year regulatory period while the final FAD prices are averaged over a three-year regulatory period.

As noted, the ACCC is yet to issue a FAD for wholesale ADSL and LBAS services and, consequently, has yet to finalize the pricing methodology for these wholesale services. While it is currently reviewing alternative costing approaches

for wholesale ADSL, it seems likely that ACCC will adopt a BBM costing approach in this case. To date, the ACCC has set an interim price ceiling of \$27 per month for a 25/5 megabit per second (Mbps) service (which is equivalent to NBN Co's price in its Wholesale Broadband Agreement).²⁴

NBN Co is in the early stages of the rollout of the fibre access services and it has set initial pricing for its wholesale fibre services.²⁵

Summary

In Australia, the ACCC recently moved away from using a TSLRIC+ approach to setting prices for declared (mandated) wholesale services to a BBM costing methodology which incorporates a locked-in and rolled-forward RAB. The initial RAB is set on the basis of a hybrid HCA/CCA approach. In effect, the ACCC's BBM costing approach can be considered as a hybrid HCA/CCA fully allocated costs (FAC) model.

Wholesale service price ceilings have been set by the ACCC on a multi-year basis. The ACCC applies an implicit form of price cap regulation to future price levels.

Another key development of note in Australia is the recent adoption of a structural separation approach under which fibre-based wholesale services will be provided through a separate entity, NBN Co. The costing methodology to be adopted for NBN Co is currently under review. However, it appears that with the recent move to the BBM costing approach, the same approach currently used for Telstra's copper network services will likely also be adopted for NBN Co's fibre network services.

²⁴ ACCC, LBAS Interim Access Determination, July 2012.

²⁵ NBN Co Wholesale Access Service, Product and Pricing Overview for Service Providers, December 2011. See <http://www.nbnco.com.au/getting-connected/service-providers/pricing-approach.html>.

3.2 EUROPEAN UNION MEMBER COUNTRIES

Background

The regulatory framework for electronic communications networks and services in the European Union (EU) was established by the European Commission (EC) in 2002 and revised in 2009.²⁶ The EC regulatory framework is intended to create harmonized regulation across EU Member States and is aimed at reducing entry barriers and fostering prospects for effective competition for the benefit of consumers. The EC is responsible monitoring the timely and correct implementation of the regulatory framework by EU Member States.

The basis for the regulatory regime is set out in a series of EC Directives which cover the overall regulatory framework, access and interconnection, authorization of networks and services, universal service and privacy matters.

The EC's Framework Directive sets out a number of policy objectives and regulatory principles for national regulatory authorities (NRAs) in each EU Member State to follow,²⁷ which include (among other things):

- a) the promotion of competition in the provision of electronic communications networks, services and associated facilities and services;
- b) ensuring that in carrying out the EC's Directives, NRAs take the utmost account the objective of making regulations technologically neutral;
- c) ensuring the development of consistent regulatory practice and the consistent application of the EC's Directives); and
- d) ensuring that in carrying out the EC's Directives, NRAs take all reasonable measures introduced are proportionate to their objectives.

Under the Framework Directive, NRAs are required to conduct periodic market reviews (following established EC guidelines)²⁸ to assess and determine in which markets operators possess significant market power (SMP). Where they find this to be the case in a relevant market, NRAs are obliged to propose appropriate regulatory measures or "remedies" to address market failures, including the

²⁶ http://ec.europa.eu/information_society/policy/ecomms/eu-rules/index_en.htm.

²⁷ EC, Directive 2002/21/EC of the European Parliament and of the Council *on a common regulatory framework for electronic communications networks and services* (Framework Directive), Article 8, 7 March 2002 (as amended by Directive 2009/140/EC).

²⁸ EC, Commission guidelines on market analysis and the assessment of significant market power under the Community regulatory framework for electronic communications networks and services, (2002/C 165/03).

imposition of wholesale access obligations and cost oriented pricing on SMP operators.

The wholesale services markets covered by this requirement include:²⁹

- call origination
- call termination
- wholesale (physical) network infrastructure access (including shared or fully unbundled access) at a fixed location
- wholesale broadband access
- wholesale terminating segments of leased lines, irrespective of the technology used to provide leased or dedicated capacity
- voice call termination on individual mobile networks

The EC's Access Directive

The EC's Access Directive set out specific directions for NRAs to follow relating to the rights and obligations for operators and for undertakings seeking interconnection and/or access to their networks or associated facilities.³⁰ The *Access Directive* states NRAs may impose obligations on operators to meet reasonable requests for access to, and use of, specific network elements and associated facilities, in situations where the NRA considers that denial of access or unreasonable terms and conditions having a similar effect would hinder the emergence of a sustainable competitive market at the retail level, or would not be in the end-user's interest. The types of network elements and associated facilities identified include:

- i) unbundled local loops,
- ii) facilities required for interconnection,
- iii) co-location or other forms of associated facilities sharing, and
- iv) open access to technical interfaces, protocols or other key technologies that are indispensable for the interoperability of services or virtual network services.³¹

In terms of pricing, the Access Directive calls for NRAs to impose "cost orientation" obligations on interconnection and access services in situations where a market analysis indicates that a lack of effective competition, implying that the operator concerned could sustain prices at an excessively high level or

²⁹ EC, Commission Recommendation, *on relevant product and service markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communications networks and services*, (2007/879/EC), 17 December 2007.

³⁰ EC, Directive 2002/19/EC of the European Parliament and of the Council *on access to, and interconnection of, electronic communications networks and associated facilities* (Access Directive), 7 March 2002 (as amended by Directive 2009/140/EC).

³¹ *Ibid.*, Article 12.

may apply a price squeeze to the detriment of end-users. The Access Directive adds that to encourage NGN investments by operators, including in NGNs, NRAs must take into account the investment made by the operator, and allow it a reasonable rate of return on adequate capital employed, taking into account any risks specific to a particular new investment network project. As well, the Access Directive requires that NRAs ensure that any cost recovery mechanism or pricing methodology that is mandated serves to promote efficiency and sustainable competition and maximize consumer benefits.³²

The EC's Interconnection Recommendation

In terms of interconnection services, the EC issued a *Recommendation on the Regulatory Treatment of Fixed and Mobile Termination Rates* in 2009 (the FTR/MTR Recommendation).³³ In it, the EC set out pricing principles for call termination rates. The EC recommended that NRAs set termination rates on the basis of the following considerations:

- The evaluation of efficient costs should be based on current cost and the use of a "bottom-up" LRIC (BU-LRIC) modeling approach.
- Results of the BU-LRIC approach may be compared with those of a "top-down" model which uses audited data with a view to verifying and improving the robustness of the results.
- The cost model should be based on efficient technologies available in the time frame considered by the model and, therefore, the core part of both fixed and mobile networks could in principle be NGN-based.
- Within the LRIC model, the relevant increment should be defined as the wholesale voice call termination service provided to third parties, implying that incremental costs should reflect the difference between the total long-run cost of an operator providing its full range of services and the total long-run costs of this operator in the absence of the wholesale call termination service being provided to third parties.
- Economic depreciation should be relied on wherever feasible.

The EC's Next Generation Access Recommendation

In 2010, the EC issued a *Recommendation on Regulated Access to Next Generation Access Networks* (the NGA Recommendation).³⁴ Recognizing the

³² Ibid., Article 13a and b.

³³ EC Recommendation (2009/396/EC), 7 May 2009.

³⁴ EC Recommendation *on regulated access to Next Generation Access Networks (NGA)*, September 20, 2010.

ongoing transition from copper to fibre-based networks, the intent in this respect was to ensure consistency of regulatory approaches taken by NRAs so as to avoid distortions within the EU market (as a whole) and to create legal certainty for all investing undertakings.

Under the NGA Recommendation, where an operator is found to possess SMP, it would be appropriate to impose an access remedy (i.e., mandate access). The services covered by the NGA Recommendation include (among other things):

- i) civil engineering infrastructure (e.g., poles, ducts and manholes),³⁵
- ii) unbundled access to fibre-to-the-home (FTTH) or building (FTTB) connections,
- iii) unbundled access to the copper sub-loop in the case of fibre-to-the-node/cabinet (FTTN or FTTC) services, and
- iv) wholesale broadband access (WBA, including, for instance, VDSL).³⁶

While again stating that prices for the above-noted wholesale services, where mandated, should be "cost-oriented", Annex 1 of the NGA Recommendation provides specific guidelines for setting prices on this basis.

The EC's recommended common principles to be used by NRAs for pricing NGA access, which include the following:³⁷

- NRAs should consider whether duplication of the relevant NGA access infrastructure is economically feasible and efficient and, where this is not, use different cost bases for the calculation of cost-oriented prices for replicable and non-replicable assets, or at least adjust the parameters underpinning their cost methodologies in the latter case.
- In cases where NGA investment depends for its profitability on uncertain factors such as assumptions of significantly higher ARPUs or increased market shares, NRAs should assess whether the cost of capital reflects the higher risk of investment relative to investment into current networks based on copper.

The EC's recommended common principles to be used for pricing access to fibre in the case of FTTH (unbundled fibre loop) include:

³⁵ Note that According to Article 11 NGA-Recommendation —"Civil engineering infrastructure" means physical local loop facilities deployed by an electronic communications operator to host local loop cables such as copper wires, optical fibre and co-axial cables. It typically refers, but is not limited to, subterranean or above-ground assets such as sub-ducts, ducts, manholes and poles. Civil engineering infrastructure falls within the same market as wholesale (physical) network infrastructure access.

³⁶ EC NGA Recommendation, paras 12-38.

³⁷ Note that the principles and guidelines summary that follow are either paraphrased or drawn directly from the EC's NGA Recommendation.

- When setting access prices to the unbundled fibre loop, NRAs should include a higher risk premium to reflect any additional and quantifiable investment risk incurred by the SMP operator.
- Additional pricing flexibility could also be provided via long term commitment rates or volume discounts.
- Under the principle of non-discrimination, the price charged to the SMP operator's downstream arm should be the same as the price charged to third parties.

The EC's recommended common principles to be used for pricing access to the copper sub-loop in the case of FTTN include:

- NRAs should impose cost-based access to all items necessary to allow sub-loop unbundling, including backhaul and ancillary remedies, such as non-discriminatory access to facilities for co-location, or in their absence, equivalent co-location.
- Regulated access prices should not be higher than the cost incurred by an efficient operator (for this purpose, NRAs may consider to evaluate these costs using bottom-up modeling or benchmarks, where available).
- When setting the price for access to the copper sub-loop, NRAs should not consider the risk profile to be different from that of existing copper infrastructure.

The EC's recommended criteria for setting a risk premium, where warranted, include:

- The return on capital allowed *ex ante* for investment in NGA facilities should strike a balance between providing adequate incentives for undertakings to invest (implying a sufficiently high rate of return) and promoting allocative efficiency, sustainable competition and maximum consumer benefits on the other (implying a rate of return that is not excessive). Therefore, where justified, NRAs should include over the pay-back period of the investment a supplement reflecting the risk of the investment in the WACC calculation currently performed for setting the price of access to the unbundled copper loop. The calibration of revenue streams for calculating the WACC should take into account all dimensions of capital employed, including appropriate labour costs, building costs, anticipated efficiency gains and the terminal asset value.
- NRAs should estimate investment risk *inter alia* by taking into account the following factors of uncertainty:

- i) uncertainty relating to retail and wholesale demand;
- ii) uncertainty relating to the costs of deployment, civil engineering works and managerial execution;
- iii) uncertainty relating to technological progress;
- iv) uncertainty relating to market dynamics and the evolving competitive situation, such as the degree of infrastructure-based and/or cable competition; and
- v) macro-economic uncertainty.

These factors may change over time and therefore should be reviewed periodically.

- Criteria such as the existence of economies of scale (especially if the investment is undertaken in urban areas only), high retail market shares, control of essential infrastructures, as well as privileged access to equity and debt markets are likely to mitigate the risk of NGA investment for the SMP operator. These aspects should also be periodically reassessed by NRAs when reviewing the risk premium.
- The above considerations apply in particular to investment into FTTH. Investment into FTTN, on the other hand, which is a partial upgrade of an existing access network (such as for example VDSL), normally has a significantly lower risk profile than investment into FTTH, at least in densely populated areas. In particular, there is less uncertainty involved about the demand for bandwidth to be delivered via FTTN/VDSL, and overall capital requirements are lower. Therefore, while regulated prices for WBA based on FTTN/VDSL should take account of any investment risk involved, such risk should not be presumed to be of a similar magnitude as the risk attaching to FTTH based wholesale access products. When setting risk premia for WBA services based on FTTN/VDSL, NRAs should give due consideration to these factors.

Lastly it should be noted that in the NGA Recommendation also covered access to civil engineering infrastructure (focusing first and foremost on ducts). The EC indicated that the principle of cost orientation is also to be applied in this case and added that NRAs should:³⁸

- regulate access prices to civil engineering infrastructure consistently with the methodology used for pricing access to the unbundled local copper loop;
- ensure that access prices reflect the costs effectively borne by the SMP operator;

³⁸ EC NGA Recommendation, Annex 1, section 2.

