

ONTARIO ENERGY BOARD

EB-2014-0116

IN THE MATTER OF the Ontario Energy Board Act, 1998, S.O. 1998, c.15, (Schedule B);

AND IN THE MATTER OF an application by Toronto Hydro-Electric System Limited for an order approving just and reasonable rates and other charges for electricity distribution to be effective May 1, 2015 and for each following year effective January 1 through to December 31, 2019.

Expert Report

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1 Introduction

1.1 Toronto Hydro's Application for Revision of the Regulated Wireline Pole Attachment Rate

1. Toronto-Hydro Electric System Limited ("Toronto Hydro"), a local electric distribution company owned by the City of Toronto, is required to provide Canadian telecommunication carriers and cable operators access to its network of utility poles for wireline attachments at a regulated rate. The regulated rate for a utility pole attachment has previously been set by the Ontario Energy Board ("Board") in its decision RP-2003-0249 ("CCTA Decision") at \$22.35 per year.¹
2. Toronto-Hydro has applied for a revision of the regulated wireline pole attachment rate through its *Custom Incentive Rate-setting ("Custom IR") Application for 2015-2019 Electricity Distribution Rates and Charges*.²
3. I have been retained by counsel to Rogers Communications Partnership, Cogeco Cable Inc. on behalf of itself and its affiliates, including Cogeco Cable Canada LP and Cogeco Data Services Inc., Allstream Inc., and TELUS Communications Company and its affiliates (the "Carriers"), to provide an economic analysis of the principles of common cost allocation used to price pole access for wireline attachments.

1.2 Summary of Conclusions

4. Based on my expertise, my review of the economic literature, and my examination of past regulatory decisions, I have reached the following conclusions:
 - Equal sharing of common costs is not an appropriate methodology for allocating common costs to set regulated rates for wireline pole attachments and has no basis in principles of economic efficiency.
 - The appropriate methodology of allocating common costs between two or more uses that can be defended as economically efficient is somewhere between incremental cost and a version of fully distributed cost in which the cost shares are based on the proportionate use, or demands, made on the common capital input. The latter fully distributed cost (FDC) pricing methodology is grounded in sound economic principles and is a methodology widely used by regulators in North America for allocating common capital costs between different users (or different products).

¹ *In the Matter of an Application pursuant to section 74 of the Ontario Energy Board Act, 1998 by the Canadian Cable Television Association for an Order or Orders to amend the licenses of electricity distributors*, Decision and Order, RP-2003-0249, March 7, 2005 ("CCTA Decision").

² *In the Matter of an Application by Toronto Hydro-Electric System Limited for an Order or Orders approving or fixing just and reasonable rates and other service charges for the distribution of electricity as of May 1, 2015*, Wireline Pole Attachments Update, EB-2014-0116, Exhibit 8, Tab 2, Schedule 1, Appendix B, p. 1, Filed: July 31, 2014, Corrected: March 12, 2015.

1.3 Background and Qualifications

5. I am a Full Professor of Economics at Queen's University, Kingston, Ontario. I have held full-time faculty positions for 35 years at the University of Toronto and Queen's University, and a visiting position at the University of California, Berkeley from 1987 to 1988. I have a Ph.D. in Economics from Queen's University.
6. I am an economist specializing in industrial organization and public economics. I have published many articles in the area of Industrial Organization and Competition Policy, and co-authored *Industrial Organization: A Strategic Approach*, a major textbook on the economics of industrial organization, much of which is devoted to antitrust economics and regulation.³ I teach three or four courses each year at both the undergraduate and graduate level, covering the Economics of Regulation and Industrial Organization. From 1993 to 1994, I held the T.D. MacDonald Chair at the Competition Bureau, and provided advice to the Director of Investigation and Research (Head of the Competition Bureau) and other officers on many cases and issues. I have testified, given evidence, and consulted in many matters involving competition and regulatory issues, including several prominent cases heard at the Competition Tribunal. I have also been an invited speaker to the Canadian Bar Association Annual Competition Law Conference on several occasions.
7. My curriculum vitae, which includes a list of my publications, is attached as Appendix A to this report.

