

Report on Regulation of Fixed Wireline Wholesale Access to High-Speed Networks in Canada and Other Countries

A report prepared for Cogeco Communications Inc., Quebecor Media Inc., on behalf of its affiliate, Videotron Ltd., Rogers Communications Canada Inc., and Shaw Communications Inc.

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Executive Summary

- ES1. This report was commissioned by Cogeco Communications Inc., Quebecor Media Inc., on behalf of its affiliate, Videotron Ltd., Rogers Communications Canada Inc., and Shaw Communications Inc. to provide analysis on how Canadian wireline wholesale access regulations diverge from other countries in response to the Competition Bureau's Market Study Notice: Competition in Broadband Services.
- ES2. The report considers wireline wholesale access regulations in 12 countries. Six, or one-half, of these countries exhibit very high coverage by both telecom and cable network operators: Canada, Belgium, the Netherlands, Portugal, Switzerland and the United States. The remaining six countries have more limited coverage by cable operators: Australia, France, Germany, Italy, Japan, and the United Kingdom.
- ES3. The Canadian Radio-Television and Telecommunications Commission (CRTC) regulates wholesale access to the high-speed internet networks of both the incumbent telecom and cable network operators across Canada. The extent of the regulations encompasses *ex ante* review and approval of all rates, terms and conditions, with rates based on detailed cost studies.
- ES4. The Ladder of Investment theory, which informed the regulatory framework in most European countries, proposes that regulators mandate wholesale access to an incumbent operator's facilities in a manner that incents entrants to progress from lower-risk and lower-investment forms of entry by using wholesale services at lower rungs to higher-risk and higher-investment entry based on services at higher rungs. Ultimately, entrants would become fully facilities-based.
- ES5. The Ladder of Investment theory appears to have had some influence on the Canadian regulations. Resale-based entrants have been provided with wholesale access across a range of facilities with the expectation they will evolve towards facilities-based competitors. Yet, the CRTC's approach to wireline wholesale access in practice has resulted in mandated access to facilities at one of the lowest rungs on the ladder – bitstream – while mandated access to one of the higher rungs – unbundled loops – has been phased-out.
- ES6. There are three key findings that follow from the analysis in this report.
- 1) Regulatory intervention in the wireline high-speed internet market in the 12 countries studied has had limited influence on market structures in the presence of competing network operators.
 - 2) A number of the countries studied are looking to promote private sector investment in next generation architecture (NGA) networks with a focus on

lessening regulatory uncertainty and obligations associated with these investments.

- 3) Facilities-based competition and investment by entrants can be promoted by applying more regulatory remedies at the higher rungs of the Ladder of Investment, rather than the lower rungs.

ES7. These findings provide the basis for lessons for how Canada could improve its approach to regulating wholesale high-speed access services in the wireline market.

(1) Market structure is determined more by the presence of competing wireline facilities than by regulatory frameworks

ES8. The report finds the approach to regulation varies in intensity among the 12 countries without exhibiting a strong commonality with the market structure, notably network coverage by facilities-based and resale-based competitors and their respective market shares.

ES9. Entrants' market share is less than 20% in six countries, including Canada. There are countries in this group with fewer regulatory remedies (e.g., Portugal, Switzerland and the United States) and more regulations (e.g., Canada, Belgium and the Netherlands). What these six countries do have in common is they each exhibit extensive coverage by telecom and cable networks.

ES10. Canada is the only country with long-standing wholesale access obligations applied to both the incumbent telecom and cable operators among those countries where both are widely available. Canada also applies remedies at the lowest rungs, on an *ex ante* basis, with little intervention at the higher rungs.

ES11. With the exception of Belgium which only recently took steps to extend the regulations to cable operators, wholesale access regulations apply to just the telecom operators in the studied countries with both telecom and cable carrier networks. The regulatory remedies for telecom operators apply to varying degrees, or not at all, as in the case of the United States.

ES12. The findings in this report, as well as other studies, strongly suggest that regulatory intervention directed at stimulating resale-based competition relying on mandated wholesale access is unlikely to have a significant impact on the market structure in countries with widespread coverage by two independent facilities-based network operators.

(2) Promoting investment in NGA networks by lessening regulation

ES13. Canada shares with most other countries the common goal of promoting the widespread deployment of NGA networks. Canada has achieved a high degree of availability of higher-speed internet services on NGA networks, but it has not kept pace with advances in several countries studied in this report.

ES14. Several countries have introduced more flexible, lighter regulations for advanced NGA networks. Examples include alternatives to strict cost-based rates, reduced or zero wholesale access requirements for fibre-based facilities. Countries that have adopted, or proposed, lighter-touch regulation for NGA facilities recognize that doing so can promote investment by reducing the risk of regulation and providing more commercial flexibility.

ES15. The CRTC's wholesale access regulations promise ongoing regulation of full-fibre wholesale access services of both the telecom and cable network operators. At the same time, slower speed access services delivered over legacy network facilities could be deregulated in the future.

(3) Regulatory remedies should focus more on support structures and other wireline passive facilities to promote facilities-based competition and investment

ES16. Regulation must carefully balance incentives among the different regulatory remedies at different stages of the market development for it to successfully promote facilities-based competition and investment. The wireline wholesale access regulations in Canada appear to be overly weighted to the most active services that require less investment by entrants, compared to most other countries in this report.

ES17. To rebalance the regulatory approach, Canada should take steps to lessen regulation of the more active wireline wholesale access services, such as bitstream services, and improve access to more passive access services, notably support structures.