- take into account actual lifetimes of the relevant infrastructure and possible deployment economies of the SMP operator;
- ensure that access prices capture the proper value of the infrastructure concerned, including its depreciation; and
- should not consider the risk profile to be different from that of copper infrastructure, except where the SMP operator had to incur specific civil engineering costs — beyond the normal maintenance costs — to deploy an NGA network.

EC Review of Costing Methodologies

In 2011, the EC launched a public consultation on a variety of issues regarding costing methodologies for wholesale services.³⁹ In its consultation document, the EC raised concerns in the consultation that NRAs are applying divergent approaches when setting cost oriented wholesale access prices. It noted that even where NRAs apply the same cost model for the same access products, there are divergences in terms of implementation – consequently, local loop access prices across Europe, for example, vary widely from roughly €5/month in Lithuania to over €12/month in Ireland. Consequently, the EC is concerned that there is a lack of predictability and legal certainty for (cross-border) investors, alternative operators and potential market entrants.

In the consultation document, the EC also raised questions regarding the impact of intermodal competition and NGA deployment on unbundled copper local loop pricing. It noted that with consumers' switching to cable, mobile and NGA retail products, the volume of services provided over the copper networks has declined, which in turn can have the effect of increasing the per unit costs of copper and, consequently, access prices where BU-LRIC models are used.

The EC also raised concerns that wholesale copper network access pricing may significantly affect the incentives to invest in new NGA networks. In defining the most appropriate costing methodology for copper and NGA networks, the EC therefore considered that regulators should maintain an objective of promoting efficient investment and innovation in new and enhanced infrastructures.

Some of the considerations the EC sought parties comments on included:

- **Asset Valuation and Replicability:** for non-replicable legacy assets (copper and ducts), the EC proposed using historical costs; whereas for

³⁹ The process closed on November 28th 2011 and conclusions have not yet been released. See http://ec.europa.eu/information_society/policy/ecommm/library/public_consult/cost_accounting/index_en.htm for further detail on the consultation process. The process specifically looked at access services.

most fibre-based assets, which can be considerable replicable, could be based actual replacement costs.

- **Modern Equivalent Asset Approach:** the EC questioned whether fibre could be considered a MEA for copper; which, in that case, a single model for both copper and fibre access prices could be constructed based on the cost of fibre deployment (although the EC noted that fibre deployment is still very limited in most EU Member States and, therefore, adopting this costing approach could lead to over-compensation for copper facilities).
- **Access Pricing and NGA Investment Incentives:** As in the NGA Recommendation, the EC raised the issue of a risk premium for unbundled fibre loops and, if one is included, how it should be measured.

Numerous parties provided responses to the EC's consultation document. Our review of the responses suggests that much of the commentary is pitched at a relatively theoretical or principles level although the commentary does include some practical suggestions on costing methodologies. The issue of costing for traditional networks versus NGNs was discussed at length, including the issue of what approach would provide the most appropriate investment incentives for network builders.

The EC is yet to publish its conclusions and recommendations resulting from its costing methodology consultation.

Summary

As noted, the EC's role is to set a regulatory framework for EU Member States, including common regulatory principles and practices. While the EC has set a common obligation of "cost orientation" for wholesale services, it has not adopted any single recommended costing approach (other than as noted, BU-LRIC in the case of call termination).

With the ongoing transition from copper to fibre networks, the EC NGA Recommendation provides guidance for pricing wholesale NGA facilities. Of key note is the recommendation to allow for high risk premium on NGN or fibre access facilities.

This overview of the EC's approach to pricing of wholesale services serves as a useful backdrop to the approaches followed in the UK, France, Germany and Sweden which are reviewed in the following sections. All of these countries are subject to the EC's directives in this respect.

3.3 THE UNITED KINGDOM

Background

In the UK, the Office of Communications (Ofcom) is the regulatory and competition authority responsible for the telecommunications sector. It came into existence in late 2003, replacing its predecessor, the Office of Telecommunications (OfTel).

In 2002, OfTel required British Telecom (BT), the UK's dominant incumbent telecommunications carrier, to provide wholesale line rental (WLR) services and also set the prices or charges for certain WLR services. The first basic WLR service was made available from September 2002. WLR services allow alternative suppliers to rent access lines on wholesale terms from BT and resell the lines to customers, providing a single bill that covers both line rental and telephone calls.⁴⁰

In 2003, OfTel reaffirmed the requirement for BT to offer analog WLR services and additionally placed a requirement on BT to offer digital (ISDN-based) WLR services.⁴¹

In 2004, Ofcom completed a review of the wholesale local access market and determined that BT had SMP in the market for wholesale local access.⁴² As a result, Ofcom imposed certain SMP services conditions on BT in those markets, including the requirement to provide local loop unbundling (LLU) services within the wholesale local access market as well as co-location services and facilities.⁴³

In 2005, Ofcom published the two final statements regarding the valuation of BT's copper access network – the first was entitled *Valuing copper access* and the second was entitled *Ofcom's approach to risk in the assessment of the cost of capital*. As discussed below, these decisions have played a key role in setting basis costing WLR and LLU services.

In September 2005, BT offered and Ofcom accepted a set of undertakings pursuant to the Enterprise Act 2002 which included the commitment to establish a new, functionally separate organization, Openreach, in order to manage BT's

⁴⁰ At that time, the rental charges for residential and business analog WLR products were set at £9.33 per line per month (£112.00 per line per year) and £9.96 per line per month (£119.48 per line per year) respectively. These charges were also subject to a charge control set at RPI-2%.

⁴¹ OfTel, *Review of the fixed narrowband wholesale exchange line, call origination, conveyance and transit markets*, 28 November 2003.

⁴² Ofcom, *Review of the wholesale local access market*, 16 December 2004

⁴³ As explained by Ofcom, LLU is a process by which the dominant provider's local loops are physically disconnected from its network and connected to another communications provider's network. This enables competing providers partly or wholly to lease a customer's access line and provide voice and/or data services directly to end users.

wholesale access network.⁴⁴ The range of Openreach's wholesale services at the time included the provision of residential and business WLR, LLU, which includes fully unbundled lines (Metallic Path Facility or MPF) and shared unbundled lines (Shared MPF or SMPF), and Ethernet services. Today the range of wholesale services provided by Openreach is wider in scope and includes fibre access services.

It should be noted that, in 2008, Ofcom found that BT possessed SMP in certain geographic markets in the UK with respect to the provision of wholesale ADSL (bitstream) services; however, it decided not to regulate the price of the services (i.e., BT's Datastream and IPStream products).⁴⁵ Ofcom decided instead to promote use of and investment in LLU by competitive players since it considered that price regulation in wholesale ADSL service markets might change the incentives for this investment. Consequently, it chose to leave prices for wholesale bitstream unregulated while investment in LLU continued.

In addition, based on its in 2010 wholesale local access market review, Ofcom mandated that "virtual unbundled local access" (VULA), would have to be provided by BT wherever it deploys its NGA network.⁴⁶ VULA is intended to provide access to the NGA network in a way that is similar to how LLU provides access on the copper legacy network. However, rather than providing a physical line, VULA will provide a virtual connection that provides a dedicated link to and substantial control over the services provided to customers. In terms of pricing, Ofcom decided that it would not to regulate the prices of the product(s) that BT provides under the VULA obligation. Instead, it decided to give BT the flexibility to price its VULA services according to emerging information on the demand for and supply costs of NGA services.

In the same 2010 wholesale market review, Ofcom decided not to regulate unbundled access to fibre loops. However, generic Ethernet Access fibre to the premises and cabinet products (FTTP and FTTC) are currently available through Openreach.⁴⁷

⁴⁴ Note that functional separation is one of the SMP remedies supported in the EC's Access Directive.

⁴⁵ Ofcom, *Review of the wholesale broadband access markets – final explanatory statement and notification*, Statement, 21 May 2008.

⁴⁶ Ofcom, *Review of the wholesale local access market – Statement*, 07 October 2010.

⁴⁷ <http://www.openreach.co.uk/orpg/home/products/pricing/loadProductPrices.do?data=Po3KnmqvCqPyVFu37aLXIdpyYOJW58IELJ3a1hFsXScqDWVqEbA2PDIT5Y2OhxKv>.

Access Costing Methodology

In November 2005, Ofcom set charge ceilings for LLU services and, in January 2006, for WLR services.⁴⁸ The same general approach to setting ceilings was followed in both cases.⁴⁹

Initially, Ofcom imposed a requirement on BT to charge for the provision of network access in the wholesale local access market on the basis of long run incremental cost plus an appropriate mark-up for common costs including an appropriate return on capital employed (i.e., LRIC+).

Ofcom indicated that current cost accounting with fully allocated costs (CCA FAC) and LRIC+EPMU ("equal proportionate mark-up" for common costs) provide two alternative means of determining a reasonable mark-up. However, Ofcom considered that LRIC+EPMU has the disadvantage of involving a time consuming process which BT carries out on an irregular basis and, moreover, that Ofcom has little visibility as to how BT generates costs from its LRIC model, and this extra iteration by BT of its financial data is not subject to external audit scrutiny. In addition, Ofcom noted that performance monitoring on a LRIC+EPMU basis against BT's actual financial performance is not straightforward. By contrast, Ofcom noted that wholesale service profitability information is routinely prepared on a CCA FAC basis and that CCA FAC uses data that can be reconciled to the regulatory financial statements, which have been audited and are in the public domain.

Therefore, according to Ofcom, given that LRIC+EPMU is not conceptually superior to CCA FAC as a cost basis for setting charges, but that CCA FAC has transparency benefits, Ofcom decided to use CCA FAC as the basis for setting the fully unbundled rental charge ceiling (with the exception of certain cases as noted below).

In its 2005 *Valuing Copper Access* statement, Ofcom concluded that it was no longer appropriate to value BT's pre-1997 copper access network assets on the basis of a pure CCA FAC approach because to do so would have allowed BT to potentially over-recover the costs of those assets which, until 1997, had been valued under a historical cost accounting (HCA) approach. In order to avoid the potential for such over-recovery, and given that it is unlikely that any operator would build a new nationwide access network in competition with BT in the near future, Ofcom decided to establish a "Regulatory Asset Value" (RAV) to represent the remaining value of the pre-1997 copper access network assets rather than continuing to value those assets at their current cost. The value of the RAV was set to equal the closing historical cost accounting value for the pre-

⁴⁸ Ofcom, *Local Loop Unbundling: Setting the Fully Unbundled Rental Charge Ceiling and Minor Amendments*, November 30 2005 and Ofcom, *Wholesale Line Rental: Reviewing and setting charge ceilings for WLR services*, 6 January 2006.

⁴⁹ Note that Ofcom's approach involves setting charge ceilings as opposed to exact charges.

1997 assets and its value was increased each year by the Retail Price Index (RPI) to ensure it was not eroded by inflation. Under Ofcom's approach, over time the RAV will gradually disappear as the pre-1997 assets are gradually replaced with new ones. Post-1997 assets which have consistently been valued on a CCA FAC basis throughout their lives will continue to be valued using the CCA convention.

Therefore, the part of the LLU charge which reflects recovery of the costs of the local loop now reflects an average of the costs associated with pre-1997 assets, based on the RAV, and the costs associated with post-1997 assets, calculated using CCA FAC. The other components of the LLU rental charge are based on CCA FAC. The same approach is followed for costs of the local loop component of WLR costs. Consequently, the adopted costing approach can be described as a hybrid HCA/CCA FAC model.

The following cost categories are included in the LLU and WLR rental charges:

- E-side and D-side capital and maintenance – the exchange side (E-side) and distribution side (D-side) infrastructure, which were considered in the valuing BT's copper access review;
- MDF capital and maintenance – the main distribution frame (MDF) equipment where local loops terminate and cross connections to competing providers' equipment can be made;
- Drop capital and maintenance – the drop wire from the street to the customer premises;
- Selling and general administration costs – these costs are the administrative costs BT incurs in providing a fully unbundled loop; and
- Test access matrix (TAM) & line test costs – the TAM provides a remotely controllable facility for the temporary connection of a line to the line test system to facilitate fault investigation tests.

For each cost category, Ofcom assessed BT's cost data and made adjustments to ensure that:

- only relevant costs are included;
- no double counting takes place; and
- costs are based on efficiently incurred cost levels.

At the time, Ofcom set charge ceilings for residential and business WLR services at £100.68 and £110.00 per line per year, respectively. As well, Ofcom has imposed a charge ceiling for the LLU rental charge of £81.69 per line per year.