2 Pole Access for Wireline Attachments

8. Toronto Hydro's distribution network comprises approximately 175,000 utility poles which support primary and secondary distribution functions, and provide for street lighting.⁴ The approximately 39,000 street lighting poles, formerly part of the street lighting system in Toronto, are not available for communications wireline attachments.⁵ Canadian telecommunication carriers and cable operators obtain access to Toronto Hydro's network of utility poles for the purpose of supporting telecommunication and cable television transmission lines.⁶ The *CCTA Decision* in 2005, after

³ Church, J.R. and R. Ware, *Industrial Organization: A Strategic Approach*, (San Francisco: McGraw-Hill-Irwin), 2000.

⁴ *In the matter of an application by Toronto Hydro-Electric System Limited for an order approving just and reasonable rates and other charges for electricity distribution to be effective May 1, 2015 and for each following year effective January 1 through to December 31, 2019*, EB-2014-0116, Exhibit 1A, Tab 2, Schedule 1, p. 5, updated January 15, 2015.

⁵ *In the matter of an application by Toronto Hydro-Electric System Limited for an order approving just and reasonable rates and other charges for electricity distribution to be effective May 1, 2015 and for each following year effective January 1 through to December 31, 2019*, EB-2014-0116, Interrogatory Responses, WR-Carriers-1, p.2, March 12, 2015.

⁶ Other third-party attachments to Toronto Hydro's utility poles may include lighting (street or decorative), cathodic protection devices, transit DC and trolley cables, red light cameras, power supplies and disconnects,

reviewing costs of providing pole access, set the regulated rate for a utility pole attachment at \$22.35 per year per attachment.

9. In the past decade and a half, public utility boards in Ontario, Nova Scotia, Alberta, Newfoundland, and New Brunswick have had applications to review regulated pole rental rates brought before them. The methodology used to calculate the pole attachment rates varies across jurisdictions. Annual rates per pole are typically based on direct costs such as administration and loss in productivity, and indirect costs such as pole maintenance, depreciation, capital carrying costs, and a pole space allocation factor.⁷ Table 1 summarizes regulated annual pole attachment rates in Canada, which are typically set around \$20.

Table 1: Regulated Canadian Pole Access Rates (per Pole per Year)⁸

Jurisdiction	Regulating Body	Year	Rental Rate per Pole
Nova Scotia	Nova Scotia Utility and Review Board	2002	\$14.15
Newfoundland	Board of Commissioners of Public Utilities	2001	\$12.84
Ontario	Ontario Energy Board	2005	\$22.35
New Brunswick	New Brunswick Energy and Utilities Board	2006	\$18.91 ^A
Alberta	Alberta Utilities Commission	2000	\$18.34

^A The rate approved in the New Brunswick Decision in 2006 has been subject to an annual CPI adjustment. The rental rate per pole corresponds to 2014.

10. At the current regulated rate of \$22.35, Toronto Hydro’s revenue from pole attachments is approximately \$2.3 million.⁹ Toronto Hydro states in the application for rate revision that its annual direct and indirect costs for pole attachments exceed the regulated rate and are estimated at \$80.38

traffic signs and signals, bus loop detectors and signals, as well as banners, pole wraps and flower basket hoops. Supra note 5, WR-Carriers-2, p.2.

⁷ CCTA Decision, pp. 4-12; *In the Matter of an application by Toronto Hydro-Electric System Limited for an order pursuant to section 29 of the Ontario Energy Board Act, 1998*, “Pole Attachment Regulation: Canada, U.S., U.K. and Other Jurisdictions,” Nordicity (“Nordicity Report”), March 14, 2014.

⁸ Supra note 7, *Nordicity Report*, Table 2. Pole attachment rates in the United States are broadly within the same range.

⁹ *In the matter of an application by Toronto Hydro-Electric System Limited for an order approving just and reasonable rates and other charges for electricity distribution to be effective May 1, 2015 and for each following year effective January 1 through to December 31, 2019*, Wireline Pole Attachments Update, EB-2014-0116, Exhibit 3, Tab 2, Schedule 1, p.5, March 12, 2015.

per pole, \$55.89 of which are indirect costs allocated to the attaching party based on an allocation factor of 30.4% (based on an average of 1.61 attachers).¹⁰

3 Access Pricing for Wireline Pole Attachments

11. A network of utility poles is generally considered a non-rivalrous good and exhibits economies of scope.¹¹ A pole network jointly used for electricity distribution, telecommunications and/or cable TV distribution is characterized by lower costs for *each* joint-product. Although the installation of a new duplicate pole network to attach wireline transmission lines could substitute for access to Toronto Hydro's utility poles, proliferation and wasteful duplication of pole networks is not in the public interest. Both federal and provincial regulatory authorities have recognized the need to avoid such wasteful duplication of pole networks.¹²