ES18. Support structures are recognized as a critical input to promoting investment in NGA networks and increasing facilities-based competition in almost every country considered in this report. This includes the otherwise deregulated approach in the United States.

ES19. There has been no meaningful improvement in access to support structures in Canada. Rather, recent rulings have resulted in higher rates without regard to the impact this could have on the cost of deploying infrastructure.

ES20. In summary, the experience in the other countries studied in this report provides Canada with multiple examples of alternative approaches to regulation – both positive and negative. Underpinning the more positive examples is the guiding principle that, if regulation is pursued, the regulator must commit to weakening the lower rungs and strengthening the higher rungs if it is hoping to influence the market towards greater facilities-based competition and investment in NGA networks.

1.0 Purpose and Scope of the Report

1. The purpose of this report is to provide analysis in response to the Competition Bureau's Market Study Notice: Competition in Broadband Services. In particular, the report provides information and analysis in response to question four posed in the notice of the Market Study, which stated:

“How do other countries manage and regulate broadband competition?”

1. Do Canadian regulations diverge in any meaningful way from those employed by other countries? Are there significant differences between Canada and other jurisdictions that explain any divergence?
 2. Are there lessons to be learned from how other jurisdictions regulate broadband?”
2. The report was commissioned by Cogeco Communications Inc., Quebecor Media Inc., on behalf of its affiliate, Videotron Ltd., Rogers Communications Canada Inc., and Shaw Communications Inc.
 3. The report begins with a brief overview of models that have been adopted by regulators of telecommunications in Canada and other developed countries. This section provides a contextual framework for the discussion of the regulations adopted in Canada and how these compare to regulations in the other countries studied in this report. This is followed by a general discussion of key indicators for assessing market characteristics of fixed wireline high-speed services. This section introduces common terminology used to describe the different types of network platforms used by facilities-based and resale-based competitors.
 4. The report next turns to the presentation of the regulations of wholesale high-speed access services in Canada in section 2. The third section provides similar regulatory information for the 11 other countries included in the report, Australia, Belgium, France, Germany, Italy, Japan, Netherlands, Portugal, Switzerland, United Kingdom and United States. Section 4 presents data on market characteristics in the provision of high-speed internet service for each of the 12 countries.
 5. The fifth section presents key findings and responds to the second part of question four – lessons that can be drawn from the approaches taken in the other studied countries.

1.1 Overview of regulatory models

6. Regulation of wholesale access to high-speed networks varies across countries. This reflects differences in legislative frameworks and policy objectives, in addition to market characteristics.
7. Most countries studied in this report are pursuing policy objectives that seek to increase the supply of, and demand for, high-speed internet access services. Government support for these objectives can be in the form of financial initiatives targeting increased supply (e.g., subsidies for and/or investment in networks, tax incentives) or support for demand (e.g., targeting the “digital divide” through training or other forms of assistance to non-users, online access to key government services). Regulation of high-speed internet access services, either at the retail or wholesale level (although rarely at both levels) may also be tasked with serving these policy objectives.
8. The legislative framework for most regulatory agencies studied in this report is grounded in the principle of applying regulatory remedies in response to existing or potential market failure. Regulation in response to market failure is intended to achieve outcomes that replicate those likely to occur in a properly functioning, competitive market. A market that is not competitive and is not likely to be subject to competitive entry or threat of entry (i.e., due the presence of high barriers to entry) can be regulated at the retail service level. An example of this is the regulation of local telephony services that was commonplace in the 20th Century when such services were provided by telecom operators with monopoly rights and obligations. Regulation can also mandate wholesale access to the facilities of a network operator to enable other service providers to use those facilities. This can bring about resale-based service competition in the retail market and may be accompanied by deregulation of services at the retail level.
9. A decision to impose new, or maintain existing, regulatory remedies is based on an assessment of market conditions to determine the state of competition. This assessment commonly follows a three-step process. First, the relevant market is defined in terms of the scope of the products to be included in the same market and the scope of the geographic coverage of the market. Ideally, the relevant market should be defined narrowly to include only products that are competitive substitutes available within the same geographic region.¹ The second step requires an assessment of the effectiveness of competitive market forces within the relevant product and geographic market to determine if a network operator has significant

¹ The geographic scope of the market may be defined at a more aggregate level in order to simplify the analysis.

market power. The third step is to determine what regulatory remedies are warranted in response to a finding of significant market power in the second step.

10. It has been argued in some jurisdictions studied in this report that regulation mandating wholesale access to facilities of existing network operators can bring about competitive entry that, in addition to being resale-based, will enable the entrants to pursue a strategy of investing in their own facilities and compete in the market independent of the incumbent network operator, thus enhancing facilities-based competition.² This is also referred to as the Ladder of Investment theory, popularized by Martin Cave in the early 2000s.³ It is similar in concept to the stepping stone model.⁴
11. The Ladder of Investment theory posited that mandating wholesale access would result in sustainable facilities-based competition by providing entrants with the ability to enter the market by first relying almost entirely on components of the incumbent network operator's facilities at the lowest rung and then evolving to less dependency at higher rungs.
12. The lowest rung on the ladder is simple resale that requires only minimal investment by the entrant. Wholesale services provided at progressively higher rungs on the ladder require the entrant to commit to more investment as it substitutes its own facilities for those of the incumbent. The lower rungs of the ladder are also characterized as providing access to more active components of the incumbent's network (e.g., customer billing, operational support, switching), while higher rungs may provide only passive components (e.g., unbundled loops, dark fibre). At the highest rung, and arguably off the top of the ladder, is access to the supporting structures for network facilities (e.g., poles, conduits/ducts, rights of way). In some jurisdictions, the term "active" is used to refer to the group of wholesale services at the lower rungs, while the term "passive" refers to wholesale services at the higher rungs.
13. A key challenge with the Ladder of Investment theory is creating a regime that incents entrants to progress to higher rungs towards becoming fully facilities-based. Cave noted that doing so required regulators to commit to the model.

