

Intervention

Regarding *Review of wholesale services and associated policies*, Telecom Notice of Consultation CRTC 2013-551, 15 October 2013 and CRTC 2013-551-1, 8 November 2013.

Intervenors:

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By submitting this intervention we are indicating our intent to become parties to this proceeding.

We also wish to appear at the public hearing on 24 November 2014 in Gatineau, Quebec.

Executive summary

1. This intervention regarding the *Review of wholesale services and associated policies* (CRTC 2013-551) is based on evidence from our research on the interplay between public regulation, market competition, and the development of broadband connectivity in Canada, as well as other advanced economies.
2. Given the broad scope of the Review, this intervention focuses primarily on three of the areas under the purview of the proceedings:
 - I. Objectives of wholesale services policies.
 - II. The design and scope of wholesale services regulatory framework.
 - III. Appropriateness of mandating wholesale access obligations to fibre access and transport facilities.
3. Based on evidence from our research, this intervention suggests essential facilities/interconnection regulations that promote business cooperation and risk sharing can enhance the pace of progress in the development of Canada's broadband network infrastructure. We submit that simplifying and broadening the wholesale regulatory framework can enhance the "efficiency and competitiveness ... of Canadian telecommunications" and "encourage innovation in the provision of telecommunications services".¹ Furthermore, we argue that adopting clear and credible interconnection obligations can enhance the effectiveness of provincial and municipal initiatives intended to improve broadband availability. A number of examples from British Columbia, Alberta, and Ontario support this hypothesis.²
4. While the current essential facilities regime has not been very effective in promoting service-based competition among Internet service providers, it has been relatively successful in stimulating investments to support Internet service provision by large incumbent local exchange carriers (ILECs) and large cable companies.³ Despite these relatively high capital expenditure levels, there are concerns about the competitiveness of Canada's broadband infrastructure, with implications for the economic competitiveness of Canada and its regions.⁴ Strengthening Canada's essential facilities regime may

¹ Pursuant to statutory objectives mandated under *Telecommunications Act*, S. 7(c) and 7(g) respectively.

² See Rajabiun, R. & Middleton, C. (2013a) Multilevel Governance and Broadband Infrastructure Development: Evidence from Canada. *Telecommunications Policy*, 37, 9, 702-714. Available at: <http://www.sciencedirect.com/science/article/pii/S0308596113000724>

Rajabiun, R. & Middleton, C. (2014) Rural Broadband Development in Canada's Provinces: An Overview of Policy Approaches. *Journal of Rural and Community Development*. Available at: <http://www.jrcd.ca/>

³ van Gorp, A. & Middleton, C. (2010). The impact of facilities and service-based competition on Internet services provision in the Canadian broadband market. *Telematics and Informatics*, 27, 3, 217-230. Available at: <http://www.sciencedirect.com/science/article/pii/S0736585309000811>

⁴ Quality of service and price considerations are equally represented in these concerns. See e.g. Government of Canada (2010). *Improving Canada's Digital Advantage. Strategies for Sustainable Prosperity – Consultation Paper on a Digital Economy Strategy for Canada*. Retrieved from http://publications.gc.ca/collections/collection_2010/ic/Iu4-144-2010-eng.pdf; Middleton, C. A., & van Gorp, A. F. (2009). *How Competitive Is the Canadian Residential Broadband Market? A Study of Canadian Internet Service Providers and Their Regulatory Environment*. Telecommunications Policy Research Conference, Arlington, VA. Retrieved from http://www.broadbandresearch.ca/ourresearch/middleton_vangorp_TPRC2009.pdf; In terms of pricing, international comparison study commissioned by the CRTC and conducted by Wall Communications Inc. suggests Canadians tend to pay relatively more for a variety of wired and wireless communications services than consumers in a number of other advanced economies; perhaps beside the United States where average prices seem somewhat higher than in Canada. See Price

enhance risk sharing, innovation, and investment in next generation broadband platform technologies, but will likely involve some risks in terms of lower return to investors in sunset digital subscriber line (DSL) and cable broadband platforms.

5. In addition to their relevance for the rate and direction of technological change at the national level, decisions by the Commission pursuant to this consultation are likely to have distinctive impacts on network development in urban and rural communities: In relatively more densely populated urban areas it might be economically feasible to have multiple broadband platforms that compete on price and quality of service. However, in relatively high cost rural settings platform competition is neither feasible nor economically desirable as it implies too much duplication and too little risk sharing/cooperation in deploying fixed network assets. Adopting clear and predictable wholesale access/interconnection regulations can be particularly beneficial for improving broadband connectivity in relatively high cost rural and remote communities by enhancing business incentives to share the risks associated with fixed capital expenditures on capacity upgrades and deploying new broadband technologies (i.e. fibre, hybrid fibre/wireless networks).
6. Despite the presence of a clear Policy Direction⁵ and credible commitments by the Commission⁶ to forbear from regulating fibre access and transport facilities for a number of years, the diffusion of high-capacity fibre-to-the-premises (FTTP) networks remains negligible. While there are a number of sound theoretical reasons for CRTC's past regulatory forbearance in this area, interconnection regulations that promote cooperation and risk sharing among backbone, access, and content network providers could enhance the incentives of both incumbents and potential entrants to invest in FTTP networks and increase the pace of creative destruction from legacy to new broadband platforms.