Subsequently, in 2008, Ofcom undertook a review of the pricing framework applicable to Openreach. Ofcom was considering at the time a new framework that would continue to encourage efficient, sustainable competition in access services and also provide appropriate incentives for future improvements in the quality, innovation and investment in existing and next generation services. Ofcom indicated that the framework should enable Openreach to charge prices which reflect costs, promote efficient competition, and provide it with the opportunity to recover efficiently incurred costs, including the cost of capital. Ofcom's review involved:

- Analyzing and, where relevant, benchmarking Openreach's cost structure and efficiency levels and assessing aspects of Openreach's service costing methodology;
- Developing cost projections for Openreach – overall and at the level of individual services;
- Considering how price controls for the regulated services should be determined given the overall, and service specific, cost projections for Openreach; and
- Considering if and how the contribution made by other services to the total cost base should be taken into account.

Ofcom also indicated that it intended to review the prices of the regulated access network services, including the prices for WLR and LLU (MPF and SMPF) rentals, referred to as the "Core Rental Services".

With respect to costing approach, Ofcom indicated that it intended to continue to use its established hybrid HCA/CCA FAC approach since it considers that the approach offers some important practical advantages, including:

- it is a widely understood concept and has been the anchor point for many previous price controls;
- it uses data that can be reconciled to the regulatory financial statements, which are audited and, generally, in the public domain; and
- no strong efficiency reasons for moving away from CCA FAC.

In its 2009 statement on the new pricing framework for Openreach, Ofcom concluded that setting charges equal to CCA FAC is broadly consistent with achieving an efficient outcome and, therefore, in consumers' interests.⁵⁰

⁵⁰ Ofcom, *A new pricing framework for Openreach*, Statement 22 May 2009.

At the time, Ofcom established the following new price ceiling controls for LLU (MPF and SMPF) services:

Table 2: LLU Rates in the UK

LLU Services	Current price	Price in 2009/10	Indexation in 2010/11
MPF	£81.69	£86.40	RPI +5.5%
SMPF	£15.60	£15.60	RPI +1.0%

Later in 2009, Ofcom determined that the price controls for residential and business WLR services would be replaced by a single price control for Core WLR Rental services.⁵¹ The Core WLR services would be available to all customers, both residential and business. Ofcom indicated that the implementation of the Core WLR service would be phased in, in order to allow Openreach appropriate time to ensure that they can make necessary changes to their systems, to be able to provide products that fulfill the requirements of the new services.

The price ceiling controls set by Ofcom for the new services are provided in the following table:⁵²

Table 3: Core WLR Service Rates in the UK

New WLR Core Services	2009 Price	Oct 09 – Mar 10	2010/2011
WLR Core Rental Charge	£100.68	£100.68	RPI + 3.8%
WLR Transfer Charge	£2.00	£3.00	RPI + 3.8%
WLR New Connection	£88.00	£67.00	RPI - 16%

Interconnection Costing Methodology

As a result of its wholesale narrowband market review concluded in 2009, Ofcom reaffirmed that BT has SMP in the markets for wholesale fixed call origination and call termination services. At the same time, Ofcom established new charge controls or caps for these services provided by BT, including controls on: (i) wholesale call origination services, (ii) call termination services and (iii) interconnection circuits, necessary for the provision of both wholesale call origination and geographic call termination services.⁵³

While initially a LRIC model was considered the most appropriate costing approach for these services, Ofcom adopted an alternative approach 2009 which is generally consistent with costing approach adopted for wholesale access services discussed above.

⁵¹ Ofcom, *Charge controls for Wholesale Line Rental and related services*, Statement and Consultation, 26 October 2009.

⁵² Ibid.

⁵³ Ofcom, *Review of BT's Network Charge Controls Explanatory Statement and Notification of decisions on charge controls in wholesale narrowband markets*, Statement, 15 September 2009.

Ofcom adopted CCA FAC methodology to set charge controls for BT's fixed network interconnection services. It relied on data from BT's regulatory financial statements as inputs and also adjusted the data to reflect "hypothetical" efficient NGN ongoing network costs.

The model was designed to meet Ofcom's objectives by providing efficient network investment signals, and by protecting end users and competing operators in downstream markets from excessive pricing. In particular, it sought to avoid the risk of inefficient parallel running costs being passed on to consumers during the migration between the PSTN and BT's next generation network (which BT commonly refers to as its 21st Century Network or 21CN).

Ofcom has noted however that BT recently announced plans to extend the life of its PSTN for voice services. Ofcom reviewed its cost modeling methodology in light of this development and concluded that some adjustments to the model are appropriate to reflect BT's plans for voice services. The key area of the model affected is the assumption on appropriate asset lives for a hypothetical ongoing network.

As noted by Ofcom, asset lives are used in the model to calculate the depreciation charge. Other things being equal, longer asset lives will cause yearly depreciation charges to be lower. Ofcom adjusted modeled asset lives by calculating a weighted average of the network asset lives in BT's regulatory financial statements for the last five years. This has enabled it to reflect the available empirical evidence of longer use of some assets within the overall framework of the hypothetical ongoing network cost model. This change has increased the length of some component asset lives and in turn has reduced the modeled depreciation charge. The resulting decrease in yearly depreciation has led to lower charge controls than otherwise for call termination and origination services.

Ofcom also recognized that the future development of services covered by the charge controls during the next several years is uncertain. Ofcom noted that BT's announcement of new plans for its voice services and extended use of the PSTN has added to the uncertainty over the underlying costs since the precise mix of capital and operational expenditure involved in extension of the legacy PSTN is not yet known. As a result, Ofcom was of the view that that its hypothetical ongoing network cost model remains the most robust option available to set efficient charges for interconnection services. Ofcom considers therefore that the adjustments it made to the modeling assumptions on asset lives are appropriate to reflect the new evidence on the useful economic lifetime of PSTN assets within a hypothetical ongoing network model.

The approved price ceilings and ongoing interconnections per minute charge controls set by Ofcom in its decision are as follows:⁵⁴

Table 4: Interconnection Rates in the UK
(UK pence/min)

Service/technical area/component	Charge 2009/10	Charge Controls 2009-2013
Termination (ppm)	0.160	RPI+3.75%
Origination (ppm)	0.178	RPI+2.75%

Support Structure Costing Methodology

In 2010, Ofcom introduced a new wholesale market remedy requiring that support structure or "physical infrastructure access" (PIA) be made available to competitors to deploy their own NGA infrastructure to provide broadband and telephony services.⁵⁵

Ofcom also indicated that the prices for PIA services are to be cost-based – i.e., based on the long-run incremental cost of provision, including an appropriate mark-up for BT's common costs (LRIC+).

BT was required to issue a PIA reference offer by Ofcom at the time; consequently no starting price or price controls were set for PIA services in Ofcom's 2010 decision. Ofcom did, however, provide some guidelines with respect to PIA service pricing at the time.⁵⁶

- **Basis of charges** – to encourage efficient use of infrastructure capacity, Ofcom proposed that charges for infrastructure usage should reflect the proportion of the useable capacity that is occupied. It noted that this approach has been adopted in other countries where charges for duct usage are based on the cross sectional area of the cable and the length of the duct occupied. Typically there are also additional charges for cable joints and loops of cable that occupy space in chambers.
- **Investment risk** – at a high level, Ofcom considered that there should be three potentially distinct cases of investment risk:
 - Existing infrastructure, most of which is legacy infrastructure for current generation services for which demand is well established and therefore investment risk was low.

⁵⁴ Ibid, para 4.110 and 4.124.

⁵⁵ Ofcom, Review of the wholesale local access market Statement on market definition, market power determinations and remedies, Statement, 7 October 2010.

⁵⁶ Ibid, para 7.15.

- New infrastructure constructed solely for current generation services. As with legacy infrastructure, demand is well established and investment risk should be relatively low.
- New infrastructure constructed for new high bandwidth services for which in the short term at least demand is uncertain and therefore investment risk is higher.

Given the higher risk associated with infrastructure investments for new high bandwidth services, Ofcom considered that in principle it should be treated differently from the infrastructure for current generation services. In particular to provide BT with a "fair bet", accounting for the uncertainty and sunk costs of FTTP investment, prices should be set to earn a reasonable rate of return on the basis of the expected cash flows from the investment at the time of deployment. Ofcom acknowledged that in practice it may be necessary to seek to achieve this by using a risk adjusted cost of capital when setting charges in order to reflect the risk associated with NGA. Further, Ofcom proposed to conclude that the practical application of this principle would be likely to depend on the product specification and the operational processes adopted for PIA. In particular the ability to distinguish between each of the three categories of infrastructure identified above would be key. Ideally, infrastructure prices would vary according to the investment risk but if it is not possible to distinguish between the categories of infrastructure then it would be necessary to adopt an alternative approach such as applying a cost of capital to all infrastructures which recognizes the weighted average risk of the different categories of infrastructure.

The follow-up process to Ofcom's decision in this respect, including the requirement for BT to produce a PIA reference offer, is currently in process.

Summary

In 2005, Ofcom moved from using a LRIC approach for setting rates for unbundled local loops to a hybrid HCA/CCA FAC approach. Subsequently, in 2009, Ofcom made a similar move in the case of call origination and termination services – i.e., shifting from a LRIC to a CCA FAC costing approach (in this case, basing the asset valuation on a "hypothetical ongoing network" design intended to reflect the transition to BT's NGN). On the other hand, Ofcom intends to maintain a LRIC pricing approach for support structures (possibly with a risk adjusted cost of capital in the case NGA related PIA facilities).

When setting a price ceiling for a specific wholesale service, Ofcom also typically applies a multi-year charge control (or price cap) which adjusts to the price ceiling annually according to an established "RPI – X" formula (i.e., inflation less a productivity offset which, in the latter case, may be positive or negative in value depending on the service in question).

As well, it is important to note that Ofcom has adopted a functional separation model under which regulated wholesale services are provided through BT's separate Openreach division on an equivalent, transparent and non-discriminatory basis to competing carriers (including BT's retail arm).

In terms of access to NGA services, Ofcom does not regulate BT's NGA service prices (such as VULA or fibre access), but rather has provided BT with the flexibility to price these services according to emerging market demand and supply conditions.

3.4 FRANCE

Background

In France, the telecommunications regulatory authority (ART) was created in 1996. Its mandate was expanded to the regulation of electronic communications and postal sectors in 2005 (when it became ARCEP). The agency regulates electronic communications in France, including the provision of wholesale services. One of its primary objectives is to work with government to define and implement the EC's electronic communications regulatory and framework in France.

ARCEP's wholesale service directives apply primarily to France's incumbent telecommunications operator, France Telecom (which now operates under the brand name: Orange).

Access Costing Methodology

Initially, ART relied on a long run incremental cost (LRIC) costing approach to set rates for local loops.⁵⁷ However, in 2005, ARCEP conducted a review of alternative costing methodologies and later in that same year issued a decision outlining a revised costing approach for local loop unbundling (LLU) services.⁵⁸

The costing decision followed an earlier ruling the same year in which ARCEP found that France Telecom possessed SMP in the markets for unbundled copper loops and sub-loops and, consequently, it imposed an obligation on France Telecom to continue to make these wholesale services available to alternative operators.⁵⁹ In particular, France Telecom is required to provide:

- i) direct access to the local loop via unbundling (including shared access and full unbundling) and
- ii) wholesale bitstream service provided at either the regional or departmental level (delivered in Ethernet, IP or ATM mode on a shared or "naked" ADSL access basis).

The wholesale pricing principles and objectives adopted by ARCEP included:

- adherence to the principle of non-discrimination (i.e., between the internal prices paid for the services in question by France Telecom and alternative operators);
- the encouragement of efficient investment by France Telecom;

⁵⁷ ARCEP, Decision 02-0323, 16 April 2002.

⁵⁸ ARCEP, Decision 05-0834, 15 December 2005.

⁵⁹ ARCEP, Decision 05-0277, 19 May 2005.

- the encouragement of efficient investment by alternative operators; and
- the promotion of competition.

When it revisited the costing methodology for local loops in 2005, ARCEP considered four alternative asset valuation approaches:⁶⁰

- historical cost accounting (HCA);
- current cost accounting (CCA);
- CCA with economic depreciation; and
- successive replacement cost method.

ARCEP rejected use of the HCA and successive replacement cost method, noting in the later case that there is little likelihood of local loops being replaced. Instead, it opted for a CCA-based approach and, of the two options, preferred the use of CCA with economic depreciation.

The adopted CCA approach with economic depreciation takes into account France Telecom's historical investments in copper loops, including cable, conduit/poles, civil engineering and related equipment), price trends, technical change and asset lives.⁶¹ In addition to the cost of the local loop (which is also adjusted for the geographic coverage over which the LLU service is available),⁶² the pricing of the LLU service also includes service-specific costs (administration, billing and maintenance) and a share of common costs. More detailed cost accounting and accounting separations guidelines were issued by ARCEP the following year in Decision 06-1007.⁶³

The costing approach adopted by ARCEP for LLU can be considered a "top-down" fully allocated cost (FAC) approach. That is the approach is considered "top down" in that the costs are developed using accounting rather than modeled data.