² Because telecommunications is a network service, even independent facilities-based network operators require interconnection to the networks of its competitors in order to permit communications to flow between the end-users served by different networks.

³ Cave, M., "Encouraging infrastructure competition via the ladder of investment," *Telecommunications Policy*, 30 (2006), pages 223-237.

⁴ Telecommunications Policy Review Panel, "Telecommunications Policy Review Panel, Final Report," (March 2006), pages 3-33 to 3-35.

“[T]his approach requires active management by the regulator: it is not a policy of ‘easy access’ but one of ‘tough love’ in which [competitive providers] are chivvied up the ladder by price incentives or the expectation of withdrawal of the more comprehensive access products corresponding to the lower rungs of the ladder.”⁵

14. It has been observed that regulators that adopted the Ladder model have had little success in achieving the stated goal of facilities-based competition, with most entrants remaining dependent on the facilities of the incumbent.⁶
15. A critical challenge with regulating wholesale access to the incumbent network operator’s facilities is setting the rates, terms and conditions for wholesale access.⁷ Entrants may choose to buy rather than build their own facilities; a decision that is strongly influenced by the wholesale rates of facilities at different rungs. Entrants may also have greater incentives to rely more on facilities at higher rungs because this offers more control over their operations which, in turn, enables them to differentiate their retail services from competing offers of the incumbent or other service providers.
16. The wholesale rates for facilities at different rungs of the ladder can influence the investment decisions of the incumbent network operator obligated to provide wholesale access to its facilities. Several studies have found that setting wholesale rates too low discourages investment by incumbents and entrants.⁸ Low wholesale rates reduce the return on investment for the network operator both in wholesale and retail markets. This could similarly discourage other existing or potential facilities-based network operators from investing. A related concern is that rates that are too low promote uneconomic entry by service providers that lack sufficiently robust business plans to progress to higher rungs. The impact of regulatory intervention on investment incentives risks the development of faster and more capable telecommunications networks.
17. Regulatory agencies that have mandated wholesale access may choose to adopt a market-oriented, or “light-touch”, regime where there is evidence that doing so will

⁵ Cave, M., “Snakes and ladders: Unbundling in a next generation world,” *Telecommunications Policy*, 34 (2010), pages 80-85.

⁶ Feasey, R. and M. Cave, “Policy towards competition in high-speed broadband in Europe, in an age of vertical and horizontal integration and oligopolies, Project Report,” Centre on Regulation in Europe, (February 20, 2017), pages 16 and 50; and Vogelsang, I., “The Endgame of Telecommunications Policy? A Survey,” *CESifo Working Paper No. 4545, Category 11: Industrial Organisation* (2013).

⁷ See also Feasey and Cave (2017), page 16.

⁸ Wallsten, S., “The Incentive Effects of Wholesale Unbundling Regulation on Investment,” *Appendix 2 to the comments of Rogers Communications Canada Inc., in response to Telecommunications Notice of Consultation CRTC 2013-551*, (2014). See also Briglauer, W., C. Cambini, M. Grajek, “Speeding Up the Internet: Regulation and Investment in European Fiber Optic Infrastructure,” European School of Management and Technology (ESMT) Working Paper 17-02, (May 3, 2017).

support competition in the retail market. A market-oriented regime reduces wholesale access obligations, for example, related to active facilities at lower rungs in the ladder. Similarly, regulators may choose to impose less stringent obligations, or none at all, on new facilities that replace legacy networks. Lightening the obligations can take various forms:

- flexible rules for setting rates that are based on less stringent methods than full-blown cost studies;
- negotiated rates, which may be subject to transparency measures (e.g., published reference offer); and
- *ex post* complaints-based enforcement of the obligation to provide wholesale access on non-discriminatory terms.

18. Regulators may also determine that more stringent regulatory obligations are warranted where it is determined that existing obligations have failed to achieve sufficient competition. Examples include functional or structural separation of an incumbent operator into wholesale and retail operations, or extending mandated wholesale obligations to other incumbent network operators. Regulatory obligations may also be added as conditions for approving a merger between competing network operators.⁹ In these circumstances, the regulatory obligations apply to only the merged entity and may remain in effect for a pre-determined period of time.

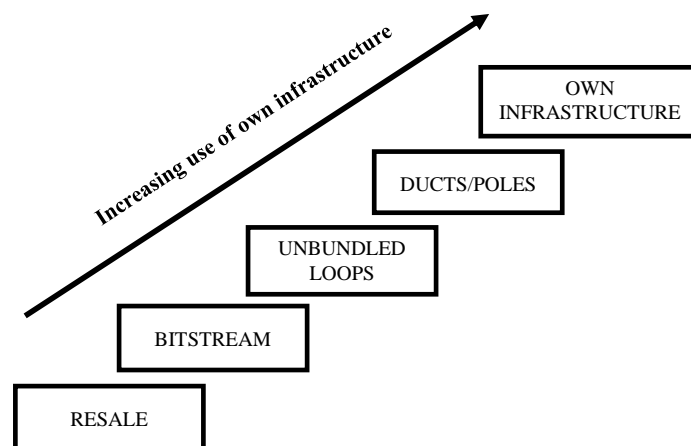
1.1.1 Regulatory remedies considered in country comparisons

19. Regulatory authorities in the different countries studied in this report have adopted a range of remedies for wholesale access to facilities for the fixed wireline high-speed internet service market. In order to facilitate a comparison among the countries, regulations are presented based on the following concepts and terminology.