Comparisons of Wireline, Wireless and Internet Services in Canada and with Foreign Jurisdictions 2013 Update: Retrieved from: <http://crtc.gc.ca/eng/publications/reports/rp130422.htm>; Broadband pricing data from OECD provides further evidence of the relatively higher prices in the Canadian market, particularly for relatively high-speed broadband connections required for deploying more advanced content and application services. See Tables 4c to 4m, OECD Broadband Portal: <http://www.oecd.org/sti/broadband/oecdbroadbandportal.htm>; In terms of service quality, average Internet download speeds in Canada are about 2 to 3 times lower than a number of leading countries in Europe and Asia. According to data from Speedtest/Ookla Net Index for the 3 months prior to this submission (Nov 2013-Jan2014), Canada ranked, 37th and 56th globally in terms of average download and upload speeds respectively. Download speeds in Canada are around 10% lower than the EU average, but about the same as OECD and G8 averages. Notably, measured upload speeds are substantially lower than G8, OECD, and EU averages, illustrating the particularly asymmetric nature of service quality on the Canadian broadband system. See: <http://www.netindex.com/>

⁵ *Order Issuing a Direction to the CRTC on Implementing the Canadian Telecommunications Policy Objectives*, P.C. 2006-1534, 14 December 2006

⁶ CRTC Telecom Decision 2008-17.

Part One – Intervention

7. Objectives of the review: The preamble to the Telecom Notice of Consultation CRTC 2013-551 states that the “purpose of wholesale services is to facilitate competition in retail markets to provide Canadians with increased choice”. However, neither Section 7 of the *Telecommunications Act* (hence, the Act) nor the 2006 Policy Direction include facilitating or promoting competition as one of Canada’s telecommunications policy objectives. In fact, the 2006 Policy Direction orders CRTC to “ensure technological and competitive neutrality” and “not to artificially favour either Canadian carriers or resellers”.⁷ Consequently, the statutory framework under the Act and the Policy Direction both constrain that legal basis for justifying wholesale access regulations in terms of facilitating or promoting competition.
8. Cooperation versus competition: In contrast to the adversarial approach inherent in viewing objectives of wholesale regulations in terms of competition between incumbents and entrants, we submit that it might be more productive to base debates in this Review in terms of “efficiency and competitiveness” pursuant to Section 7(c) of the Act. Given the broad scope of the Review, an emphasis on efficiency and competitiveness may help the consultation abstract away from the particular positions of interested parties by forcing incumbents, entrants and resellers, content/application delivery companies, and consumer groups to justify why essential facilities/interconnection obligations should, or should not, be imposed on particular elements of the system. While competition is not always efficient due to scale economies and the risk of duplication, regulations that enhance the incentives for cooperation and risk sharing are usually beneficial from an economic perspective. Understanding the problems at hand in terms of coordination failures is particularly relevant in the long term transition from legacy platforms to next generation fibre-to-the-premises (FTTP) connectivity, as well as rural communities where the costs of deploying new network technologies are relatively high. It is precisely under such conditions that policies that enhance business incentives to share the risk in irreversible capital expenditures can mitigate market failures by supporting private sector efforts to “respond to the economic requirements of users of telecommunications services.”⁸
9. Technological change: Despite rapid declines in the costs of deploying fibre networks and clear policy regarding forbearance from regulating fibre access networks under Telecom Decision 2008-17, in 2012 fewer than 2% of the total lines were FTTP.⁹ Mid-2013 OECD data show 2% of broadband subscriptions in Canada were fibre connections, 8 times below the average for OECD members (16%) and 4 times lower than the United States (8%), a country that has generally followed a similar strategy of regulatory forbearance as Canada.¹⁰ It is particularly surprising that the diffusion of FTTP connections remains negligible even in relatively densely populated urban areas where the fixed costs of deploying new technologies can be allocated across a large number of

⁷ 1(b)(iv).

⁸ *Telecommunications Act*, S. 7(h).

⁹ CRTC Monitoring Report 2013, Fig. 5.2.6.

¹⁰ OECD Broadband Portal, Table 1L, June 2013. Available at:

<http://www.oecd.org/sti/broadband/oecdbroadbandportal.htm>

end users (e.g. apartment buildings, residential subdivisions).¹¹ This suggests other factors, such as the smaller size of Canada's market or international barriers to corporate control of incumbents may be at play in constraining the pace of creative destruction from old to new technologies. These considerations are beyond the purview of this Review, but we submit that they should inform decisions about the design and scope of wholesale services access/interconnection regulations: Replicating the U.S. style regulatory strategy of forbearance on emerging broadband technologies (i.e. FTTP) may not be necessarily appropriate in Canada due to specific institutional conditions that also influence market outcomes in Canada.