¹⁰ *In the matter of an application by Toronto Hydro-Electric System Limited for an order approving just and reasonable rates and other charges for electricity distribution to be effective May 1, 2015 and for each following year effective January 1 through to December 31, 2019*, Wireline Pole Attachments Update, EB-2014-0116, Exhibit 8, Tab 2, Schedule 1, Appendix B, p. 1, Filed: July 31, 2014, Corrected: March 12, 2015.

¹¹ “[M]ost property is rivalrous – its possession by one party results in a gain that precisely corresponds to the loss endured by the other party. In this case, however, the property that has been taken – space on a pole – may well lack this congruence. It may be, for practical purposes, nonrivalrous. This means that use by one entity does not necessarily diminish the use and enjoyment of others. A common example of a nonrivalrous good is national defense.” (*Alabama Power Company v. Federal Communication Commission*, No. 00-14763, November 14, 2002, p. 24, www.ca11.uscourts.gov/opinions/ops/200014763.opn.pdf). “In most cases, there is enough space on the existing utility pole network to accommodate the attaching entity’s needs without forcing the utilities to sacrifice anything.” (*Georgia Power Company v. Teleport Communications Atlanta and the Federal Communication Commission*, No. 02-15608, September 29, 2003, www.ca11.uscourts.gov/opinions/ops/200215608.pdf). A production process is characterized by *economies of scope* if joint production is less costly than producing the products individually.” (Church, J.R. and R. Ware, *Industrial Organization: A Strategic Approach*, (San Francisco: McGraw-Hill-Irwin), 2000, p. 782).

¹² In its revised regulatory framework, the Canadian Radio-television Telecommunications Commission (“CRTC”) determined that support structure facilities provide an important social benefit and classified them in the public good category, with mandated access. Canadian Radio-television and Telecommunications Commission, *Revised Regulatory Framework for Wholesale Services and Definition of Essential Service*, Telecom Decision CRTC 2008-17, March 3, 2008, ¶93. The New Brunswick Public Utility Commission in 2005 found that “[i]t is in the public interest that every enterprise who wishes to provide services to the public which logically require access to electricity poles and telephone poles not have to obtain easements and erect its own poles when there are readily available poles to which the services can be attached with no technical interference with or harm to the owner of the poles. It is in the public interest to avoid proliferation of poles. [...] [I]t would be uneconomic and wasteful if all utilities and persons seeking to provide services in New Brunswick were required to acquire their own easements and poles in areas already served by electric power poles. It would be appropriate to allow access to electric power poles to provide services provided it can be done without interference with the distribution system.” (Oral Ruling of the New Brunswick Board of Commissioners on the Rogers Jurisdiction Motion in the Disco Rate Application, October 27, 2005). In 2010, the British Columbia Utilities Commission stated: “The Commission Panel notes that the Commission is required to consider the public interest in its regulation of public utilities. [...] In the Commission Panel’s view, the policy objective against duplication of infrastructure is clear on a reading of the Act as a whole, for the reasons discussed above.” (*In the Matter of an*

12. In its *CCTA Decision* on pole access for cable and telecommunication providers, the Board determined that power poles are essential facilities.¹³

3.1 Pricing Methodologies for Pole Attachment

3.1.1 Incremental Cost Pricing

13. The Ontario Energy Board in its *CCTA Decision*,¹⁴ the CRTC in its Telecom Decision CRTC 2008-17,¹⁵ and the FCC in its 2011 Pole Attachment Order¹⁶ have all recognized pole networks to be an essential facility for the purpose of regulating attachments by communications companies and companies supplying other services (e.g. streetlights). The lowest price for an attachment to an essential facility that keeps the incumbent whole (i.e. implies no net cost or loss in profit to the incumbent) is a price corresponding to incremental cost, i.e. all of the *additional* costs associated with adding a single attacher to an existing pole. Incremental cost is the lowest price that can be considered economically efficient. A price for attachments that is at least equal to incremental cost will also guarantee that there is no subsidy taking place from the incumbent pole owner to the attaching party. Pricing access to an essential facility at incremental cost has been approved in many important regulatory decisions, among them the CRTC and the FCC.¹⁷