(i) Service level

20. The service level is based on the Ladder of Investment concept, ranging from those with the most active functionalities (e.g., resale and bitstream) to the most passive (e.g., dark fibre and support structures). Services at certain rungs can be further delineated according to whether the facilities are supported by legacy or next generation architecture (NGA) networks. The following provides an illustration of the rungs on the Ladder of investment.

⁹ The network operators seeking merger approval may propose to abide by certain obligations or structural remedies in order to gain regulatory approval.



(ii) Type of regulatory remedy

21. The type of regulatory remedy considered in the analysis starts with identifying whether access is mandated, and if so, the extent to which the terms for providing access are prescribed by the regulatory agency. The following generalized types of regulatory remedies are considered:

- (a) mandated, where wholesale access to the service has been mandated by the regulatory agency;
- (b) non-discrimination, where the mandated service provider is subject to an obligation to provide access on non-discriminatory terms, usually enforced through an *ex post* complaints mechanism;
- (c) negotiated, where the mandated service provider is required to provide access on negotiated terms, which may be in lieu of more strict *ex ante* remedies that require rates, terms and conditions approved in advance;
- (d) cost-based rates, where the mandated service provider is required to obtain prior approval to rates based on cost studies; the nature of the costing exercise and inputs may allow for different levels of compensation to the wholesale service provider;
- (e) quality of service (QoS), where the mandated service provider is required to maintain a minimum level of service quality provided to wholesale customers; and
- (f) functional or structural separation, where the mandated service provider is required to provision the wholesale services separately from its retail operations,

and where structural separation requires establishing a legally separate operating entity.

22. The regulatory remedies may be imposed in combination. Notably, most regulatory authorities in the countries studied in this report that have mandated wireline wholesale access require that access be provided on non-discriminatory terms. This remedy may be used to resolve specific disputes between network operators and wholesale customers.
23. Similarly, a network operator with the requirement to provide access at cost-based rates may also be permitted the option of offering access on negotiated terms, since the wholesale customer would not accept negotiated terms that are less favourable than the regulated terms. In some cases, the network operator is required to make public a reference offer that sets out a default set of rates, terms and conditions which can form the basis for a negotiated agreement.
24. Finally, remedies related to quality of service and functional or structural separation are generally applied in addition to cost-based rates. Regulatory remedies related to functional or structural separation are considered among the most intrusive.
25. The six general types of regulatory remedies are referenced in the presentation of the regulations in Canada. In addition, the remedies inform the comparison of the regulations applied in the other countries studied in this report.
26. An important aspect of the comparison is the extent to which regulatory remedies are applied to different categories of network operators, specifically, telecom and cable operators. As discussed in more detail in the subsequent sections, Canada is the only country to have mandated wholesale access obligations on both the telecom and cable operators from the very start of the development of the wireline high-speed internet market.

1.2 Overview of market characteristics of fixed wireline high-speed networks

27. Fixed wireline high-speed networks consist of wired transmission facilities capable of delivering internet access services at speeds sufficient to support commonly used applications. Currently, this would encompass services with speeds of at least 5 Mbps downstream and 1 Mbps upstream and, arguably, higher speeds of at least 30 Mbps downstream as usage of applications intensifies.
28. The wired transmission facilities used to deliver fixed high-speed internet access services in most countries are those that evolved from legacy telephony (copper) and cable television (coaxial) networks. Beginning in the 1990s in Canada and some

other countries, each telecom and cable network operator upgraded its networks to provide high-speed internet services. Today, most of these networks have been upgraded to include fibre-based links where the fibre is extended closer to the customer premise. Fully fibre-based links include those referred to as fibre-to-the-home (FTTH), fibre-to-the-building (FTTB), collectively FTTH/B.

29. Partial fibre links include the higher speed digital subscriber line (DSL)¹⁰ connections provisioned by telecom operators as well as the hybrid fibre-coax (HFC) connections of cable operators. These types of connections are also indicated by the acronym FTTx. NGA networks encompass connections provisioned over FTTH/B, as well as those using FTTx that have been upgraded to support higher speeds.¹¹
30. Most of the cable operators' networks consist of fibre-rich connections, while a growing share of the telecom operators connections are FTTH/B.¹² In Canada and most other countries, the fibre-rich networks of cable operators are provisioned using DOCSIS 3.0 or 3.1 protocols that enable speeds in the range of those offered over the telecom operators' FTTH/B-based networks.
31. Telecom and cable network operators typically provide retail wireline high-speed internet services to the same regions where they initially offered their respective legacy services of telephony and cable television. Their network footprints tend to overlap to a large degree, although the cable operator's network coverage is more limited in rural areas and may include only city centres in some countries.
32. The telecom network operators in some of the countries studied were initially state-owned, and have retained some degree of state ownership, including in several European countries and Japan.¹³ There were also instances where the same entity owned both the telecom and cable operators, including state ownership, although most of these ownership structures have since been dismantled.¹⁴
33. Other facilities-based service providers that may compete in the market for high-speed internet services are electrical utilities (or their subsidiaries). Electrical utilities have been able to make use of the support structures they own for their electricity

¹⁰ This includes asymmetric DSL (ADSL) and very-high-bit-rate DSL (VDSL), generically referred to as xDSL

¹¹ In the case of telecom networks, FTTx connections that use bonding and/or shorter loop lengths are capable of delivering speeds of at least 25 Mbps. In the case of cable networks, FTTx connections provisioned using the DOCSIS 3.0 standard are capable of delivering speeds of at least 50 Mbps.