The price of LLU service had been declining steadily since first established and, as a result of ARCEP's 2005 Decision, it declined further still to €9.29 in early 2006. Additional rate revisions have been implemented since that time. A summary of historical copper LLU rates in France is provided in the following table:

⁶⁰ ARCEP, Decision 05-0834, Section III where all of the methods are described in some detail.

⁶¹ Ibid., Section IV.

⁶² LLU tariffs were to be calculated on the basis of access lines corresponding to profitable universal service areas (approximately 95% of lines), reflecting the fact that alternative operators are not likely to serve non-profitable areas. In any case, the universal service mechanism compensates for the difference between the cost of the local loop in non-profitable areas and the LLU average price.

⁶³ ARCEP, Decision 06-1007, Cost accounting and accounting separation obligations imposed on France Telecom, 7 December 2007.

Table 5: LLU Rates in France⁶⁴

Date	Price
2000 (November)	€ 17.10
2001 (July)	€ 14.48
2002 (June)	€ 10.50
2005 (June)	€ 9.50
2006 (January)	€ 9.29
2009 (January)	€ 9.00
2012 (January)	€ 8.80

In 2011,⁶⁵ ARCEP expanded the LLU obligation placed on France Telecom to include wholesale access to copper sub-loops. In this respect, France Telecom was required to offer LLU operators collocation and fibre backhaul solutions for their equipment installed in the new supply points in the sub-loop, and at prices that provide enough of an incentive to allow alternative carriers to deliver unbundled access from such locations. While sub-loop pricing remains under review, ARCEP intends to use the same costing methodology as currently applied in the case of LLUs.

Unbundled fibre access is not mandated in France at this time.

In December 2011, ARCEP also issued a report to Parliament on the France Telecom's copper local loop costs and how they will be affected by the transition from copper to fibre. In the report, ARCEP indicated that it remains of the view that the current top-down FAC costing methodology it uses to determine loop costs is the most appropriate approach. However, it also acknowledged that with the increasing deployment of fibre optic networks, customers will gradually migrate from the copper network to NGNs, which will in turn lead to accelerated obsolescence of active copper cables. While this trend will no doubt vary by geographic area, in high density areas, ARCEP noted that copper will more quickly be challenged by fibre, whereas in the lower density areas, copper will remain at least for a time as a single wire local loop infrastructure. As a result, ARCEP identified several risks, including possible upward pressure on tariffs for access to the copper network to increase as migration increases despite the lower total cost of copper network and declining incentives for France Telecom to maintain its copper network through new investments, as such investments may well be rendered obsolete before have been recovered.

While ARCEP is of the view that its current method of assessing the costs of France Telecom's copper local loop remains appropriate, it is considering various options for addressing the ongoing transition from copper to fibre including:

⁶⁴ <http://www.arcep.fr/index.php?id=6989> and ARCEP's 2011 Annual Report.

⁶⁵ ARCEP, Decision No. 2011-0668, on the definition of the relevant market for wholesale access to the physical infrastructure that comprise the wireline local loop, the designation of an operator enjoying significant market power and the obligations imposed on it as a result, 14 June 2011.

- Avoiding "rate shock" and "yoyo effects" in the evolution of LLU tariffs, to provide greater predictability to operators;
- Avoiding LLU price increases due to declining demand on the copper network;
- Providing consistent signals for continued fibre deployment:
 - for alternative operators, by reducing the cost of access to civil engineering infrastructure used to deploy fibre;
 - for France Telecom, by ensuring more predictable revenues and greater certainty necessary to support ongoing investments.

ARCEP has suggested that reducing copper asset lives while also extending the amortization period of the civil engineering infrastructure should assist in meeting these objectives.

In 2011, ARCEP also completed a market review of the wholesale broadband access market, which covers France Telecom's wholesale (access and backhaul) bitstream services.⁶⁶ While the obligation for France Telecom to provide these services was maintained by ARCEP, the obligation was limited to exchanges where it was the only supplier of such services. As into the case of LLUs, a forward looking CCA FAC approach is used by ARCEP to set France Telecom's wholesale broadband access service prices.

Interconnection Costing Methodology

In 2011, ARCEP conducted a review of fixed telephony markets (as required under EC Directives). In the resulting decision,⁶⁷ ARCEP upheld existing obligations relating to the provision of wholesale access to fixed call origination and termination services.

Following the EC recommendation on fixed and mobile termination rates,⁶⁸ ARCEP adopted a symmetrical pricing scheme which was imposed on all operators. As well, in the decision ARCEP set call termination rates on the basis of the estimated long-run incremental costs of a generic efficient (pure NGN) operator – effectively, a bottom-up or BU-LRIC approach. As of 1 January 2013, call termination rates have been set to 0.08 eurocents a minute.⁶⁹

As to call origination service, ARCEP modified France Telecom's current obligation to charge cost-based prices to being forbidden to charge excessive

⁶⁶ ARCEP Decision 11-0669, 14 June 2011.

⁶⁷ ARCEP Decision 2011-0926, 26 July 2011.

⁶⁸ EC Recommendation *on the Regulatory Treatment of Fixed and Mobile Termination Rates in the EU*, 7 May 2009.

⁶⁹ ARCEP 2011 Annual Report, page 172.

prices for this service. A multi-annual pricing schedule specifies the maximum average prices that France Telecom can charge over the course of the next several years – i.e. 0.430, 0.415 and 0.400 eurocents a minute, as of 1 January 2012, 2013 and 2014, respectively.⁷⁰

Support Structure Costing Methodology

In its wholesale market review completed in 2011,⁷¹ ARCEP also determined that France Telecom is required to provide access to its underground and now also its overhead (i.e., service poles and building facades) civil engineering infrastructure to allow competing operators to deploy their own fibre local loop networks under transparent, non-discriminatory conditions. Prices for civil engineering infrastructure services are required to be set on a cost-oriented basis.

The same general FAC costing approach used by ARCEP to set LLU prices is also used in the case of civil engineering infrastructure.⁷²

Summary

In France, ARCEP decided to move away from using a LRIC-based approach to setting LLU prices to one based on a CCA FAC approach. ARCEP intends to apply the same methodology in the case of copper sub-loops, which France Telecom was recently directed to unbundle. A similar approach is also being used for support structures. On the other hand, ARCEP has decided to maintain a BU-LRIC approach (based a cost of a generic efficient NGN operator) in the case of call termination services.

In view of the ongoing transition from copper to fibre, ARCEP has considered measures to mitigate upward pressure on copper LLU rates (by increasing depreciation rates to reflect declining asset lives and offset the effects of declining demand for copper loops). It has also considered keeping the cost of access to civil engineering infrastructure used to deploy fibre as low as possible to help promote investment in NGA facilities.

⁷⁰ Ibid.

⁷¹ ARCEP Decision 11-0668, 14 June 2011.

⁷² See ARCEP, Decision 10-1211, 9 November 2010.

3.5 GERMANY

Background

In Germany, the Regulatory Authority for Telecommunications and Posts (RegTP) was established in 1998 (replacing the then existing Federal Ministry of Posts and Telecommunications). RegTP was later replaced in 2005 by the Federal Network Agency (Bundesnetzagentur or BNetzA) which has regulatory authority over the electricity, gas, telecommunications, post and railway sectors. BNetzA is responsible for, among other things, regulating the provision of wholesale telecommunications services.

Obligations to provide wholesale wireline telecommunications services are imposed primarily on Germany's incumbent telecommunications carrier, Deutsche Telekom (DT). DT was first required to offer competitors fully unbundled access to the local loop in 1997 by the Federal Ministry of Posts and Telecommunications.

At the time no such obligation had existed under European Community law. However, in 2001, EC regulations came into force which required local-loop unbundling, and LLU has since been mandatory under European Community law. Under German telecommunications law, charges for access to the local network must be cost oriented and must be authorized in advance by BNetzA.

BNetzA also requires that DT provides unbundled access to sub-loops and wholesale broadband (bitstream) access. In the former case, in addition to mandated access to the street cabinet, DT must provide also duct access and, where duct access is not possible due to capacity reasons, access to dark fibre. Mandated access is also required to FTTH facilities, however, not on a cost orientation basis at this time. While FTTH access prices will be scrutinized by BNetzA to ensure they are not excessive, regulation of FTTH access will be primarily on an *ex post* basis at this time.⁷³

Access & Interconnection Costing Approach

As noted, in 1997, DT was first required to provide alternative operators with unbundled access to the local loop, the German regulator at the time decided to use a "bottom-up" LRIC (or BU-LRIC) costing approach for setting rates. Version 1.0 of the BU-LRIC model was developed by an external consultancy group, WIK-Consult (WIK). Through a follow-up consultation process conducted by RegTP, WIK ultimately developed a revised Version 2.0 of the analytical cost

⁷³ http://www.bundesnetzagentur.de/cln_1932/SharedDocs/Pressemitteilungen/EN/2011/110125RegulatoryConditionsLastMile.html?nn=214432.

model in 2000.⁷⁴ The Version 2.0 BU-LRIC model was used in 2000 and subsequent years for setting various wholesale service rates.

In broad terms, the WIK BU-LRIC model establishes the costs of the network infrastructure with reference to the elements used.⁷⁵ It breaks down DT's telecom network into elements defined by their function, for instance, switching and transmission.

In costing network access services, two key assumptions are made: either the individual services correspond directly to network elements or the costs can be arrived at by adding the costs of the different elements used. This element based charging (EBC) approach allows the costs of services to be linked transparently to the required functionally defined network elements.

Provided the use of network elements by different services stems from the same cost driver, the incremental costs of the element can be allocated to the services in the same way. Under the EBC approach, fixed costs caused by indivisibilities, for instance the costs of an exchange's central processing units or the costs of trenches, are split among the services, following the principle of causation as allocable costs of the element.

The Version 2.0 BU-LRIC model was based primarily on copper local access network technology which was predominant at the time. The model uses a forward-looking costing approach, based on current costs, and is designed to model costs as would be incurred by an efficient operator.⁷⁶ It relies on a "scorched-node" modeling approach – i.e., it takes DT's core network design as given and then adjusts the node structure, as necessary, to maximize efficiency. The cost model has been used by BNetzA to set LLU as well as interconnection rates.

In 2010, WIK developed an updated version of the BU-LRIC model (i.e., Version 2.1) which takes into account the growing use of fibre technologies (FTTx) as well as IP technology in the network core. The updated model is used to set charges for LLU, wholesale broadband access as well as interconnection services. Following a public consultation process, WIK produced the final Version 2.1 BU-LRIC model for BNetzA in December 2011.⁷⁷

⁷⁴ WIK Consult, Analytical cost model, Access network, Reference Document 2.0, developed for RegTP, November 2000.

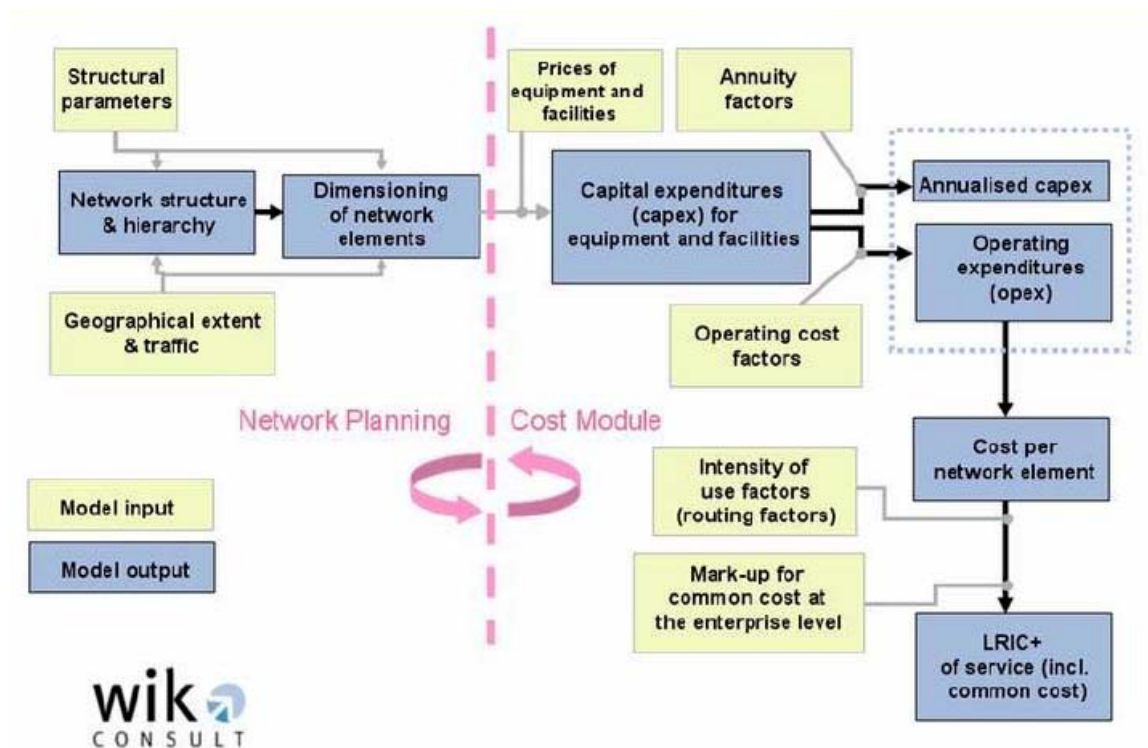
⁷⁵ http://www.bundesnetzagentur.de/cln_1931/EN/Areas/Telecommunications/TelecomsRegulation/AnalyticalCostModel/analyticalcostmodel_node.html

⁷⁶ Details of the Version 2.0 Model are available on BNetzA's website, in German: http://www.bundesnetzagentur.de/cln_1911/DE/Sachgebiete/Telekommunikation/RegulierungTelekommunikation/Kostenmodelle/AnalytKM_Anschlussnetz/AnalytKM_Anschlussnetz_node.html.