10. Limited availability of high-capacity fibre last mile links represents both a short and long term problem for the development of telecommunications services from the perspective of both residential and business consumers of broadband Internet connectivity. In the short term, lack of fibre forces end users with high demand for network resources onto shared DSL and cable infrastructure, increasing congestion and degrading the service quality average end users will experience.¹² This exacerbates congestion problems on local links and routers, contributing to a growing gap between average and maximum possible links speeds as specified in retail contracts between ISPs and end users.¹³ In the longer run, reductions in the costs of deploying fibre (and hybrid fibre-wireless networks) and its advantages in terms of end users speeds/service quality pose a significant challenge to the business models of legacy platform operators. This limits their incentives to cooperate with third party entities (e.g. competing ISPs, property developers/managers, municipalities) interested in taking advantage of rapidly declining costs of deploying new broadband technologies to serve the needs of business and residential customers.
11. Unless the regulated price of third party access to fibre access networks is sufficiently high, imposing essential facilities obligation on this class of facilities has the potential to deter both incumbents and potential entrants from investing in such networks. On the other hand, third party access obligations at a relatively high regulated price could actually reduce business uncertainty and create a race to be the first party to make large irreversible investments required to increase FTTP diffusion above the current 2%. Once these investments have been made, obligations to share part of their installed capacity with third parties will impose some competitive discipline on their operators, while minimizing the need for other entities to build duplicate infrastructure.

¹¹ There are a number of exceptions to this trend in various urban and rural communities around Canada, but these efforts do not appear to be sufficient to impact the overall supply of FTTP across the country. For example, in Nova Scotia and New Brunswick the incumbent DSL operator Bell Aliant has been relatively active in rolling out fibre-to-the-home (FTTH) connections. See The Wire Report: Fibre-to-the-home rollout ramps up in Canada, Wednesday 01/15/2014. A notable example in rural Canada can be found in Olds Alberta where community and municipal leadership has stimulated FTTP deployment to both residential and business end users. See

<http://www.oldsinstitute.ca/media/gigabit.pdf> & <http://www.o-net.ca/manage/index.php>

¹² Rajabiun, R. & Middleton, C. (2013b) Lemons on the Edge of the Internet: Technological Convergence and Misleading Advertising in the Provision of Internet Access Services (August 15, 2013). TPRC 41: The 41st Research Conference on Communication, Information and Internet Policy. Available at SSRN: <http://ssrn.com/abstract=2241563>

¹³ i.e. low congestion (after midnight) and average conditions (late afternoons and evenings). See Table 1 below for relevant data across the Canada's and for a discussion see Rajabiun, R. & Middleton, C. (2013a) Multilevel Governance and Broadband Infrastructure Development: Evidence from Canada. *Telecommunications Policy*, 37, 9, 702-714.

Available at: <http://www.sciencedirect.com/science/article/pii/S0308596113000724>

12. Rural implications: Due to differences in the relative costs of upgrading network capacity and deploying new technologies, decisions about the design of access regime on old and new platforms have different implications for the supply of Internet access services in rural and urban areas. In relatively densely populated urban settings, it might be feasible and economically justifiable for multiple platforms to coexist, serving different classes of end users' preferences. As the costs of deploying networks increase with lower population densities and challenging geographical obstacles, policies that promote platform competition become less efficient as they can lead to duplication and overinvestment. In a manner analogous to the discussion of FTTP above, wholesale access regulations that promote cooperation and risk sharing in fixed assets among operators of access and transport network are of crucial importance for efficient network development in rural areas.¹⁴
13. Multilevel governance: While regulation of telecommunications is under federal jurisdiction, the importance of open access rules to the efficient development of broadband networks (particularly in rural communities) has motivated some provinces and municipalities to adopt their own initiatives aimed at promoting industrial cooperation among operators of essential access and transport network facilities. In addition to investing in a fibre backbone to serve its own needs, the Government of Alberta has imposed open access obligations on the operator of the SuperNet to interconnect with third party entities at local points of presence around the province. In return, the province has entered into long term procurement guarantees for public sector network services with the private operator of the publically funded backbone. In British Columbia the government has not directly invested in an open access backbone, but induced the incumbent to upgrade its network and keep its local Points-of-Presence (POPs) open to third party access with a series of contracts that commit various public sector organizations to buying their telecom and information services from that incumbent. Although it would be very difficult to try to calculate the costs of these procurement guarantees on the public sector, the two provinces have experienced substantially higher rates of growth in average and peak broadband network speeds end users experience (i.e. versus advertised "up to xMbps" rates) than other provinces.¹⁵ The experience of the Eastern Ontario Regional Network (EORN) is also instructive in the context of this Review: Although the incumbent operator had largely installed a high capacity fibre backbone in the region, a direct subsidy of more than \$50 million was necessary to induce the operator to upgrade its local switching facilities and open its fibre backbone to third party service providers responsible for installing high-speed last mile links to underserved rural communities.¹⁶ The adoption of a more robust essential facilities/interconnection regime at the federal level would reduce the need for inducements by lower levels of government to operators of essential facilities to interconnect with third parties. This perspective on the issue is particularly relevant in the context of Section 7(b) of the Act which stipulates federal policies should aim to "render... telecommunications services of high quality accessible to Canadians in both urban and rural areas in all regions of Canada."