¹² CRTC, Communications Monitoring Report, 2017, Figures 5.1.5 and 5.3.15, as of 2016.

¹³ In Canada, the larger telecom operators had been owned by the provincial government but have since been privatized, with the exception of SaskTel. There are other small, municipally owned telecom operators.

¹⁴ Denmark, which is not included in this report, continues to have the telecom and cable networks owned and operated by a single company, TDC.

transmission facilities to place fibre cables. Electrical utilities typically resell capacity on their fibre networks on a wholesale or bulk basis rather than enter the retail internet services market directly.

34. Mobile network operators are another source of facilities-based competition in the higher-speed internet market. Mobile network operators that have deployed fourth-generation (4G/LTE) facilities can support data transmission speeds in the range of 30 Mbps. Mobile operators in several countries have widely deployed 4G and are investing in fifth-generation, 5G networks. 5G promises transmission speeds of up to 10 Gbps, as well as other quality improvements over 4G. There are indications that end-users are replacing their fixed wireline internet connections with mobile data-only broadband connections, particularly in Japan. The rate of substitution in this market follows a similar trend in mobile substitution that has occurred with voice telephony services.
35. Competition through mobile substitution in high-speed internet services adds another dimension to facilities-based competition, even in markets where the mobile network operator is integrated with a fixed wireline network operator since the coverage of the two types of networks can differ. This report does not analyse the wholesale access obligations with respect to mobile networks, which is a matter that is beyond the scope of the Competition Bureau's market study.

1.2.1 Measures of market characteristics considered in country comparisons

36. The degree to which multiple, independent facilities-based network operators compete in the market for high-speed internet services generally influences the regulation of retail and wholesale services provided by competing network operators. It is instructive to assess the level of competition in the high-speed market among the different countries studied in this report to provide context for the comparison of regulatory remedies.
37. The analysis is supported by a comparison of a number of market statistics for each country using the following indicators:

Part I – coverage by competing networks

- (a) Percentage of households with high-speed access services delivered by copper/fibre facilities, such as those typically deployed by an incumbent telecom network operator and, where available, the percentage providing at least 30 Mbps downstream;¹⁵

¹⁵ Telecom network operators' copper/fibre facilities used to provide xDSL high-speed internet services may be capable of delivering downstream speeds of at least 30 Mbps where upgraded to VDSL.

- (b) Percentage of households with high-speed access services as in (a) delivered by coaxial cable/fibre facilities, such as those typically deployed by an incumbent cable network operator);¹⁶
- (c) Percentage of households with high-speed access services delivered by full-fibre facilities (FTTH/B), which may be deployed by an incumbent telecom or cable network, or another network operator;
- (d) Percentage of households with high-speed access services delivered by mobile wireless facilities (4G/LTE or better);

Part II – subscriber penetration

- (e) Percentage of households subscribing to fixed wireline high-speed internet services in total and providing at least 30 Mbps downstream;

Part III – market shares

- (f) The percentage of subscribing households accounted for by an incumbent telecom network operator;
- (g) The percentage of subscribing households accounted for by an incumbent cable network operator; and
- (h) The percentage of subscribing households accounted for by a competitive service provider (neither telecom nor cable); and where possible, insights on the portion of the entrants' market share served using its own facilities versus those using resold wholesale access facilities.

38. Of the 12 countries studied in this report, Canada and five of the other countries have broadband-capable cable networks that are widely available, to at least 85% of households. The six countries are: Belgium, Canada, the Netherlands, Portugal, Switzerland and the United States. This group of countries with similar coverage are of particular interest to the analysis since competition in the retail market is supported by two independent facilities-based network operators.

¹⁶ Cable networks in the countries considered in this report have been upgraded to provide at least 30 Mbps downstream.

2.0 Regulation in Canada

2.1 General principles of regulation

39. In Canada, the Canadian Radio-television and Telecommunications Commission (CRTC) has responsibility for regulation of telecommunications. The CRTC regulates the telecommunications activities of Canadian carriers and may forbear from regulation where it finds that doing so is in the public interest. The CRTC employs an analytical framework for considering forbearance based on the three step process discussed in Section 1.1.
40. The CRTC's regulations are guided by the policy objectives set out in the Telecommunications Act as well as the Policy Direction of 2006. The objectives in the Telecommunications Act include, among others, to "enhance the efficiency and competitiveness" and "foster increased reliance on market forces" in the telecommunications industry.¹⁷ The Policy Direction further directed the CRTC to "rely on market forces to the maximum extent feasible", apply regulations that "interfere with the operation of competitive market forces to the minimum extent necessary to meet the policy objectives," and when mandating access to wholesale services, establish "appropriate pricing...to encourage investment and innovation in network infrastructure".¹⁸
41. Competition in telecommunications markets is preferred to regulation, as demonstrated by the above objectives and direction. Consistent with this principle, the CRTC has stated that facilities-based competition is a more sustainable and beneficial form of competition that ultimately provides greater consumer choice by enabling competitors to invest in their own facilities.