⁷⁷ Details of the Version 2.1 Model are available on BNetzA's website, in German: http://translate.google.com/translate?sl=de&tl=en&js=n&prev=_t&hl=en&ie=UTF-8&layout=2&eof=1&u=http%3A%2F%2Fwww.bundesnetzagentur.de%2Fcln_1912%2FDE%2FHome%2Fhome_node.html&act=url.

The following figure provides a general overview of the BU-LRIC modeling approach followed by WIK.

Figure 1: WIK-Consult BU-LRIC Cost Model Overview



The WIK BU-LRIC model has been used for much of the last decade to set LLU rates in Germany. A summary of some historical LLU rates is provided in the following table.

Table 6: Unbundled Local Loop Charges in Germany⁷⁸

Date	Monthly Fee	New Connections (one-off charge)
1998 (March)	€ 10.56	€ 309.84
1999 (February)	€ 12.99	€ 100.50
2001 (March)	€ 12.48	€ 92.59
2003 (April)	€ 11.80	€ 81.12
2009	€ 10.50	€ 36.19
2011	€ 10.20	€ 30.83

⁷⁸ Europe Economics, *Pricing Methodologies for Unbundled Access to the Local Loop*, Final Report, May 2004, page 44 and OECD Communications Outlook 2009 and 2011.

As of 2011, local level interconnection rates were set at 0.54 eurocents for peak periods and 0.38 eurocents for off-peak periods, and the average rate was 0.45 eurocents.⁷⁹

Support Structures⁸⁰

In Germany, mandated access to civil engineering infrastructure applies largely to ducts, and more specifically to provide duct access between the MDF and street cabinet in the case of sub-loop unbundling (FTTC), but not necessarily to the between the street cabinet and the end-user. In effect, duct access is considered as an ancillary service to sub-loop unbundling (which is a mandated service).

As in the case of other cost-oriented mandated wholesale services, BNetzA relies on a BU-LRIC costing methodology, using a CCA asset valuation approach, to set prices for duct access.

Summary

In Germany, the regulator has consistently relied on a BU-LRIC model, using current cost for asset valuation purposes, for pricing LLU and interconnection services. The BU-LRIC model relied on by BNetzA was developed by a third-party consultancy group, with input from interested parties (including DT). The model has been recently updated to reflect the growing use of fibre and IP technologies.

The updated BU-LRIC model is also used to set prices for wholesale broadband access, sub-loops and duct access.

Mandated access is also required to FTTH facilities, however, not on a cost orientation basis at this time. While FTTH access prices will be scrutinized to ensure they are not excessive, BNetzA will regulate FTTH access on an *ex post* basis at this time.

⁷⁹ BEREC, FTR Benchmark snapshot (as of January 2011), BoR (11) 57, 8 December 2011.

⁸⁰ Information in this section based on BEREC, *Annex I to the BEREC Report Next Generation Access – Collection of factual information and new issues of NGA roll-out, Country Case Studies* BoR (11) 06b, February 2011.

3.6 SWEDEN

Background

The Swedish Post and Telecom Authority (PTS) regulates the electronic communications and postal sectors in Sweden. The term “electronic communications” includes telephony (fixed and mobile), internet and radio spectrum.

The primary service provider in Sweden is TeliaSonera (a company formed by merging Telia of Sweden and Sonera of Finland in 2002). On January 1, 2008, TeliaSonera established a separate infrastructure subsidiary, TeliaSonera Skanova Access AB (Skanova).⁸¹ Skanova provides wholesale network infrastructure services, such as copper and fiber-based capacity products to third parties and TeliaSonera.

Skanova is the dominant wholesale network infrastructure service provider in Sweden. It provides infrastructure services on the same commercial terms to both TeliaSonera's own end-customer business in Sweden and to other operators. Skanova is a limited liability company with a board of directors of its own. The company is independent of TeliaSonera's end-customer business.

As noted earlier the EC has issued a directive for a common framework for electronic services. This directive covers access to, and interconnection of, electronic communications networks and associated facilities and further requires each NRA (such as the PTS) to analyze and identify markets in which an operator possesses SMP. Where, following a market analysis, an operator is identified as having SMP in a given market, the NRA must impose obligations on that operator that include providing third party access to various network facilities (including unbundled local loops) as well as providing such services on a cost orientation basis.

According to an EU report,⁸² several PTS decisions have been overruled by the Courts during the past few years. Three PTS orders from 2008 and 2009 aiming at lowering fixed and mobile termination rates were overturned in June 2011 and other regulatory decisions have not yet been settled in the Administrative Court of Stockholm. “Most likely PTS will have to issue new decisions before knowing the outcome in the appeals processes regarding earlier decisions, leading to further regulatory uncertainty.”⁸³

⁸¹ Note that Skanova had previously existed as an in-house wholesale service brand name since 2000. See: <http://www.teliasonera.com/en/about-us/markets-and-brands/sweden/>

⁸² EU “Sweden: Telecommunications Market and Regulatory Developments 2011”, http://ec.europa.eu/information_society/digital-agenda/scoreboard/

⁸³ Ibid.

Public consultations have recently been initiated concerning revisions to the analyses of the wholesale market for (physical) network infrastructure access (including LLU and shared access), as well as for the wholesale market for broadband access. It is expected that these consultations will lead to determinations that should be finalized in 2013.⁸⁴

Costing Approaches

The PTS has adopted a LRIC approach to its costing.⁸⁵ In particular, it adopted a hybrid "top down" and "bottom up" (TD/BU) LRIC model for determining (wholesale) access and interconnection service prices. The model:

- is based on the long run incremental costs for an efficient operator who makes use of modern technology, and
- includes, where appropriate, a mark-up for common costs for an efficient operator under competitive conditions.⁸⁶

The hybrid model is used, together with a pricing methodology approved by PTS, when PTS assesses whether the prices that TeliaSonera applies for interconnection and LLU services (among others) satisfy the EC directive requirement regarding cost orientation. In the Swedish system prices are defined during the supervision procedure phase. Following a PTS decision on remedies, a LRIC cost model and price method is posted, and is then applied during the supervision procedure phase, when PTS issues orders or injunctions defining the price.

During the years 2002-2003, PTS with input from operators produced the first version of the hybrid TD/BU LRIC model for calculating the costs of interconnection in the fixed network and LLU. It was completed and approved in December 2003. PTS has updated the hybrid model on a regular basis, with the current version (v7.1) released in December 2009.

According to the PTS Regulations on the LRIC method for the calculation of cost-oriented pricing, PTS shall, at least every three years, review the need to revise the respective hybrid model. PTS shall then take into account, among other things, economic life, required return and the application of new technology.

In April 2011, the PTS made notice of a LRIC cost model affecting fixed call origination and termination, as well as fixed access services (both unbundling

⁸⁴ Ibid.

⁸⁵ Information on the LRIC approach adopted by the PTS is taken from the PTS document DNR 10-420/2.1.2, February 4, 2010 "Draft Model Reference Paper Guidelines for the LRIC Bottom-up and Top-down Models".

⁸⁶ PTSFS 2005:5 PTS Regulation on the LRIC method for the calculation of cost-orientated pricing. It should be noted that the PTS determined that there should be no mark up on the common costs for termination charges.

and wholesale broadband access) with a new methodology to be applied for the calculation of price control remedies on an operator with SMP in a given market.

TeliaSonera (with final PTS approval) is tasked with preparing the underpinnings of the top-down model. PTS (with participation from interested parties) undertakes the development of the bottom-up model.

In general, the purpose of the top-down model is to calculate the LRIC on the basis of the existing network and cost structure of the SMP operator, eliminating inefficiencies and replacing outdated equipment with new, more cost-effective technology.

The purpose of the bottom-up model is to calculate the LRIC on the basis of an efficient network using the newest technology actually employed in large-scale networks. In principle, the bottom-up model should model the network that an efficient operator would build today to meet the forward-looking demand of the SMP operator. The costs (if any) for migrating to the efficient operator from today's operations are not included.

A reconciliation of the two models is undertaken by PTS and used as the basis for the regulator's development of a revised hybrid model. "Reconciliation" in this sense means that the significant differences between the models are identified and assessed and not necessarily that the outputs of the two models be made identical. PTS noted that the two approaches are combined to give a balanced view of what it would cost for an efficient operator of TeliaSonera's size to build and operate a modern network, with the top-down calculations, based on TeliaSonera's actual network, balanced with the more theoretical bottom-up framework.

A more comprehensive description of the PTS LRIC costing is provided in various background documents.⁸⁷ As a general principle, and to the extent practical, costs (both capital costs and operating costs) are allocated to services on the basis of cost causality. This assumes that the network is constructed in an efficient manner and does not, without good, justifiable reasons, separate services such that not all services attract a fair proportion of cost.

Setting charges "based on" (but not "set at") LRIC permits recovery of efficiently incurred common costs. This can be achieved either by usage drivers or via the use of mark-ups, where, for example, the LRIC of each increment is marked up by an equal proportion so as to recover (but not over-recover) the common costs. The PTS models are capable of treating common costs in a number of different ways including, as a minimum, firstly to recover them from the remaining services using the broader core network increment on the basis of usage drivers or mark-

⁸⁷ See PTS February 4, 2010 "Draft Model Reference Paper Guidelines for the LRIC Bottom-up and Top-down Models".

ups, and secondly to exclude them from all price regulated wholesale products and services.

Common costs are typically allocated using usage drivers (where feasible) or some sort of mark-up. The mark-up can vary depending on the product or service under examination.

PTS believes that an estimated nominal pre-tax cost of capital, based on the capital asset pricing model, of 8.2% currently represents the best available estimate of the cost of capital of a Swedish SMP operator. Therefore, this estimate is suggested as an interim cost of capital in the both the bottom-up and the top-down models.

The bottom-up model uses the following key inputs:

- Traffic volumes;
- Equipment prices;
- Utilization rates;
- Quality of service parameters;
- Sharing parameters;
- Key technical input and network design rules;
- Cost of capital;
- Asset lives;
- Price trends; and
- Operating costs.

Wholesale Access

As a regulatory requirement, TeliaSonera must meet all reasonable requests from another operator for access to conventional metal subscriber lines, which refers to the physical connection in the form of a twisted metallic pair local loop connecting the network termination point at the subscriber's premises to cross join or an equivalent connection point in the public telephone network. Access includes the following:

- Full access, allowing the full frequency spectrum of the twisted metallic pair cable is used.
- Shared access, which allows part of the frequency spectrum of the twisted metallic pair cable.
- Collocation and other relevant installations.
- TeliaSonera must meet all reasonable requests from another operator for access to operational support systems, information systems or similar required functions.

The general costing methodology as it is applied to access (as well as most other wholesale services) is described in the previous costing section. For LLU in particular, the PTS has adopted a novel approach whereby fibre and wireless are considered Modern Equivalent Assets (MEA) of copper. The PTS differentiated five geotypes according to differences in population density. For copper, the PTS set a single national price for fully unbundled copper access, which is the average of the costs of deploying fibre (replacement cost) in the most densely populated geotypes. It considered wireless as the MEA for copper in low density areas. For fibre, it proposed access prices differentiated according to each geotype, with some averaging in municipalities which represent more than one geotype.

Remedies established by PTS in 2010 for the regulation of the wholesale market for (physical) network infrastructure access (including LLU and shared access), and the wholesale market for broadband (bitstream) access, have been applied during 2011, based on the revised LRIC model. Considering the wide deployment of the fibre in Sweden, fibre and copper are considered substitutes by PTS, and therefore fibre access is regulated in parallel with copper access. Cable and mobile broadband are not included in the relevant market. The regulations allow the incumbent to charge for fibre based on level of usage.