3.1.2 Fully Distributed Cost (FDC)

14. Fully Distributed Cost (FDC) pricing is an approach to allocating common capital costs that creates a sharing rule based on proportionate use or relative shares of demand made on the common capital input. The FDC pricing methodology is grounded in sound economic principles and is a methodology

Application by Shaw Cablesystems Limited and Shaw Business Solutions Inc. to Continue to Use FortisBC Inc's Transmission Facilities, Reasons for Decision, April 1, 2010, p.8.). The Court of Appeal for British Columbia similarly stated: "In my view, avoidance of duplication achieves an important policy goal within the scheme." (FortisBC Inc. v. Shaw Cablesystems Limited, 2010 BCCA 552, December 6, 2010, ¶158).

¹³ An essential facility is a "unique input to the production process that cannot be cheaply duplicated." Laffont, J.J. and J. Tirole, *Competition in Telecommunications*, (Cambridge, Massachusetts: MIT Press), 2000, p. 282. "The Board agrees that power poles are essential facilities. It is a well-established principle of regulatory law that where a party controls essential facilities, it is important that non-discriminatory access be granted to other parties. Not only must rates be just and reasonable, there must be no preference in favour of the holder of the essential facilities. Duplication of poles is neither viable nor in the public interest." (*CCTA Decision*, p. 3).

¹⁴ Supra note 1.

¹⁵ Canadian Radio-television and Telecommunications Commission (CRTC), *Revised Regulatory Framework for Wholesale Services and Definition of Essential Service*, Telecom Decision CRTC 2008-17, March 3, 2008.

¹⁶ Federal Communications Commission (FCC), *Implementation of Section 224 of the Act A National Broadband Plan for Our Future, Report and Order and Order on Reconsideration*, FCC 11-50, April 7, 2011, pp. 138-139.

¹⁷ Supra note 15 and note 16. In some cases, the regulatory authority has required that a markup (15% in the case of CRTC's wholesale essential facilities) be added to incremental cost, in order to provide a profit margin to the incumbent. Pole structures are classified as public good services by the CRTC and the 15% markup is not applied (Supra note 15, ¶134, ¶138-139).

widely used by regulators in North America for allocating common capital costs between different users (or different products).

15. The classic work of regulatory economics by Alfred Kahn states that common costs “may be distributed on the basis of some common physical measure of utilization, such as minutes, circuit-miles, message-minute-miles, gross-ton miles, cubic feet, or kilowatt-hours employed or consumed by each. Or they may be distributed in proportion to the costs that can be directly assigned to the various services. [...] [T]he allocations among the various services are often made in part on the basis of the relative number of physical units of consumption or utilization by each, and the total allocation dollars are then divided by those physical units to get the unit costs.”¹⁸
16. In the United States, pole attachment rates are regulated at the federal level by the Federal Communications Commission (FCC). In particular, U.S. Code Title 47, Section 224(d)(1) on pole attachments defines just and reasonable rates to be between the incremental costs that would not be incurred by the utility but for the pole attachment and the percentage of fully allocated costs based on the portion of space on a pole occupied by an attacher.¹⁹ The *Telecommunications Act of 1996* added section 224(e) which provides a methodology of determining pole attachment rates based on “the cost of providing space on a pole” and explains how these costs should be allocated between the pole owner and the attaching party.²⁰
17. I describe several common cost allocation rules of fully distributed cost pricing in my textbook on industrial organization and regulation.²¹ Relative output, attributable cost, or revenues are all ways of allocating common costs in proportion to relative use.
18. Fully Distributed Cost is a methodology only for allocating common costs. Thus, the incremental costs of attachment must be added to the distributed common costs to provide the full rate for attachment using this methodology.

3.1.3 Equal Sharing²²

19. An equal sharing rule divides common costs equally between joint uses, that is, on a “per capita” basis. Such an equal division of common costs is often justified by an appeal to principles of fairness, impartiality, or by reference to a hypothetical ex-ante bargaining outcome among similarly situated parties.

¹⁸ Kahn, A.E., *The Economics of Regulation*, (Cambridge: The MIT Press), 1988, pp. 152-153.

¹⁹ 1978 United States Code Congressional and Administrative News (U.S.C.C.A.N.), pp. 127–28.

²⁰ 47 U.S.C. § 224(e)(2)–(3).