¹⁴ Rajabiun, R. & Middleton, C. (2014) Rural Broadband Development in Canada's Provinces: An Overview of Policy Approaches. *Journal of Rural and Community Development*. Available at: <http://www.jrcd.ca/>

¹⁵ See Table 1, page 9 below for the relevant summary indicators of the evolution of broadband network performance.

¹⁶ See <http://www.eorn.ca/resources/>

Part Two – Responses to specific questions and issues to be examined

Market definition and conditions

14. The overview of the Internet market sector in the CRTC's most recent Communications Monitoring Report (2013) starts by stating that "Canadians are served by over 500 Internet Service Providers".¹⁷ This characterization might create the impression that consumers/end users have a wide range of options available and can substitute among a large number of competing providers. Since more than 90% of residential Internet access market revenues continue to accrue to regional duopolies of DSL and cable operators¹⁸, most Canadians primarily have a choice from a menu (i.e. price/speed/usage cap combinations) from two companies that operate competing last mile DSL and cable links to their premises. Although Canada has one of the highest cable broadband penetration rates in the world,¹⁹ the current wholesale regime has not been effective in increasing service-based competition in the retail market for the provision of Internet access services.
15. While there is clearly some competition from resellers, utility companies, and other carriers (8% of residential and 25% of business sub-sector revenues), we submit that a duopolistic market structure with imperfectly substitutable products represents a more realistic model for analyzing the design and scope of policies under the purview of this Review (i.e. sunset versus sunrise platforms). As noted above, FTTP diffusion of 2% limits the ability of end users with relatively high demands for fast, high quality connectivity to switch to next generation platforms. Even in competitive urban settings, end users essentially have a choice of fixed links from two platforms, which they may obtain from either incumbents themselves or resellers. In theory, upgraded cable links can deliver higher connectivity speeds than DSL, but in practice the relative performance of the two platforms from the end user perspective is largely determined by the ability and incentives of the operators to identify growing demand for network resources at the local level, provisioning sufficient resources (local switching and backhaul), and optimizing their installed capacity when most end users want to deploy network intensive applications (i.e. afternoons and evenings when most end users want to deploy network intensive applications). Increasing the availability of FTTP connectivity is particularly important in Canada due to the relatively low upload speeds on existing DSL and cable platforms, by providing end users that require that type of more symmetric connectivity speeds for their applications to move away from legacy broadband platform technologies.²⁰
16. For end users with very low demand for network speeds and capacity (i.e. those that only want to deploy applications such as email and simple web browsing), even mobile data plans might be sufficient and a substitute to fixed broadband. However, due to the high

¹⁷ CRTC Monitoring Report 2013, Section 5.3. page 143.

¹⁸ CRTC Communications Monitoring Report, 2013. Fig. 5.3.3. There is a bit more competition in the provision of business Internet access services, where only around 70% of the market revenues accrue to the incumbents.

¹⁹ OECD Broadband Portal: <http://www.oecd.org/sti/broadband/oecdbroadbandportal.htm>

²⁰ According to user generated data from Speedtest/Ookla Net Index for the 3 months prior to this submission (Nov 2013-Jan2014), Canada ranked, 37th and 56th globally in terms of average download and upload speeds respectively. While average download speeds in Canada were around 2 to 3 times lower than a number of leading countries in Europe and East Asia, average upload speeds in were nearly 20 times lower than leading countries with respect to this measure of network quality. See: <http://www.netindex.com/>

price of wireless connectivity via mobile operators, it should not be considered a substitute to fixed connectivity for most Canadians who want to deploy the Internet as a platform for converged communications and broadcasting services. In past decisions about rural connectivity the Commission has allowed mobile services to be defined as a substitute to fixed (or hybrid fixed/wireless) high-speed connectivity, a position which appears inconsistent with pricing and service quality on wired and mobile networks.²¹ In particular, the data caps on mobile data plans make them unaffordable as a primary mode of connectivity for the average user.²² Further, although DSL and cable are partially substitutable paths for connecting to the Internet, we submit that the Commission should not consider them to be a viable substitute to FTTP networks in the longer term due to the vastly higher capacity/connectivity speeds that can be achieved.

17. Trends in the evolution of the market at the wholesale level reflect the Commission's increasing emphasis on forbearance pursuant to the 2006 Policy Direction and CRTC Telecom Decision 2008-17. Overall revenues from wholesale services grew on average by 13% annually between 2008 and 2012.²³ Importantly, this growth was primarily associated with revenues from reselling lower capacity access which increased by 17% annually.²⁴ In sharp contrast, the size of the wholesale market for higher speed access and transport services declined annually by about 5% over the same period.²⁵ This trend is of particular concern for interconnecting private and public edge networks to high-capacity backhaul infrastructure.