It should be noted that while costing is accomplished using the hybrid model described earlier, the actual price charged (for fixed network services such as copper loops or dark fibre) is derived from after the cost has been established. The so-called “price-method” provides a degree of flexibility to the incumbent in setting prices.⁸⁸

The current price of a copper LLU is 265 kronor/quarter or roughly 88 kronor monthly.⁸⁹ Using the current exchange rate, the charge amounts to roughly CDN\$13 per month.

The price for fibre access varies according to the length of contract. The quarterly price for a one year contract is between 1.60 and 2.20 kronor per meter (i.e., CDN\$0.24 to \$0.33/m). For a 10 year contract, the price falls to between 1.15 and 1.60 kronor per meter (i.e., CDN\$0.17 to \$0.24/m).⁹⁰

Interconnection

In 2011, PTS issued an injunction to TeliaSonera to lower interconnection rates in its fixed network, effective immediately. The regulator stated that TeliaSonera's current wholesale prices were not cost-oriented. Consequently, PTS calculated cost-oriented prices using its hybrid TD/BU-LRIC model.

⁸⁸ See <http://www.pts.se/upload/Ovrigt/Tele/Bransch/Kalkylarbete%20fasta%20nätet/revidering%202011/10-420-lric-prismetod-fasta-natet.pdf>.

⁸⁹ <https://www.skanova.se/skcons/groups/public/documents/productdocument/ts015612.pdf>.

⁹⁰ <https://www.skanova.se/SKAWEB/Nyheter/Nyheter/index.htm?ssDocName=TS015335>.

For the purpose of modeling interconnection charges, the increments for costing have usually been defined as the entire group of services using the core (or access) network. These services (voice, broadband, leased lines, etc.) include those provided by the incumbent operator as well as those provided by interconnecting operators using the incumbent operator's network. The costs of the network providing this wider group of services are then divided by the total volume of demand (for example, number of subscribers, calls or traffic minutes, gigabytes) in the increment to produce the average incremental cost per unit.

Using the above-noted hybrid LRIC costing approach, the fixed line call termination charge is currently set at 0.0233 kronor per minute.⁹¹

Support Structures

Poles are not prevalent in Swedish urban areas,⁹² so the focus in terms of support structures in Sweden has been on ducts and trenching. However, there is no provision for applying a costing methodology to support structures in Sweden at this time.

Duct access is not regulated. However the incumbent is required to roll out fibre on request if it has available ducts. Legal aspects might be limiting the possibility of leasing ducts without the approval of the land owner. A public consultation began in December 2011 on the wholesale terminating segment of leased lines, which might lead to additional fibre regulation; PTS is in the process of discussing whether the current system designed to prevent excavation-related damage to cables can be developed so as to locate ducts, and coordinate ducting projects, and if so, what initiatives are appropriate in that regard. PTS has also been asked by the government to look at possible business models with broadband ducting, and ways of facilitating increased co-location of ducts.

Summary

Sweden has adopted a hybrid TD/BU-LRIC model to set prices for mandated wholesale access and interconnection services. PTS has adopted a novel approach in this respect for costing purposes in that it treats fibre and wireless as replacement technologies (or MEAs) for copper in high density and low density areas, respectively.

PTS hybrid TD/BU-LRIC has been updated on a regular basis to take into account the ongoing transition from copper to fibre. During this transition, PTS has expanded regulation of access services to include wholesale broadband

⁹¹ <https://www.teliaoperator.se/iccons/groups/public/documents/regulatedproductdocument/ts118458.pdf>.

⁹² According to an analyst at the PTS, poles in urban areas cover only about 7% of the territory covered by trenches/ducts.

(bitstream) access as well as fibre access. The updated hybrid TD/BU-LRIC model has been used to set prices for these services.

As a general observation, however, the LRIC costing approach used by the PTS appears to be quite complex and involves considerable time and resources to prepare and vet. Moreover, it appears to be subject to considerable challenge and appeal to judicial bodies.

As noted, PTS does not regulate support structure prices. However, it is considering options for facilitating access to or collocation of ducts to help promote broadband deployment.

In addition, while not imposed by PTS, TeliaSonera voluntarily chose to functionally separate its wholesale and retail operating arms. Consequently, wholesale services are offered through TeliaSonera's subsidiary, Skanova. Skanova provides infrastructure services on the same commercial terms to both TeliaSonera's own end-customer business and to other operators.

3.6 THE UNITED STATES

Background

In 1996, the US Congress passed the *Telecommunications Act of 1996* (the 1996 Act). One of the key objectives of the 1996 Act was to promote and facilitate competition in the local telecommunication market. In this respect, section 251 of the 1996 Act required incumbent local exchange carriers (ILECs) to provide interconnection services and unbundled network elements (UNEs) to requesting competitive carriers as well as allow resale of their telecommunications services.

The 1996 Act also addressed the need for efficient pricing of UNEs and interconnection. Section 252 of the 1996 Act required that if carriers could agree on such prices voluntarily without government intervention, these agreements could be submitted directly to the States for approval; if the carriers, in voluntary negotiation, could not determine prices, State commissions would have to set those prices.

In August 1996, the Federal Communications Commission (FCC) issued its First Report and Order setting out rules for implementing of the local competition provisions of the 1996 Act.⁹³ The Order specified, among other things, the range of UNEs to be provided by ILECs (which included local loops, switching, interoffice transmission facilities, access to databases and signaling systems and operations support systems), along with interconnection and co-location services.

The FCC also established a common, pro-competition understanding of the pricing standards for interconnection and unbundled elements, resale, and transport and termination to be employed by State regulators.⁹⁴ Under section 251 of the 1996 Act, UNE prices must be based on costs (including a reasonable profit) under the law, and the FCC interpreted that to mean requiring that prices be based on forward-looking economic costs.

Because not every State had the resources to implement the FCC's pricing methodology immediately in arbitration, the FCC established default proxies for State commissions to use when resolving arbitrations (in the period before applying the pricing methodology). In most cases, these default proxies provided price ceilings and allowed a State to select lower prices. Once a State had set prices according to an economic cost study, the defaults ceased to apply.

⁹³ FCC 96-325, In the Matter of Implementation of the Local Competition Provisions in the Telecommunications Act of 1996 and Interconnection between Local Exchange Carriers and Commercial Mobile Radio Service Providers, CC Docket No. 96-98 and CC Docket No. 95-185, *First Report and Order*, 8 August 1996.

⁹⁴ These rules and principles were challenged in the eighth Circuit Court by both state commission and ILEC companies; the challengers won the battle in the Eighth Court, but the FCC brought it to the Supreme Court which resulted in confirmation of the FCC's authority and approach.

In the years following the issuance of the FCC's First Report and Order, the FCC conducted numerous follow-up reviews and implementation proceedings which were aimed at refining the range of UNEs that ILECs would be required to provide at cost-based rates. The FCC's rulings were also subject to numerous court challenges during this period, which ultimately proved largely successful. By 2005, the FCC was reducing rather than expanding UNE obligations.⁹⁵ For instance, the requirement to provide local switching was eliminated by the FCC which in turn eliminated the requirement for ILECs to provide UNE-Platform (UNE-P) services to competitive carriers. UNE-P combined the local loop, local switching and transport network elements and, at the time, represented the most popular means for competitive carriers to enter the local market. The FCC also eliminated the requirement to provide line sharing (i.e., unbundling the high frequency portion of the local loop).⁹⁶

While ILECs must offer unbundled access to stand-alone copper loops and sub-loops for the provision of narrowband and broadband services, they are not required to provide access to unbundled fibre loops or provide wholesale broadband access (e.g., xDSL).

Costing Methodology

In its 1996 First Report and Order, the FCC set out a detailed costing approach for UNEs and interconnection services. The approach adopted Total Element Long Run Incremental Cost (TELRIC) is a forward-looking, incremental cost-based pricing methodology and includes a reasonable allocation of forward-looking joint and common costs.⁹⁷ The FCC does not allow the recovery of embedded costs in excess of economic cost, ILECs' opportunity costs, universal service subsidies or and access charges. In this way, the costing methodology differs somewhat from conventional incremental costing methodologies (where no common costs are included).

The FCC used the term TELRIC for following reasons. The ILECs offerings to be priced using this methodology are "network elements", rather than

⁹⁵ FCC 04-290, In the Matter of Unbundled Access to Network Elements and the Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carrier, Order on Remand, released: February 4, 2005.

⁹⁶ FCC 03-36, In the Matter of Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers, Implementation of the Local Competition Provisions of the Telecommunications Act of 1996 and Deployment of Wireline Services Offering Advanced Telecommunications Capability, Report and Order and Order on Remand and Further Notice of Proposed Rulemaking, released: August 21, 2003

⁹⁷ The details of the FCC's TELRIC model are set out in detail in FCC 96-325, In the Matter of Implementation of the Local Competition Provisions in the Telecommunications Act of 1996 and Interconnection between Local Exchange Carriers and Commercial Mobile Radio Service Providers, CC Docket No. 96-98 and CC Docket No. 95-185, *First Report and Order*, 8 August 1996.

"telecommunications services," as defined in the 1996 Act. More fundamentally, the FCC decided that TELRIC-based pricing of discrete network elements or facilities, such as local loops and switching, is likely to be much more economically rational than "Total Service" LRIC (TSLRIC) based pricing of conventional services, such as interstate access service and local residential or business exchange service.

Separate services are typically provided over shared network facilities, the costs of which may be joint and common with respect to some services. The costs of local loops and their associated line cards in local switches, for example, are common with respect to interstate access service and local exchange service, because once these facilities are installed to provide one service they are able to provide the other at no additional cost. By contrast, the network elements largely correspond to distinct network facilities.

Therefore, the amount of joint and common costs that must be allocated among separate offerings (i.e. unbundled elements) is likely to be much smaller using a TELRIC methodology than a TSLRIC approach that measures the costs of conventional services. Because it is difficult for regulators to determine an economically-optimal allocation of any joint and common costs, pricing elements, defined as facilities with associated features and functions, is more reliable from the standpoint of economic efficiency than pricing services that use shared network facilities. In addition, TELRIC attempts to capture the cost, on average, for an efficient firm with the latest technology. Accordingly, there is no use of "historic" cost information.

Initial local loop default proxy price ceilings for local loops were set by the FCC in 1996 for each State.⁹⁸ They ranged from a low of \$9.83 for the State of Massachusetts to a high of \$25.36 for the State of North Dakota. The average was \$16.36. In the case of interconnection, the FCC set a default proxy price range for unbundled local switching of between 0.2 cents and 0.4 cents per minute of use.⁹⁹ Moreover, based on the range of evidence at the time, the FCC considered the lower end of this range to be a reasonable default proxy.

However, as noted above, the FCC set general directions for costing related to access and interconnection. In practice each State will set prices for wholesale unbundled loops and related services.

The FCC's advice to State regulatory agencies on the allocation of forward looking shared and common costs was to use percentage mark-ups over directly attributable costs. Further, they suggested that there be relatively low mark-ups on certain critical network elements, such as the local loop and co-location (i.e. that are most difficult for entrants to replicate quickly). In practice, there does not appear to be any consistency in the mark ups used by State regulators.

⁹⁸ FCC 96-325, op cit., Appendix D.

⁹⁹ Ibid., para 811.

However, mark ups generally fall in the range of between 15% and 35% although higher mark ups have been approved on rare occasions.¹⁰⁰

Prices set for local loops vary widely across different states. In general, a state will have anywhere between 3 and 5 “density” zones for the setting of local loop prices.¹⁰¹ A comparison of rates unbundled local loop rates across several US States is provided in the following table.

**Table 7: Unbundled Local Loop Prices by State (Sample)
(Rate in US\$ and by Density Zone as of March, 2006)**

State	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Arizona (QW)	9.05	14.84	36.44		
California (SBC)	9.48	12.79	26.43		
Connecticut (SBC)	14.41	14.41	14.41		
Florida (BS)	10.69	15.20	26.97		
Louisiana (BS)	12.90	23.33	48.43		
Minnesota (QW)	5.84	8.95	10.62	15.66	
Montana (QW)	23.10	23.90	27.13	29.29	
Nebraska (SBC)	11.77	22.64	66.25		
New York (VZ)	7.70	11.31	15.51		
Washington (QW)	11.27	13.63	16.92	28.23	67.77
West V (VZ)	14.49	22.04	35.00	43.44	

Source: *A Survey of Unbundled Network Element Prices in the United States*, B. J. Gregg, Public Service Commission of West Virginia, March 2006.

The average unbundled local loop price in the US in 2006 was US\$13.70 per month.¹⁰²

Support Structures

Section 224 of the *Communications Act* (the Act) authorizes the FCC to adjudicate pole attachment disputes (other than in states which regulate such matters themselves¹⁰³). In 1996, the Act was amended to expand the definition of pole attachments to include ducts, conduits, or rights-of-way owned or controlled by a utility.