²¹ Church, J.R. and R. Ware, *Industrial Organization: A Strategic Approach*, (San Francisco: McGraw-Hill-Irwin), 2000, pp. 846-847.

²² The Board in its *CCTA Decision RP-2003-0249* recognized that a case can be made for competing cost allocation methodologies such as the fully distributed cost methodology discussed in the next section, but on balance preferred the equal sharing methodology based in part on openly negotiated reciprocal access agreements between electricity and telephone companies in some provinces.

20. An equal sharing rule has no basis in economic efficiency. Rather it is a rule which originates from putting an extreme weight on equity (sometimes also described as “fairness”), which is not an economic consideration. In fact, from an economic perspective, the equal sharing rule has substantial drawbacks: First, an equal sharing rule bears no relationship to economic activity. A user who places multiple times as heavy a demand on a utility pole will pay the same contribution to common costs as any other user of the pole.
21. Second, an equal sharing rule creates perverse incentives: Two users that take up space on the pole and combine their operations will reduce their total contributions to common costs even though their economic demands on the pole network are unchanged. Changes in market structure affect contributions to common costs even if economic activities are unaltered.

3.2 Conclusion on Cost Methodology for Pole Attachment

22. The FCC’s recent 2011 Pole Attachment Order uses cost-based formulas to determine a range of just and reasonable pole attachment rates.²³ The Commission identifies the upper bound rate for pole attachments based on a “fully allocated cost methodology”, often referred to as fully distributed costs. The lower bound is identified as the pole owners’ marginal or incremental costs associated with the pole attachment:²⁴

“This zone of reasonableness for cable attachment rates ranges from “the additional costs of providing pole attachments,” known as the incremental cost, to a percentage (based on usable space) of “the sum of the operating expenses and capital costs of the utility attributable to the entire pole,” known as fully allocated costs.”²⁵

23. My conclusion is the same as that of the FCC. The only rates for pole attachment that can be defended as economically efficient are rates that lie between incremental cost and some version of fully distributed cost (the latter, since it includes incremental cost, must always be larger). Pole networks have been identified as essential facilities by the OEB and other regulatory bodies; appropriate pricing of access to an essential facility has been approved in a wide range of regulatory decisions at incremental cost plus some contribution towards common costs. The most reasonable method for calculating the latter is one based on proportionate use, which leads to my recommendation for the use of the FDC methodology in the current case.

²³ Federal Communications Commission (FCC), *Implementation of Section 224 of the Act A National Broadband Plan for Our Future, Report and Order and Order on Reconsideration*, FCC 11-50, April 7, 2011. Federal rate regulation does not apply to municipal utilities or to states that choose to pre-empt federal regulation. Nonetheless, many pre-empt states and municipal utilities use the FCC pole attachment rules as guidelines.

²⁴ Supra note 23, ¶141-142.

²⁵ Supra note 23, ¶156.

3.3 Application of the FDC Methodology in the Current Case

24. For the purposes of allocating costs, we can conceptually divide each pole into usable or dedicated space (for attachments) and non-usable or common space (ground clearance, buried pole etc.). We require a rule for allocating costs for both the usable or dedicated space and for the non-usable space (the common costs).
25. As regards the dedicated space, the space required for each attacher on the pole represents a reasonable estimate of the opportunity cost of attaching that user to the pole. If that user did not attach to the pole, the same space would be available to another user. These are the dedicated costs of attaching a new user to the pole.²⁶
26. To implement this methodology for computing dedicated costs, if the new user's pole attachment occupies Y feet on a pole of length Z , then the dedicated cost would be equal to

$$\frac{Y}{Z} \cdot \text{total annual pole costs}$$

where the total annual pole costs include the costs of depreciation and pole maintenance, as well as the capital or interest costs of the pole. The above expression represents a method of determining the dedicated costs of attachment.