Consumer impacts

18. In addition to the price of Internet access subscriptions, the key measure of the economic value of Internet connectivity is the quality of service end users can achieve on network infrastructure they share with others. The market convention is to specify expected speeds in terms of maximum possible link speeds (i.e. up to X Mbps), which can diverge widely from the actual speeds end users can achieve when most other end users in the vicinity also want to deploy network intensive applications. As discussed above and documented in Table 1 below, the pace of progress in terms of network performance growth consumers have experienced since the late 2000s has been substantially higher in provinces that employed their procurement power and subsidies to promote cooperation and access to essential facilities on the interface of last mile access and second mile transport networks.²⁶

²¹ e.g. Telecom Decision CRTC 2010-805

²² The average residential subscriber used about 34 GB of data per month in 2012 (CRTC Monitoring Report 2013). To transfer this volume of data at 4G speeds on a mobile network would cost well over \$200 per month, according to pricing on Bell and Rogers' websites as of January 2014.

²³ CRTC Monitoring Report 2013, Table 5.3.1.

²⁴ Ibid.

²⁵ Ibid.

²⁶ For a more detailed analysis of the provincial broadband speed measurements presented in Table 1 and their determinants see: Canada's and Rajabiun, R. & Middleton, C. (2013a) Multilevel Governance and Broadband Infrastructure Development: Evidence from Canada. *Telecommunications Policy*, 37, 9, 702-714. Available at: <http://www.sciencedirect.com/science/article/pii/S0308596113000724>

Table 1. Network Performance Growth in Canada: 2007-2011 (%)

Source: Akamai Technologies/own calculations

	Monthly Growth (Avg. Speeds)		Cumulative Growth		Avg. Annual Growth	
	Avg.	Median	Avg. Speed	Peak Speed	Avg. Speed	Peak Speed
AB	1.57	0.34	76	216	20	58
BC	1.95	1.81	110	250	29	67
MB	1.51	0.44	70	200	19	53
NB	1.3	0.93	50	144	13	38
NF	1.28	0.82	38	174	10	46
NS	0.34	0.04	0	100	0	27
ON	1.51	0.79	65	164	17	44
PE	0.54	-0.28	8	120	2	32
QC	1.28	1.1	56	111	15	30
SK	1.05	0.66	35	130	9	35
Provincial Avg.	1.23	0.67	51	161	14	43

Investment

19. Between 2008 and 2012, strong demand by Canadians for more network intensive Internet content and applications services provided a basis for Internet access service providers to grow their revenues by around 6% on an annual basis, which is approximately 2 to 3 times higher than aggregate GDP growth rates.²⁷ This trend partly reflects the willingness of Canadians to pay increasingly more for higher quality connectivity, as well as the ability of dominant cable and DSL platform operators to charge more for the service quality they offer end users.
20. Although the CRTC does not collect/publish detailed data on fixed investments in networks by the operators,²⁸ aggregate capital expenditures on telecommunications infrastructure declined by an average of around 5% on an annual basis during the same period that Internet access revenues were growing rapidly.²⁹ Most of this decline in capital expenditures was in the wireless sector (-20%), potentially due to rapid innovation and cost reductions in the provision of 3rd and 4th generation mobile networks.³⁰ In terms of fixed investment in wired networks, capital expenditures by resellers has experienced a sharp decline since 2008 (-15%), while those of incumbents and alternative service providers grew by around 12% over the same period.³¹ These trends may not have been caused by the 2006 Policy Direction or CRTC's 2008-17 decision, but are consistent with a federal regulatory framework that has increasingly emphasized investment incentives of

²⁷ CRTC Monitoring Report 2013, Table 5.1.2. Wireless revenue growth rates for this period have also been around 6% annually.

²⁸ This level of detail is also not available from the public filings of operators with relevant securities regulators.

²⁹ CRTC Monitoring Report 2013, Table 5.1.6.

³⁰ Ibid.

³¹ Ibid.

incumbents over potential consumer and efficiency gains from competitive discipline in the provision of Internet access services.

21. Despite strong investment growth, concerns about access to high quality broadband infrastructure have gained the attention of various federal review panels and consultation in the past decade.³² The 2010 Consultation Paper on Canada's Digital Economy Strategy drew attention to international evidence on the actual/measured (versus advertised) speeds of Internet connectivity and pointed out that "Canada ranks in the middle of the pack".³³ For example, according to user generated measures of broadband network performance from Ookla Net Metrics (2014) average download speeds that Canadian end users achieve are between 2 to 3 times lower than those in a number of advanced countries in Europe and Asia.³⁴ Canada's experience suggests that relatively high capital expenditure levels do not always translate into a relatively high pace of capacity enhancements and technological change, presumably because of some dynamic efficiency loss in the absence of competitive discipline and/or inefficient duplication of facilities as a result of too much platform competition.³⁵

22. Our research on the interplay between regulation, investment, and broadband speeds in the EU investigates our hypothesis inspired by the Canadian experience. We find that Canada's puzzling experience is not that uncommon: Per capita capital expenditure levels tend to be higher in countries where access regulations are less intense/dense and non-incumbents have a smaller share of the retail market (i.e. weaker access regulation and competition). However, there is little association between investment input levels and digital infrastructure quality in terms of peak and average network speeds. Overall, countries with a higher degree of service based competition appear to have developed relatively high quality broadband networks both in terms of measured connectivity speeds and access to next generation fiber platforms.³⁶ While clear and credible essential facilities access regulations may be detrimental to investors and investment incentives of operators of sunset platforms, they do not necessarily reduce, and may even enhance, innovation and the overall pace of progress in network development. The empirical experience from Canada and the EU stands in sharp contrast to the traditional policy model which assumes regulators "should balance incentives for innovation and investment ... with the benefits that greater competition can create for consumers." (Notice of Consultation, par.12). In other words, innovation and investment do not necessarily go on the same side of the equation: more competition can promote innovation and over-investment in old platforms can threaten technological innovation and lead to inefficient duplication.