In the case of pole attachments, for instance, the Act specifies that pole attachment rental charges should be deemed just and reasonable if they ensure that a utility recovers no less than the additional costs of providing pole attachments and no more than an amount determined by multiplying the

¹⁰⁰ It is worth noting that the National Regulatory Research Institute has recently initiated an exercise to gain further clarification on the specific mark ups used in State jurisdictions for local loops as part of its “Knowledge Communities” initiative.

¹⁰¹ Most States typically employ three geographic zones.

¹⁰² B. J. Gregg, *A Survey of Unbundled Network Element Prices in the United States*, Public Service Commission of West Virginia, March 2006.

¹⁰³ Roughly 21 states currently regulate pole attachment rates themselves at this time.

percentage of the total usable space which is occupied by the pole attachment by the sum of the operating expenses and actual capital costs of the utility attributable to the entire pole. In other words, the Act defines lower and upper bounds for pole attachment rental charges – i.e., (i) the utility's incremental costs and (ii) the user's share of the utility's fully allocated costs, respectively.

In implementing this approach, the FCC has established a "zone of reasonableness" for pole attachment rates (i.e., bookended by the above-noted lower and upper bounds). The FCC considers incremental costs to consist of those costs that the pole owner would not have incurred but for the requested attachments. And the FCC considers fully allocated costs to be the utility's operating expenses and capital costs of owning and maintaining poles, including depreciation, taxes, administrative expenses, maintenance expenses, and a return on investment.

In practice, the FCC has focused on setting a price formula that falls within the defined zone of reasonableness to establish a maximum allowable pole attachment rate. The per pole price formula effectively includes cost incremental costs of pole attachments plus a contribution to capital costs. It is based on a "usable space" factor and cost estimate (i.e., maintenance, administrative and carrying charges per pole), with different rates set for urban and non-urban areas.

In 2011, as part of its National Broadband Plan, the FCC made a revision the price formula applicable to pole attachments and, in the process, effectively reduced the rates to help promote the deployment of broadband services.¹⁰⁴ The revised formulas used to set attachment poles rates in this respect are described the FCC's decision in its recent Section 224 implementation decision.¹⁰⁵

Summary

In the US, the FCC has used a TELRIC costing approach to set default price ceilings for unbundled local loops and interconnections services. However, in practice, individual State regulators can set wholesale prices themselves using cost models of their choice generally subject to the provision that approved rates are less than FCC determined rate ceilings.

In the case of support structures, it has set proxy price ceilings which effectively fall between incremental cost and FAC (which a usable space model used to determine an attacher's share of the FAC in the latter case). Here again, State regulators may choose to adopt alternative costing approaches, but would be subject to the ceilings established by the FCC's methodology.

¹⁰⁴ FCC, *In the Matter of Implementation of Section 224 of the Act, A National Broadband Plan for Our Future*, WC Docket No. 07-245, Report and Order And Order on Reconsideration, Released: April 7, 2011.

¹⁰⁵ *Ibid.*, Appendix A.

Over the last decade, the range of mandated wholesale services in the US has shrunk rather than expanded. For instance, there is no FCC requirement for ILEC's to offer wholesale broadband services or fibre access to competitive carriers. Consequently, costing methodologies arising from the transition from copper to fibre facilities is of more limited concern in the US compared to the other countries surveyed for this study.

4.0 COMPARATIVE ANALYSIS

In this section we provide a summary and analysis of mandated wholesale service costing methodologies for the surveyed countries, and also compare them with current Canadian practice. Each of the three wholesale service categories considered is reviewed in turn – i.e., access, interconnection and support structure services.

Before turning to the analysis, by way of background, we note that the incumbent operators subject to wholesale service obligations included in our survey vary considerably in terms of scale. Some of the major incumbent carriers in the US (e.g., AT&T and Verizon) are by far the largest of the group with revenues of over \$100 billion each. Telstra, France Telecom, DT and BT are comparable in scale with revenues of between \$25 and \$35 billion. All of these incumbent carriers are however considerably larger than Canada's two biggest ILECs, Bell Canada and TELUS who have revenues of roughly \$20 and \$10 billion, respectively. On the other hand, TeliaSonera's Swedish operations are only roughly half the scale of those of TELUS on a revenue basis at just over \$5 billion.

Table 8 – Revenues of Incumbent Carriers by Surveyed Country
(Calendar Year 2011 or Fiscal Year 2011-12)

Country	Incumbent Carrier(s)	Revenues (local currency, billions) *	Revenues (Canadian currency, billions) **
Australia	Telstra	AUD\$ 25.3	\$ 25.9
France	France Telecom (Orange)	€ 21.6	\$ 27.5
Germany	Deutsche Telekom (DT)	€ 26.4	\$ 33.7
Sweden	TeliaSonera	SEK 36.1	\$ 5.3
UK	BT	£19.3	\$ 30.4
US	AT&T	USD\$ 126.7	\$ 123.0
	Verizon	USD\$ 110.9	\$ 107.7
Canada	Bell Canada		\$ 19.5
	TELUS		\$ 10.4

Notes: * Total country-specific company revenues from company financial reports.

** Conversion to Canadian dollars based on current exchange rates (Source: www.xe.com).

While the sample of countries is too small to draw any definitive conclusions, there does not appear to be any obvious relationship between size of the regulated carrier and the wholesale obligations (including costing methodology) that have been adopted in the countries we have surveyed.

Wholesale Access Services

A summary of the costing approaches for copper ULLs for the surveyed countries is provided in Table 10 below. For comparative purposes, we have also included Canada in the table.

The comparative factors taken into account include:

- i) Pricing principle
- ii) Asset (local loop) valuation or cost base (e.g., HCA, CCA, hybrid)
- iii) Costing methodology (e.g., FAC, LRIC, bottom-up, top-down)
- iv) Year the current cost model adopted
- v) Whether wholesale access services are provided through a functionally/structurally separate entity
- vi) Whether annual price controls or caps are applied to wholesale service prices
- vii) Current or latest available monthly rate for copper unbundled local loops (in domestic and Canadian currency)
- viii) Previous costing methodology(s) where applicable

As indicated in Table 10, with respect to copper ULLs, all of the surveyed countries follow either a cost-oriented or cost-based approach to setting ULL rates. Despite the difference in terminology, there is no practical difference in intent in this case.

In terms local loop asset valuation, two primary approaches have been adopted in the case of the surveyed countries. In Australia and the UK, a hybrid HCA/CCA approach is followed. In Australia's case, the resulting regulated asset base can be updated annually using cost inflation adjustments. On the other hand, CCA-based valuation approaches are followed in France, Germany and the US. In Sweden, a unique variation on this approach is followed. It employs a MEA valuation approach under which fibre is considered the modern equivalent to copper in high-density areas and wireless is considered the modern equivalent to copper in low-density areas.

Consequently, most of countries surveyed tend rely on CCA valuation approaches, with two relying on hybrid HCA/CCA approaches. It is worth noting in this respect that in Europe the most common local loop valuation approach by far is CCA.¹⁰⁶

In terms of costing methodology, there is an even split between FAC and LRIC approaches in the surveyed countries. Australia, the UK and France rely on top-down FAC methodologies. Germany, Sweden and the US, on the other hand,

¹⁰⁶ BEREC, Regulatory Accounting in Practice 2011, BoR (11) 34, October 2011, page 22, reports that 16 out of the 22 surveyed EU Member States use CCA for ULL cost base valuation purposes.

rely on LRIC methodologies. In Sweden's case, a top-down reconciliation process is undertaken as well.

In Europe, more generally, a slim majority of countries rely on LRIC rather than FAC methodologies for ULL costing purposes.¹⁰⁷

Of the six surveyed countries, only two apply annual price controls or caps to ULL rates: Australia and the UK.

By way of comparison, Canada's Phase II costing approach for ULLs differs from those surveyed in that a HCA approach, based on net book value (NBV), is used for local loop valuation purposes.¹⁰⁸ The Phase II costing methodology is a forward-looking LRIC methodology based on estimates (over a multi-year period) future revenue and cost streams associated with the service in question. In general terms, it is comparable to the LRIC approaches followed in many other countries (including three of the six countries we surveyed).

For the surveyed countries, current or most recently available ULL rates vary to a considerable degree. As shown in Table 10, the highest ULL rate is \$17.17 in Australia and the lowest rate is \$11.22 in France. The simple average of the surveyed countries is just over \$13.

Bell Canada's current ULL rates are also included in the table for comparative purposes. They range from \$6.75 (Band A), \$15.42 (Band C) to \$28.40 (Band E). While the rates are all broadly consistent, comparing rates across jurisdictions is obviously complicated by many factors, including differences in population density, geography, network configuration and modeling assumptions.

Changes in Methodology Over Time

Three of the six surveyed countries have made significant changes in the cost methodology they use for ULLs: the UK, France and Australia. In 2005, both the UK and French regulators shifted from LRIC to a FAC methodologies. In the UK, Ofcom justified the shift to FAC due to concerns with the complexities of the LRIC approach and "low visibility" into the LRIC costing approach used by BT at the time. In France, ARCEP came to a similar conclusion. More recently, in 2011, ACCC in Australia justified moving away from its former LRIC costing methodology for a variety of reasons, including (i) the fact that continual revaluation of network assets created pricing uncertainty and risked over/under recovery of costs, (ii) use of forward-looking costs required use of debatable MEA asset valuation considerations and (iii) the cost of bypassing incumbent's

¹⁰⁷ Ibid. BEREC reports that 13 out of 22 surveyed EU Member States currently is the LRIC methodology for costing LLUs.

¹⁰⁸ See, for example, Telecom Decision CRTC 2011-24, *Bell Aliant Regional Communications, Limited Partnership and Bell Canada – Monthly recurring rates and service rates for unbundled loops in Ontario and Quebec*, 12 January 2011.

copper access network was rising not falling, consequently the likelihood of replication has also fallen. As a result, it appears that these three countries moved to a FAC costing methodology to largely reduce complexity and uncertainty.

In the case of Germany and Sweden, while there has been no change in the methodology employed, both have modified their BU-LRIC costing approaches over time. In Germany's case, the BU-LRIC model was recently upgraded to take NGN facility deployments into better account. In Sweden, the BU-LRIC model was modified to include fibre and wireless technologies as MEAs for copper. Both of these approaches, however, appear to be relatively complex in practice. Indeed, in Germany's case, the BU-LRIC model has been developed and modified over time by an independent third-party consultancy group.

No changes have been adopted in the US, where the FCC has retrenched from wholesale access regulation compared to the regulators in the other surveyed countries.

One other notable distinction in regulatory approaches among the surveyed countries is that three of the six countries have implemented some form of structural or functional separation in recent years. In Australia, fibre, wireless and satellite-based NGN facilities are being deployed by NBN Co, which is structurally separate from Telstra. NBN Co provides regulated wholesale NGN access facilities to carriers in Australia, including Telstra. In the UK and Sweden, functional separation has been implemented through which Openreach in the UK and Skanova in Sweden provide wholesale access to both copper and fibre access facilities. While structural or functional separation in and of itself has little, if any, impact on the choice and implementation of costing methodology, it does have the effect of ensuring competitive carriers, including the incumbent, obtain access to wholesale facilities and services on transparent equivalent commercial terms and conditions.

Transitional Issues

All of the countries surveyed are seeking to facilitate and promote deployment of NGN facilities to the greatest and fastest degree possible. Consequently, a key concern is the potential impact of wholesale copper access pricing on incentives to deploy fibre access facilities.

As noted in Section 3.2 above, the EC is currently conducting a consultation on this question. Among other things, the EC cited concerns with CCA and MEA approaches to the valuation of copper and duct assets given that these assets are effectively non-replicable and, therefore, in its view should be valued on a HCA basis. In addition, it raised the issue of the need for a risk premium for fibre assets.

Table 10: Unbundled Local Loop (ULL) Costing Methodology Summary

Country	Pricing Principle	Asset Cost Base	Costing Methodology	Year Adopted
Australia	Cost Orientation	Hybrid HCA/CCA Regulatory Asset Base (RAB) model	FAC (top down) Building Block Model (BBM)	2011
UK	EC Cost Orientation	Hybrid HCA/CCA Regulatory Asset Value (RAV) model	FAC Model (top down)	2005
France	EC Cost Orientation	CCA	FAC Model (top down)	2005
Germany	EC Cost Orientation	CCA	BU-LRIC (Third-party model)	2010
Sweden	EC Cost Orientation	MEA (with fibre/wireless as MEAs in high/low-density areas, resp)	BU-LRIC (with top-down reconciliation)	2009
US	Cost-based	CCA	TELRIC (FCC sets default proxy, States can use own model)	1996
Canada	Cost-Based	HCA (NBV)	Phase II (LRIC)	1979

**Table 10: Unbundled Local Loop (ULL) Costing Methodology Summary
(continued)**

Country	Structural /Functional Separation	Price Controls/ Caps	Domestic Price (monthly)	Price CDN\$ (monthly)*	Previous Costing Approach
Australia	Yes Structural (2012)	Yes	\$16.75 (high-density)	\$17.17	LRIC+ and in some cases RMRC
UK	Yes Functional (2005)	Yes	£7.20	\$11.34	LRIC
France	No	No	€8.80	\$11.22	LRIC
Germany	No	No	€10.20	\$13.00	Updated in 2010 to reflect NGN changes
Sweden	Yes Functional (2008)	No	88 kr	\$13.02	Updated on a regular basis
US	No	No	\$13.70 (2006 average)	\$13.30	
Canada	No	No	Bell Canada Band A = \$6.75 Band C = \$15.42 Band E = \$28.40		Modified over time

* CDN\$ figures based on current (September 2012) exchange rates (source: www.xe.com)

In the surveyed countries, some changes to costing methodologies to address copper to fibre transition related issues have been made. Australia, for one, made significantly changes its costing approach by shifting from a LRIC to FAC based on a hybrid HCA/CCA asset base approach for ULLs. Similar changes in methodology were adopted in the UK and France (although France continues to rely on a CCA asset valuation approach). Germany has updated its BU-LRIC model to reflect the increased deployment of NGN facilities. Sweden has also updated its BU-LRIC model, which included the adoption of a new MEA asset valuation approach. However, the Swedish MEA asset valuation approach does not appear to conform to the EC's recommendations in this respect.