"The Commission's general approach towards wholesale service regulation has been to promote facilities-based competition wherever possible. Facilities-based competition, in which competitors primarily use their own telecommunications facilities and networks to compete instead of leasing from other carriers, is typically regarded as the ideal and most sustainable form of competition.

The desired outcome is that once competitors are given access to certain facilities (for example, access facilities), they are incited to enter the market and invest in other parts of the network, eventually leading to lower prices, innovative service offerings, and greater choice for consumers."¹⁹

¹⁷ Telecommunications Act, section 7 (c), (f).

¹⁸ Policy Direction, 2006, section (a) (i) and (ii); (c) (ii).

¹⁹ CRTC, Telecom Regulatory Policy 2015-326, paragraphs 5, 7.

42. The CRTC's statements appear to correspond to the principle of the Ladder of Investment discussed in Section 1.1. Notably, entrants have been provided with wireline wholesale access to a range of facilities with the expectation they will evolve towards facilities-based competitors. Yet, the CRTC's approach to wireline wholesale access in practice has resulted in mandated access to facilities at one of the lowest rungs on the ladder – bitstream – while mandated access to one of the higher rungs – unbundled loops – has been phased-out.

2.2 History of mandated wholesale access for fixed wireline high-speed facilities

43. The CRTC regulates wholesale access to fixed wireline high-speed facilities of both telecom and cable operators. The origins for the regulatory obligations are somewhat different for the two categories of network operators.

44. In the case of the telecom operators, the CRTC established a regulatory framework in 1994 to permit competitive entry via wholesale access to telecommunications networks for voice telephony, including an obligation to provide unbundled loops.²⁰ The CRTC issued a number of determinations throughout the latter half of the 1990s that sought to implement the overarching goal of bringing competition to markets that had been monopoly-controlled by the telecom operators.

45. The telecom operators began providing retail internet services over their networks in a manner that required end-users to complete a dial-up connection over a standard telephone line. Later in the 1990s, the telecom operators introduced higher-speed retail internet services using DSL technology that carved out a dedicated connection to the internet using the same network as for telephony but without interfering with the voice service. The CRTC concluded that the telecom operators would not be required to file tariffs for their new retail internet service, but would be required to provide wholesale access to the underlying facilities for competitors. The CRTC mandated wholesale access to the telecom operators' high-speed internet facilities, even though these were new services that were not monopoly provided; in essence, extending the regulatory approach developed for the former monopoly voice telephony services.

46. The CRTC had regulated cable operators with regard to their broadcast television distribution activities under the terms of the Broadcasting Act. However, a dispute over access to the cable networks for distributing non-programming services resulted in a decision by the CRTC in 1996 to regulate cable operators providing non-programming services as common carriers under the Telecommunications Act. It was also at this time that cable operators began to offer retail internet service. The

²⁰ CRTC, Telecom Decision 94-19 (the regulatory framework decision), and Telecom Decision 97-8 (the local competition decision).

CRTC required cable operators to file tariffs for their retail internet services initially but subsequently forbore from this regulation and the retail tariffs were withdrawn.

47. A subsequent CRTC ruling determined that the cable operators should provide third parties with wholesale access to their facilities to offer competing retail internet services. The wholesale access service was referred to as Third Party Internet Access (TPIA). The CRTC at first permitted the cable operators to set the terms for TPIA based on negotiations, subject to a general requirement, as regulated common carriers, to offer these services on non-discriminatory terms; a decision that was later reversed.
48. The CRTC's decision to mandate both telecom and cable network operators to provide wholesale access to the facilities used to provide high-speed internet service was issued in 1998. The CRTC made the following finding in that regard:
- “The Commission considers that incumbent telephone companies and incumbent cable companies have substantial market power with respect to higher speed access services, and that this market is not yet sufficiently competitive to justify forbearance with respect to the rates and terms on which these carriers provide higher speed access services.”²¹
49. The CRTC also concluded that mandating wholesale access was warranted for “the development of a competitive market for these services”. The conclusion implies that the CRTC found the telecom and cable network operators had the ability and incentive to exercise joint significant market power. However, the decision did not include detailed analysis showing how the CRTC arrived at this finding.²²
50. The CRTC decided in 1999 that it would regulate the rates, terms and conditions for the cable operators' TPIA service. In addition, the rates would be based on the long run incremental costing methodology that had been developed for setting regulated rates for retail and wholesale services of the telecom operators. The CRTC's decision to require the same costing methodology was consistent with its general view that the regulatory treatment of cable and telecom operators should be symmetrical.²³
51. Multiple proceedings spanning several years were conducted to develop the cable operators' TPIA service. The CRTC required cable operators to provide resale-

²¹ CRTC, Telecom Decision 98-9, paragraph 75.

²² The ability of unrelated firms to exercise joint significant market power requires certain conditions to be present in the market, as described in the Competition Bureau's Merger Enforcement Guidelines, paragraphs 6.26 to 6.34. <http://www.competitionbureau.gc.ca/eic/site/cb-bc.nsf/eng/03420.html>

²³ CRTC, Telecom Decision 99-8, paragraph 44. See also later rulings, including CRTC Telecom Regulatory Policy 2010-632.

based access to their retail internet service at a 25% discount off of the lowest retail price in the interim until TPIA service became available for use.