³² See e.g. Telecommunications Policy Review Panel (2006). *Final Report*. Government of Canada. Retrieved from [http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/tprr-final-report-2006.pdf/\\$FILE/tprr-final-report-2006.pdf](http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/tprr-final-report-2006.pdf/$FILE/tprr-final-report-2006.pdf)

Government of Canada (2010). *Improving Canada's Digital Advantage. Strategies for Sustainable Prosperity – Consultation Paper on a Digital Economy Strategy for Canada*. Retrieved from http://publications.gc.ca/collections/collection_2010/ic/Iu4-144-2010-eng.pdf

³³ Ibid, page 16.

³⁴ Ookla Net Metrics/Speedtest (2014). Retrieved from <http://www.ookla.com/>

³⁵ See supra note 4.

³⁶ Rajabiun, R & Middleton, C. (2013c): Regulation, investment and efficiency in the transition to next generation networks: Evidence from the European Union, 24th European Regional Conference of the International Telecommunication Society, Florence, Italy, 20-23 October 2013. Available at: <https://www.econstor.eu/dspace/bitstream/10419/88536/1/774542853.pdf>

Service categories and classification of existing wholesale services

23. As regulatory institutions mature, different interest groups solve their collective action problems and put their own footprints on the rules of the game, which increases the complexity of the regulatory framework. The evolution of Canada's wholesale regime over the past two decades is no exception to this rule. Excessive complexity increases the costs of compliance and can create the perception that regulations are there to serve the private interest of those who have succeeded in shaping them. We suggest this Review provides a unique opportunity for simplifying and consolidating the six categories of wholesale services into four: essential, non-essential, interconnection, and public good. A reclassification along these lines and clarification of appropriate rules for each category can reduce the costs of compliance on operators of essential facilities and limit uncertainties about the application of the regulatory framework for resellers, other carriers, and technology companies requiring wholesale access and interconnection services. This type of reform to the design of the regulatory framework would help achieve the objectives of the 2006 Policy Direction by helping to "...ensure the technological and competitive neutrality" of the regime in the future.³⁷

Wholesale high-speed access services

24. With its 2010 decisions on speed matching and clarification of obligations on cable companies mentioned in the Notice of Consultation, the Commission has already tried to address some of the concerns about the asymmetric application of essential facilities regulations across platform operators. While extending interconnection obligations to emerging FTTP technologies may create some disincentives for operators to invest in them, as detailed above regulatory forbearance under the Telecom Decision 2008-17 has not been that effective in stimulating fibre diffusion either (i.e. 2% in Canada, versus 16% OECD average). Pursuant to the 2006 Policy Direction's technological and competitive neutrality mandate, we submit that bringing both cable and fibre under the umbrella of a streamlined high-speed wholesale access regulatory framework would be the only appropriate direction for reform.

25. Only if the Commission decides to define FTTP as an essential facility, it will be able to employ its statutory authority to stimulate the transition from old to new platforms Canadians demand. Specifically, if FTTP is to be regulated it may be optimal to set a regulated price that is substantially above accounting costs in order to offer potential investors in FTTP deployment projects with sufficiently attractive profit opportunities. This approach can help stimulate incentives of incumbents, potential entrants, or even municipalities to incur the fixed capital expenditures of FTTP by providing them with a clearer picture of the type of return they can expect.³⁸

Additional new wholesale services

26. As noted above, access to interconnection points and backhaul transport facilities represents a particular challenge for extending high-speed connectivity to rural and remote communities. They also remain somewhat relevant in urban areas for enabling

³⁷ (1(b)(iv)).

³⁸ It should be noted that if the regulated price is too high, it is possible that in the future another firm will have incentives to roll out its own FTTP network in a particular local market, which may lead to inefficient duplication.

businesses, large organizations, independent ISPs, and other entities such as property management companies that can aggregate end user communications to bypass incumbents' networks and provision their own networking needs. The convergence of fixed and wireless connectivity creates further impetus for reconsidering this aspect of the regime.

Forbearance for wholesale services

27. We submit that simplification of the wholesale access classification system as detailed above would help mitigate uncertainties associated with forbearance and the adversarial setting in which the Commission has had to define its boundary over the past decade. Sunset and conditionality clauses on essential facilities and interconnection obligations further exacerbate uncertainties about the scope and economic implications of the regulatory framework for incumbents, entrants, and the wide range of content and application providers that require interconnections into the network in the vicinity of their end users (e.g. Content Delivery Networks (CDN) of firms such as Google, Akamai, Amazon). As the ecosystem becomes more complex, it becomes particularly important to adopt simpler more general rules that can be adapted to induce cooperation under a larger variety of circumstances.