It is important to recognize that fibre access deployments remain relatively limited at this point in time in the surveyed countries. In fact, regulators in most of the surveyed countries do not currently regulate the price of fibre access facilities. While access to fibre may be mandated in some cases, such as the UK and Germany, the fibre access prices are not set by the regulator. Consequently, no costing methodology has as of yet been adopted for unbundled fibre access. In France and the US, unbundled fibre access is not mandated. In contrast, in Australia and Sweden access to fibre is both mandated and subject to cost-oriented price regulation. However, in both of these cases, the wholesale fibre services are provided through a structurally or functionally separate wholesale service provider. While the regulators in these cases (i.e., ACCC and PTS) plan to apply the same costing methodologies used for copper access pricing for fibre as well, they are yet to set final price ceilings for fibre access services. Nevertheless, wholesale fibre access services are available in both of these countries at this time (through NBN Co and Skanova) and the associated prices have been set on a preliminary basis.

It should be noted as well, that in France's case, it is considering measures to stabilize copper ULL prices by effectively offsetting price changes that might otherwise occur from declining demand for copper access.

Interconnection Services

A summary of the costing approaches for interconnection (PSTN OTA) services for the surveyed countries is provided in Table 11 below. For comparative purposes, we have once again included Canada in the table.

The comparative factors taken into account include:

- i) Asset valuation or cost base (e.g., HCA, CCA, hybrid)
- ii) Costing methodology (e.g., FAC, LRIC, bottom-up, top-down)
- iii) Year the current cost model adopted
- iv) Whether annual price controls or caps are applied to wholesale service prices

- v) Current or latest available monthly rate for copper unbundled local loops (in domestic and Canadian currency)

In terms of asset valuation, all of the surveyed countries use a CCA-based valuation approach or variant thereof. Australia used a hybrid HCA/CCA approach; however, it appears that the HCA component relates more so to copper access than switching facilities. Otherwise, the UK, France, Germany and Sweden have all made modifications to their respective cost models to reflect NGN network upgrades. It is worth noting that the CCA approach is also by far the most widely used for costing OTA services in Europe.¹⁰⁹

In terms of costing methodology, the same general approaches that apply in the case of copper ULLs also apply for interconnection services in the six surveyed countries. Three of the six countries rely on top-down FAC cost models (i.e., Australia, the UK and France), while the remaining three rely on LRIC models (i.e., Germany, Sweden and the US). In this case, it is also worth noting that LRIC is the most widely used for costing methodology for OTA services in Europe.¹¹⁰

Of the six surveyed countries, only two apply annual price controls or caps to interconnection rates: Australia and the UK.

Canada's asset valuation approach in this case is also similar to the CCA approach used by the surveyed countries (i.e., use of current costs based on the most efficient technology). The Phase II costing approach is also consistent the LRIC approach used by half of the surveyed countries as well as the majority of EU Member States.¹¹¹

The current or most recently available per minute rates for fixed call termination service vary considerably. The highest rate is 1¢/min which is found in Australia, while the lowest rate is 0.1¢/min which is found in France. The simple average for the surveyed countries is 0.4¢/min.

For Canada, we included the current direct connect rate for Bell Canada which 0.1¢/min. This is the same rate found in France, but is otherwise well below the average fixed termination rate for the six surveyed countries. Once again, it is difficult to directly compare rates across countries due to differences in network configuration and costing assumptions and methodologies.

¹⁰⁹ Ibid. BEREC reports that 17 out of 22 surveyed EU Member States currently is the CCA valuation for costing fixed call termination services.

¹¹⁰ Ibid. BEREC reports that 14 out of 20 surveyed EU Member States currently is the CCA valuation for costing fixed call termination services.

¹¹¹ See, for instance, Telecom Decision CRTC 2006-23, *Aliant Telecom, Bell Canada, MTS Allstream, SaskTel and TCI - Approval of rates on a final basis for Direct Connection service*, 27 April 2006.

**Table 11: Interconnection (Originating and Terminating Access)
Costing Methodology Summary**

Country	Asset Cost Base	Costing Methodology	Year Adopted	Price Controls/ Caps	Termination Domestic Price (per min)	Termination Price CDN\$ (per min)*
Australia	Hybrid HCA/CCA Regulatory Asset Base (RAB) model	FAC (top down) Building Block Model (BBM)	2011	Yes	1.0 ¢	1.00 ¢
UK	CCA (NGN-based)	FAC Model (top down)	2009	Yes	0.160 p	0.25 ¢
France	CCA (pure NGN)	FAC Model (top down)	2011	No	0.08 ec	0.10 ¢
Germany	CCA (NGN-based)	BU-LRIC (Third-party model)	2010	No	0.45 ec	0.57 ¢
Sweden	CCA (NGN-based)	BU-LRIC (with top-down reconciliation)	2011	No	0.023 kr	0.34 ¢
US	CCA (forward looking)	TELRIC	1996	No	0.20 ¢ (1996)	0.19 ¢
Canada	CCA (forward looking)	Phase II (LRIC)	1979	No	Bell Canada DC Rate 0.10 ¢	

* CDN\$ figures based on current (September 2012) exchange rates (Source: www.xe.com)

Support Structure Services

A summary of the costing approaches for support structure services for the surveyed countries is provided in Table 12 below. As with the preceding tables, for comparative purposes, we have also included Canada.

The comparative factors taken into account include:

- i) Regulatory approach
- ii) Asset cost base
- iii) Costing methodology
- iv) Support structure services subject to regulatory oversight

Regulation of support structures has been long standing in US and Australia. However, whereas the FCC (and State regulators) has played an active role in establishing price ceilings for support structures, the Australian regulator serves as an arbitrator in the case of support structures and, therefore, intervenes only in situations where commercial negotiations fail. The situation in Canada is

comparable to the US. Access to support structures has been regulated for decades in Canada.

In contrast, mandated access to and regulation of support structures is a very recent phenomenon in the UK, France and Germany, one that resulted from the EC's NGA Recommendation. The main focus in these countries has been access to ducts (although in the UK and France, access to poles is also covered). On the other hand, Sweden does not regulate access to ducts at this time. However, Sweden is currently considering means of facilitating duct sharing and co-location.¹¹²

The UK, France and Germany are still in the initial stages of implementing costing methodologies to support the pricing of support structures. It appears that each intends to rely on a CCA approach for valuing the underlying assets. As well, both the UK and Germany intend to rely on a LRIC methodology for costing purposes, whereas France intends to use a FAC methodology (consistent with the costing approaches each uses for ULLs and interconnection services).

Ofcom has indicated that it is considering implementing risk adjusted support structure rates which would vary for legacy and NGN related infrastructure. In particular, it has suggested that three distinct risk categories could be established:

- Existing legacy infrastructure used for current generation services for which demand is well established and therefore investment risk is low;
- New infrastructure constructed solely for current generation services. for which demand is well established and investment risk is low; and
- New infrastructure constructed for NGA services for which in the short term at least demand is uncertain and therefore investment risk is higher.

Ofcom is yet to finalize how rate differentials would be set on this risk-adjusted basis. However, we note that this proposal appears to be contrary to the EC's NGA Recommendation which stated that the risk profile for civil engineering infrastructure should be no different than for copper infrastructure.

In the US, the FCC has provided a costing framework for setting a zone of reasonableness for support structure prices, including poles and ducts. It takes in account both LRIC and FAC costing methodologies (lower and upper bounds,

¹¹² It is worth noting that a significant majority of EU Member States (i.e., 20 of 29) impose some form of regulatory measure(s) on support structures access (covering primarily ducts). See BEREC, BEREC Report on the Implementation of the NGA-Recommendation, BoR (11) 43, October 2011.

respectively), with the latter based on HCA asset valuation as well as occupied usable space.

As part of its National Broadband Plan, the FCC recently made revisions to the pricing formula for support structures for the purpose of reducing the price ceilings in order to lower costs for access seekers and thereby help promote the deployment of broadband services.

Canada follows a pricing approach for support structures that is similar to that of the US. It is a Phase II (LRIC) based approach which includes a mark-up or contribution to fixed structure costs, where asset values are based on a HCA approach.¹¹³

Consequently, while countries such as the UK, France and Germany are in the initial stages of regulating support structures, including developing costing methodologies for pricing purposes, such measures have been in place for decades in Canada and the US. In the UK, France and Germany, as in Europe more generally as a result of the EC's NGA Recommendation, there has been increased focus on introducing regulatory measures relating to support structures in order to help facilitate the deployment of NGA facilities by competitive carriers.

Table 12: Support Structure Services Regulatory Approaches

Country	Regulatory Approach	Asset Cost Base	Costing Methodology	Services Covered
Australia	Access Dispute Arbitration	NA	NA	Poles, Ducts
UK	Cost Orientation	CCA	LRIC (Risk adjusted)	Poles, Ducts
France	Cost Orientation	CCA	FAC Model	Poles, Ducts
Germany	Cost Orientation	CCA	BU-LRIC	Ducts
Sweden	Not regulated	NA	NA	NA
US	Cost-based, zone of reasonableness	HCA	LRIC/FAC (Usable space based allocation)	Poles, Ducts
Canada	Cost-based	HCA	Phase II (LRIC) (Usable space based allocation)	Poles, Ducts

¹¹³ See, for instance, Telecom Decision CRTC 2010-900, Review of the large incumbent local exchange carriers' support structure service rates, 2 December 2010.

Summary

In our review of the six surveyed countries, it is clear that the on-going regulation of wholesale services is a well-accepted practice. More specifically, all regulators that we surveyed require regulatory-administered costing processes for key services (such as copper access and interconnection).

There does not appear to be an obvious “best” costing methodology – each country has tackled the problem in a manner that best reflects the unique circumstances of the country, including taking account of data availability, structural industry parameters, and competitive objectives.

ACRONYM LIST

ACCC	Australian Competition and Consumer Commission
ARCEP	French Electronic Communications and Postal Sector Regulator
BNetZa	German Bundesnetzagentur (Federal Network Agency)
BU-LRIC	Bottom-Up Long-Run Incremental Cost
CCA	Current Cost Accounting
FAC	Fully Allocated Cost
FAD	Final Access Determination (issued by ACCC)
FCC	US Federal Communications Commission
FTTC	Fibre-to-the-Cabinet/Curb
FTTH	Fibre-to-the-Home
FTTN	Fibre-to-the-Node
HCA	Historical Cost Accounting
LBAS	Local Bitstream Access Service
LCS	Local Carriage Service
LLU	Local Loop Unbundling
LRAIC	Long Run Average Incremental Cost
LRIC	Long-Run Incremental Cost
LRIC+EPMU	Long-Run Incremental Cost with Equal Proportionate Mark-Ups for Common Costs
LSS	Line Sharing Services
MEA	Modern Equivalent Assets
MPF	Metallic Path Facility (Local Loop Unbundling)

NCC	Network Charge Control
NGA	Next Generation Access
NGN	Next Generation Network
NRA	National Regulatory Authority
Ofcom	UK Office of Communications
OTA	Originating and Terminating Access
PIA	Physical Infrastructure Access
POI	Point of Interconnection
PSTN	Public Switched Telephone Network
PTS	Swedish Post and Telecom Authority
RAB	Regulatory Asset Base
RMRC	Retail Minus Retail Costs
SMP	Significant Market Power
SMPF	Shared Metallic Path Facility (Local Loop Unbundling)
TD-LRIC	Top-down Long-Run Incremental Cost
TELRIC	Total Element Long Run Incremental Cost
TSLRIC	Total Service Long-Run Incremental Costs
ULLS	Unconditioned Local Loop Service
VULA	Virtual Unbundled Local Access
WACC	Weighted Average Cost of Capital
WLR	Wholesale Line Rental