52. One of the challenges to implementing TPIA was resolving the technical means to provide the service. Canada was the first jurisdiction to mandate cable network operators to provide wholesale access to the facilities used for internet service. Differences in technology further complicated the deployment of TPIA service. The last-mile facilities connected to cable head-ends are shared among multiple end-users, which is quite different from dedicated last-mile loops that were used at that time to connect end-users to the telecom operators' central offices.
53. The shared nature of the cable network facilities resulted in a wholesale access service that includes more active functionalities than a dedicated connection path. Under the Ladder of Investment model, TPIA is a bitstream service which resides at a lower rung than unbundled loops.
54. The CRTC mandated the telecom operators to provide a bitstream service referred to as aggregated asymmetric digital subscriber (ADSL) access service. This had similar functionalities to the cable operators' TPIA service. The telecom operators also were mandated to provide unbundled loops that, although initially used to facilitate competitive entry in local telephony markets, were subsequently made available to provide competing retail internet services. The technology of the cable operators' networks did not permit a service comparable to unbundled loops.²⁴
55. Entrants in the Canadian high-speed internet services market have not relied on unbundled loops to any significant degree. Historical information on resale-based entrants' use of unbundled loops indicates a steady decline throughout the period when cable operators expanded their presence in the telephony market using their own network infrastructure rather than unbundled loops.²⁵
56. While the CRTC sought to apply regulation of wholesale access symmetrically to the facilities of the telecom and cable operators, there were several differences at various stages in the evolution of the services. Some were driven by differences in the technology used in the two types of networks, for example, the unavailability of unbundled loops from cable networks. Among the other differences included speed matching obligations that initially only applied to wholesale access services of the cable networks and more aggregated bitstream services that initially were only offered by some telecom operators. Most of the differences have been resolved through several rounds of CRTC decision-making.

²⁴ CRTC, Telecom Regulatory Policy 2010-632 denied requests to require the cable operators to develop a local head-end based access service.

²⁵ CRTC, Communications Monitoring Report, 2017, Table 5.6.3; and similar tables in prior years' reports.

57. The nature of the wholesale access obligations for fixed wireline high-speed networks has evolved over the twenty years through several rulings, covering all aspects of the rates, terms and conditions under which both telecom and cable operators were to provide wholesale access to their facilities for competitors. The CRTC issued more than 80 relevant rulings during this period, including nine in 2016 alone. While the CRTC initiated some of the proceedings leading up to these rulings, several were the result of disputes over the scope, functionality and, especially, the rates for wireline wholesale access services. The rulings are listed in Appendix A.

2.3 Current regulatory treatment of fixed wireline high-speed wholesale access

58. The CRTC applies *ex ante* regulation to the wireline wholesale high-speed access services it has mandated for the incumbent telecom and cable operators. Key elements of the CRTC's regulation of the mandated wholesale access are noted below and summarized further in Table 2.1, based on the regulatory concepts and terms discussed in Section 1.1.1.

59. Service rates require prior approval by the CRTC. Rates are supported by cost studies based on long-run incremental costs (referred to as Phase II costing in Canada). The CRTC has conducted numerous proceedings with respect to the costs and supporting inputs (e.g., working average cost of capital, working fill factors, allocation of costs for network elements shared among multiple services), and the level of mark-up permitted to recover common costs or additional costs to invest in new fibre-rich facilities.

60. The level of service aggregation has shifted between mandating centralized (aggregated) access that bundles transport with last-mile facilities and disaggregated access to only the last-mile (e.g., access at individual central offices of the telecom operator or the head-ends of the cable operator). Cable wholesale access was initially offered with minimal aggregation but the CRTC mandated its replacement with a highly aggregated service. More recently, the CRTC mandated both the telecom and cable operators to provide wholesale access for higher-speed, fibre-rich facilities only on a disaggregated basis. The CRTC also stated that aggregated access for slower speed facilities would be phased-out three years after the disaggregated form of wholesale access had been implemented with final rates.²⁶ While disaggregated wholesale access services are available, the rates have not been finalized and continue to have interim approval status. The three-year phase-out period has not been initiated as of yet.

²⁶ CRTC, Telecom Decision 2018-44, particularly paragraphs 17 to 21.

61. Resale-based entrants have had the option to lease disaggregated wholesale high-speed access services in Canada in the past. However, resale-based entrants preferred aggregated access, claiming that disaggregated access was disadvantageous.²⁷ This is further demonstrated by the significant increase in entrants' use of the cable operators' wholesale high-speed access services in the years following the requirement to replace disaggregated with aggregated access arrangements.²⁸
62. Mandated wholesale access must include all service speed levels that correspond to the speeds of the retail services of incumbent operators (e.g., speed matching). Speed matching was required for cable wholesale access service beginning in 2006. A similar requirement for telecom network operators was not imposed until 2010 and at that time excluded their full-fibre (FTTH/B) facilities. Another regulation was added in 2011 that required mirroring in the wholesale high-speed access rates the retail rating structure where the end-user may be charged a separate fee for usage. This was referred to as capacity-based billing.
63. Mandated wholesale access to services provisioned over NGA facilities (e.g., fibre-rich or full-fibre networks) was confirmed in a ruling in 2015 and is in the process of being deployed by telecom and cable network operators in central Canada, but only on a disaggregated basis as noted.²⁹ With the implementation of this ruling, the speed matching requirement for cable and telecom operators will apply symmetrically.
64. Quality of service performance standards were mandated in 2018. The requirement includes quarterly reporting of results, based on four key metrics for each of the major incumbent telecom and cable operators on a company-wide basis and for each wholesale customer. The CRTC decided not to impose a rate rebate plan for instances where standards are not met for the time being. The specific performance standards and definitions are in the process of being developed by an industry working group that is scheduled to report in the fourth quarter of 2018.