27. The second step in applying an FDC methodology requires the allocation of common costs according to proportionate use. Recall that the common costs are the costs corresponding to the non-usable portion of the pole. Since the total usable space of the pole is X feet, and the "non-usable" section of the pole is simply the length of the pole minus the usable space, or $Z - X$. I will assume that common costs for which a share is to be determined are the costs of the non-usable section of the pole, that is, the buried portion and the clearance portion. Allocating the costs of the non-usable portion of the pole to the different users in proportion to their space used on the usable section of the pole yields the following rule for common cost contributions:

$$\frac{Y}{X} \cdot \frac{(Z - X)}{Z} \cdot \text{total annual pole costs}$$

Adding together the dedicated cost and the common cost contribution yields

$$\frac{Y}{X} \cdot \text{total annual pole costs}$$

28. To illustrate, assume a typical 40 foot distribution pole with 6 feet buried, 17.25 feet of clearance, 2 feet of communications space, 3.25 feet of separation space and 11.5 feet of power space.²⁷ Total

²⁶ There are additional incremental costs associated with the administrative burden of adding attachers to the pole, and which have been claimed by Toronto Hydro in this case. I do not comment on the methodology of allocating those costs.

²⁷ These pole measurements are identical to the ones Toronto Hydro uses in its calculations. *In the matter of an application by Toronto Hydro-Electric System Limited for an order approving just and reasonable rates and other charges for electricity distribution to be effective May 1, 2015 and for each following year effective January 1*

usable space X , the sum of communications space, separation space and power space is 16.75 feet. Assuming that a wireline transmission cable uses one foot of the communications space and half of the separation space, then the pole attachment occupies $Y = 2.625$ feet of space on the pole. Applying the fully distributed cost formula provided above yields a common cost contribution of $\frac{Y}{X} = \frac{2.625}{16.75} = 15.7\%$ for an attaching party. The fully distributed cost methodology can be illustrated in further detail as shown in Table 2:

Table 2: Fully Distributed Cost Allocation

Space	Classification	Feet	Power Allocation	Communication Allocation per User
Non-Usable	Buried Depth	6	$\frac{11.5}{16.75} \cdot 23.25 = 15.96$	$\frac{2.625}{16.75} \cdot 23.25 = 3.64$
	Clearance	17.25		
Usable	Communications Space	2	-	1
	Separation Space	3.25	-	1.625
	Power Space	11.5	11.5	
		40	68.7%	15.7%

29. This common cost contribution factor is similar to the one advocated by the CRTC in its Telecom Decision 99-13. The CRTC considered the appropriate means of allocating common cost to be based on the percentage of usable space consumed which reflects actual use. The Commission arrived at an allocation factor of 15.5% allocation factor using pole measurements identical to the ones presented above, assuming two communications users requiring 1 foot, and considering the separation space causal to users of the communications space only.²⁸
30. It is helpful to contrast the common cost allocation factor based on the equal sharing methodology proposed by Toronto Hydro in this proceeding to allocation factors obtained from the fully distributed cost methodology commonly used and employed in other jurisdictions as shown in Table 3:

through to December 31, 2019, EB-2014-0116, Exhibit 8A, Tab 2, Schedule 1, Appendix B, p. 8, updated January 15, 2015.

²⁸ Canadian Radio-television and Telecommunications Commission (CRTC), *Part VII Application – Access to Supporting Structures of Municipal Power Utilities - CCTA vs MEA et al*, Telecom Decision CRTC 99-13, September 28, 1999, ¶1222-225.

Table 3: Common Cost Allocation Factor

Reference	Year	Methodology	# of Attachers excl. electric utility	Allocation Factor per attachment
Toronto Hydro	2015	Equal Sharing	1.61	30.4%
CCTA Decision	2005	Equal Sharing	2.5	21.9%
CRTC/Nova Scotia	CRTC 1999 NS 2002	Fully Distributed Cost	2	15.5%
FCC	2011	Incremental Cost / Fully Distributed Cost	2	max 19.4% ^A
Dr. Ware	2015	Fully Distributed Cost	2	15.7%

^A The maximum cost allocation factor is based on the FCC space factor formula for attachments to poles by any telecommunications carrier or cable operator providing telecommunications services, assuming two attaching entities in addition to the electric utility company and using the same pole measurements as in the example presented ¶28.

4 Conclusions

31. In conclusion, the equal sharing rule is not an appropriate methodology for allocating common costs to set regulated rates for wireline pole attachments and has no basis in principles of economic efficiency. The appropriate methodology of allocating common costs between two or more uses that can be defended as economically efficient is somewhere between incremental cost and a version of fully distributed cost in which the shares of common costs are based on proportionate use, or demands, made on the common capital input. This FDC pricing methodology is grounded in sound economic principles and is a methodology widely used by regulators in North America for allocating common capital costs.