Negotiate agreements

28. Off-tariff negotiated agreements represent only 3% of total wholesale access revenues, versus 24% for transactions regulated under Canada's wholesale regime.³⁹ Despite their relatively small size, this class of agreements offer a unique window into the efficacy of essential facilities regulations and their practical impact on the market. For example, debates about the rise of these agreements pursuant to Telecom Decision 2008-17 & Telecom Regulatory Policy 2009-19 can be interpreted as symptoms of increasing complexity of the wholesale regulatory regime and uncertainties about the application of regulatory framework associated with the current classification system and prospective forbearance/sunset clauses. This lends further support to comments above regarding the need to consolidate the classifications, reassign facilities into clearly defined categories, and employ simple rules of desired restrictiveness as the Commission finds relevant.

29. More generally, the rise of off-tariff negotiated agreements suggests that the regulated access price might be too low to induce operators of certain essential facilities to cooperate and interconnect with third party entities. When a party that wants to interconnect has enough to gain and the party that operates the essential facility is reasonable, a private bargain at a price that exceeds the regulated tariff is mutually beneficial. In most cases preventing such transactions would reduce efficiency and consumer welfare; and be inconsistent with Section 7.c of the Act and the 2006 Policy Direction to the CRTC to "rely on market forces to the maximum extent feasible as means of achieving the telecommunications policy objectives". This is because at the regulated price there would be no transaction at all, despite the existence of some uncertain legal obligation on the operator of the essential facility to interconnect.

³⁹ CRTC Monitoring Report 2013, Figure 5.1.10

30. Nevertheless, the efficient operation of market systems depends on information about behaviour of large entities whose strategic decisions matter for strategic decision making by others. Off-tariff negotiated agreements that bypass the regulatory regime should not be prevented as a general rule, but information they generate can be valuable to the Commission, investors and resellers, as well as other entities interested in the broadband infrastructure development such as provincial governments. By reducing disclosure obligations about off-tariff negotiated agreements under Telecom Regulatory Policy 2012-359 the Commission has closed an important channel of information to itself and the market. Given the relatively small size of this class of transaction in the total wholesale market, it is somewhat surprising that the Commission has found previous disclosure requirements represented an undue burden and instead moved to require the parties to submit only a “general summary” of such transactions. We submit that reversing course in this area is appropriate as the Commission needs to pay careful attention to information about the operation of the market and behaviour of dominant operators embedded in such contracts.
31. While not mentioned in the Notice of Consultation, a second form of negotiated agreements that are of increasingly importance for the wholesale access regime relate to Quality of Service (QOS) differentiation arrangements between particular content and application providers on one hand, and infrastructure operators on the other. Telecom Regulatory Policy CRTC 2009-657 established mechanisms to enhance the transparency of Internet Traffic Management Practices (ITMP) at both retail and wholesale levels. Given the broad scope of this review, we suggest that it might also be appropriate to include this important issue in the discussion. Under CRTC 2009-657’s conception of competitive neutrality in terms of wholesale services, it is the platform operators that have the discretion to determine which content and application providers get a higher/lower service quality. As long as the operators can show that technical ITMPs applied to wholesale services comply with the ITMP framework and do not have a significant and disproportionate impact on secondary ISP traffic, they are able to engage in QOS optimization agreements with content and application service providers that require high quality connectivity to reach their customers. This creates the potential for discriminatory practices that limit the scope for technological convergence of telecommunications and broadcasting to the Internet, a particular concern in Canada due to the high degree of vertical integration of incumbent operators in content and broadcasting. Changing the default rules and providing both the incumbents and resellers with the clear legal rights to engage in QOS optimization agreements would help promote competition and efficiency on both sides of the two-sided market for Internet connectivity.

Rate setting for wholesale access

32. Although there are some well-justified concerns about Canada’s cost plus mark up approach to pricing access to facilities considered essential, we suggest debating the merits of cost calculations may draw attention away from more important strategic issues surrounding the transition from legacy to next generation FTTP networks.⁴⁰ Specifically,

⁴⁰ For an analysis of pricing problems across legacy and emerging platforms in context of debates about competitive neutrality see Neumann, K. H., & Vogelsang, I. (2013). How to price the unbundled local loop in the transition from copper to fiber access networks?. *Telecommunications Policy*, 37(10), 893-909. Retrieved from: <http://www.sciencedirect.com/science/article/pii/S0308596113000955>

considerations of technological neutrality as mandated by the 2006 Policy Direction suggest the Commission may ultimately have to reassess its forbearance and extend the scope of the wholesale framework that applies to DSL increasingly to cable and FTTP networks. If the Commission decides to follow this path, applying the same costing methodology and mark up level to legacy and next generation platforms may be required under the Policy Direction's technological neutrality mandate. However, from an economic perspective such a regime would not necessarily be efficient as differentiated pricing strategies across legacy and emerging platforms may help accelerate the pace of creative destruction from the old to the new. Below are a number of scenarios that we hope help draw attention to this key issue:

33. If the regulated price on legacy infrastructure is relatively low from the perspective of essential facilities operators, they may not have sufficient incentives to cooperate with third parties at that price; which helps explain growing concerns about off-tariff negotiated agreements as noted above (i.e. higher price for access than is legally required). Furthermore, a low price can limit the incentives to upgrade links and invest in local switching facilities to mitigate congestion and lead to degradation in service quality. This will not necessarily be in the interest of end users with relatively modest demand for network resources who may choose to stay on relatively slower legacy platforms. On the other hand there is an advantage to a relatively low regulated access price on older technologies relative to next generation platforms as it may create some incentives for incumbents to build their fibre networks increasingly closer to the end user premises. This would benefit all end users, but more those with relatively high demand for network resources.
34. As detailed above, commitment to forbearance on FTTP networks has not been very effective in promoting their diffusion. We suggest to reverse this trend the Commission considers incorporating these emerging technologies into the regulatory framework and setting a relatively high cost plus margin for third party access. Such a policy can accentuate the payoff to being the first mover in deploying high-capacity fibre platforms and minimize the likelihood of inefficient duplication in the long term. Under the current regime incumbent DSL and cable operators are bringing fibre closer to end users. Having more than one competing FTTP platform may help promote competition in the future as legacy infrastructure is decommissioned, but is not necessarily the more efficient organizational arrangement since it implies inefficient duplication and overinvestment. In addition to defining a notional "prize" for whoever decides to take the risk of becoming the FTTP monopolist, a high regulated price and clear third party access obligation can help promote cooperation and risk sharing in fixed capital expenditures required for deploying next generation FTTP networks. For example such a policy could enhance incentives for joint ventures aimed at deploying a single very high capacity network in a particular local market by incumbents. If they decide not to take the lead, then other types of entities such as potential entrants or municipalities would also have incentives to build FTTP networks which they can then resell at more than a reasonable price. In the very long term (i.e. two to three decades), as FTTP networks become more ubiquitous, end users move away from legacy platforms, and the fixed costs of these platforms are amortized by the operators, the Commission can then start to gradually reduce the mark up on wholesale access to these platforms to reflect more closely incremental costs of operating and upgrading the network.

Performance measurement

35. According to the latest CRTC data, in terms of revenues the size of the wholesale market is less than 1/20th of the retail market (4% of total revenues).⁴¹ Changes to this ratio overtime can provide one outcome indicator for assessing the future performance of the wholesale framework and its capacity to provide non-incumbent entities with opportunities to interconnect with particular components of the network. Data on the size and structure of the wholesale access market can then be analyzed for its potential impact on indicators of economic outcomes at the retail level outcomes, such as fibre diffusion, price of access, and the quality of network connectivity end users experience.
36. We suggest the key problem in measuring policy outcomes facing the CRTC is the heterogeneity of the market for broadband access services in terms of consumer preferences, diversity of retail access packages that are offered on the same platforms, and the complexity of business arrangements at the interconnection level that determine QOS differentiation across content and application providers. Aggregating price and quality/speed measurements into simple averages is an inherently arbitrary task, but is a necessary ingredient in evidence based decision making from both business and public policy perspectives. We have been collecting and analyzing speed measurements from various sources over the past few years to enhance the ability of policymakers at the federal and provincial governments to assess the pace of progress in network development and are pleased to share this data with the Commission.⁴²
37. Measures of broadband network quality vary significantly across testing methodologies and providers of speed data commonly cited in policy debates in Canada and around the world (e.g. Ookla/speedtest, M-Lab NDT, Akamai, SamKnows). These differences are material both in terms of absolute measured speeds and in how the testing methodologies rank particular jurisdictions and Internet service providers in relative terms. In addition to various technical differences across testing methodologies, this is because each offers a distinctive window into the complex world of Internet connectivity. We submit that in evaluating the implications of its policies and regulations, the Commission should therefore focus on how network quality end users experience evolves over time and not to rely on one or another broadband speed measure on an exclusive basis. Developing a geographically disaggregated index of network quality based on complementary testing methodologies would offer a more balanced aggregated picture that can then be used to benchmark the pace of progress, identify market failures, and try to address them with the appropriate regulatory and industrial policies (i.e. rural areas).
38. As various communications and broadcasting platforms have converged to the Internet, market forces have created an increasing impetus for content and application level QOS differentiation (i.e. entities that can pay more get better connectivity to their customers). The emergence of this side of the two sided market over the past few years limits the quality of speed measurements from software and hardware based network performance tests that employ generic test packages to assess the quality of connectivity (e.g.

⁴¹ CRTC Monitoring Report 2013, 5.3.

⁴² See Table 1 above for an overview.

Ookla/Speedtest, SamKnows). In reality service providers employ increasingly complex congestion control and QOS optimization algorithms that reflect their business interests. In addition to concerns about the rise of a two tiered Internet in Canada, QOS differentiation across application and content vendors mean that speed measurements based on generic test packets do not offer a realistic picture of the end user experience. For this reason, in our research we have been relying as much as possible on network performance measurements collected from Akamai Technology's Content Delivery Network (CDN), which captures network quality during the delivery of 2nd generation content and applications services. Nevertheless, we are aware of the strengths and weaknesses of this and other testing methodologies and would be happy to provide the Commission with further details as required.

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