Appendix A Curriculum Vitae of Dr. Roger Ware

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PERSONAL INFORMATION

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DATE AND PLACE OF BIRTH

February 23, 1951 - England

CITIZENSHIP

Dual Canadian and U.K. citizenship

EDUCATION

- 1981 Ph.D., Queen's University, Kingston, Canada.
- 1973 M.A. (Industrial Economics), University of Sussex, England.
- 1976 M.A. (Cantab).
- 1972 B.A. Honours (Economics), Cambridge University, England.

PROFESSIONAL EXPERIENCE

July 1997 – present	Professor, Queen’s University
January 1991 - June 1997	Associate Professor, Queens University
August 1993 - August 1994	Holder of T.D.MacDonald Chair in Industrial Economics, Bureau of Competition Policy, Ottawa
1989 - December 1990	Associate Professor, University of Toronto
1987-88	Visiting Associate Professor, Department of Economics, University of California, Berkeley.
1986-87	Sabbatical Leave. Visiting Research Scholar, Carleton University and National Bureau of Economic Research, Stanford University
July 1986	Promoted to Associate Professor with Tenure, University of Toronto.
1981-86	Assistant Professor (Economics), Erindale College, University of Toronto.
1980-81	Lecturer in Economics, Erindale College, University of Toronto.
1979-80	Instructor, Introductory Economics, Queen's University
1977-79	Various Tutorial and Research Assistantship Positions held, Queen's University.
1975-1977	U.K. Department of Industry, Industrial Policy Analysis and Briefing Division. Provided advice on government support for research and development, and special assistance schemes for industry. During this period I completed a cost-benefit study of cost sharing support for industrial development projects.
1973-1975	U.K. Department of Industry. Economic Assistant, working on an econometric forecasting model of U.K. trade flows. Promoted to Senior Economic Assistant, October 1974.

BOOKS

Industrial Organization: a Strategic Approach. (with Jeffrey Church, University of Calgary) 2000. Boston: Irwin McGraw-Hill.

JOURNAL PUBLICATIONS

“How do Consumers Respond to Gasoline Price Cycles?” (with David Byrne and Gordon Leslie) forthcoming, *Energy Journal*, 2014.

“Identifying Market Power in Natural Gas Storage” with David Brown and David Harding, 2008 *Canadian Competition Record*. Vol 23, No. 1.

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ARTICLES IN BOOKS

Publication (on CD) of paper "The Role of Price Correlations" contained in proceedings of Canadian Bar Association 2004 Annual Fall Conference on Competition Law.

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"Network Industries, Intellectual Property Rights, and Competition Policy." 1998. in N. Gallini and R. Anderson ed., *Competition Policy, Intellectual Property Rights and International Economic Integration* Industry Canada Research Series, The University of Calgary Press.

"Entry Deterrence" (1991) chapter in *New Developments in Industrial Organization* ed. by Manfredi La Manna and George Norman, Edward Elgar Publishing, London.

Review of Market Structure and Innovation, by M.I.Kamien and N.L.Schwartz (1983), *Canadian Journal of Economics*.

WORKING PAPERS

“Price Cycles and Price Leadership in Gasoline Markets: New Evidence from Canada” co-authored with David Byrne, SSRN Working Paper.

RECENT PROFESSIONAL ACTIVITIES

Presentations in Melbourne, Australia at Law and Economics Society, Australian Competition Commission, February-March 2012.

Presentation at New Zealand Competition Commission, March 2012.

Participated in a panel session on Competition Policy at the CEA Meetings, Ottawa, June 2011.

Participated in a panel session on Competition Policy at the CEA Meetings, Vancouver, June 2008.

Presented the paper “Market Power in Natural Gas”, co-authored with David Brown, Ontario Energy Board, and David Harding, Competition Bureau at the 2007 Canadian Economics Association Meetings, Halifax, June 2007.

Refereeing on a regular basis for *American Economic Review*, *Canadian Journal of Economics*, *The International Journal of Industrial Organization*, *The Journal of Industrial Economics*, and occasionally for *Journal of International Economics*, and *International Economic Review*.

Presentations at the Canadian Bar Association annual conference, 2011.

Presentation of a paper “Efficiencies and the Propane Case” at the CBA Competition Law Section Meetings, Ottawa, September 2000.

MEMBERSHIP OF PROFESSIONAL SOCIETIES

Member of Canadian Economics Association