²⁷ CRTC, Telecom Regulatory Policy 2010-632, paragraphs 81-82.

²⁸ CRTC, Communications Monitoring Report 2015, Table 5.6.7. This table indicates a 93% compound annual growth rate in the number of cable-based wholesale high-speed access subscriptions from 2010 to 2014.

²⁹ CRTC, Telecom Decision 2015-326 and Telecom Decision 2018-44. Wholesale high-speed access for FTTH/B facilities is available only on a disaggregated basis and, to date, has only been approved for facilities in Ontario and Quebec. The CRTC plans to extend these requirements to other regions.

Table 2.1 – Wholesale High-speed Regulation in Canada

	Telecom Incumbent+	Cable Incumbent+
Service Level (ladder)		
Resale		mandated where bitstream not available, rates based on retail minus 25%
Bitstream – legacy	mandated at cost-based rates, with quality of service requirements; aggregated access to be phased out	mandated at cost-based rates, with quality of service requirements; aggregated access to be phased out
Bitstream – NGA	mandated at cost-based rates, with quality of service requirements - disaggregated only	mandated at cost-based rates, with quality of service requirements - disaggregated only
Unbundled loop – legacy	non-discriminatory access where offered; otherwise forborne	
Unbundled loop – NGA		
Passive network (dark fibre)		
Support structures (poles, conduit)	mandated at cost-based rates	

+ Smaller telecom and cable incumbent operators subject to lighter-touch regulation.

65. Table 2.1 indicates the broad extent of wholesale access obligations applied at the bitstream level of the network. Conversely, there are few remedies applied at higher rungs of the ladder. The CRTC’s decision to lift the obligations with respect to the telecom operators’ unbundled loops was based on the limited use of these facilities by competitors in the local voice telephony market and a finding that these no longer met the CRTC’s test for essential services.³⁰

66. Incumbent telecom and cable operators remain subject to a general regulatory principle of non-discriminatory treatment even for services for which the CRTC has granted forbearance from most of the regulatory obligations.³¹

67. Access to support structures has been mandated by the CRTC and subject to cost-based rates.³² These rates are cost-based but not set using the Phase II costing

³⁰ CRTC, Telecom Regulatory Policy 2015-326, paragraphs 172-190.

³¹ Forbearance is typically partial and does not include forbearance from section 27(2) of the *Telecommunications Act*, which states: “No Canadian carrier shall, in relation to the provision of a telecommunications service or the charting of a rate for it, unjustly discriminate or give an undue or unreasonable preference toward any person, including itself, or subject any person to an undue or unreasonable disadvantage.”

³² CRTC, Telecom Decision 2010-900.

methodology. This reflects, in part, the fact that access is limited to where spare capacity is available and additional fees apply to recover costs for adding capacity where none exists.³³

68. The CRTC currently oversees the rates, terms and conditions for access to support structures owned and controlled by telecommunications carriers. In practice, this includes the poles and underground conduits of the telecom network operators since cable network operators generally do not own such facilities.
69. The other type of entity that typically owns support structures, besides the telecom network operators, are electrical utilities. The electrical utilities contested the CRTC's authority to set the rates, terms and conditions for access to their support structures, and as a result, these are currently overseen mainly by provincial regulators of the electrical utilities.³⁴
70. It is common for there to be only one set of poles along a street, rather than duplicate poles. The telecom network operators frequently have arrangements with electrical utility companies that provide reciprocal access to capacity on (or in) support structures owned by each other. The arrangements establish the terms of access, including any compensation, between the telecom operators and electrical utilities. The arrangements also grant each other priority access to the usable space on the poles that is assigned for telecommunications and electrical facilities. Other parties seeking to attach facilities to the poles must get permission from the support structure owner, who determines whether spare capacity is available. The process for cable operators and other parties to gain access to poles can be costly, complex and lengthy, involving multiple companies, each with different rates, terms and conditions. Thus, even with mandated access to support structures, constructing new facilities is challenging.
71. The CRTC has not required any telecom or cable network operator to functionally or structurally separate their operations into retail and wholesale activities. The CRTC rejected structural separation in a 1994 ruling that established the regulatory framework for telecommunications in the competitive era.³⁵ The prospect of functional or structural separation was raised in a more recent proceeding but also

³³ The fees are referred to as "make ready" which recovers costs associated with replacing a pole or conduit with one that has more capacity, and associated engineering and planning costs plus costs to relocate all facilities already placed on existing support structures.

³⁴ Rates for access to the utility poles of electrical utilities have been determined by regulatory authorities in the provinces of Alberta, New Brunswick, Newfoundland and Labrador, Nova Scotia and Ontario. Parties seeking access to electrical utility poles in other provinces are required to negotiate rates, terms and conditions.

³⁵ CRTC, Telecom Decision 94-19, section II. D.

rejected as contrary to the Policy Direction.³⁶ The CRTC requirement for telecom and cable operators to file costing studies in support of rates provides a form of accounting separation.

3.0 Regulation of Fixed Wireline High-Speed Networks in Other Countries

72. This section provides an overview of the regulation of wholesale access to high-speed internet facilities of incumbent network operators in each of the other countries studied in this report: Australia, Belgium, France, Germany, Italy, Japan, the Netherlands, Portugal, Switzerland, the United Kingdom and the United States. Seven of the countries included in the report are member states of the European Union and are subject to the same regulatory framework and guidance. These countries are discussed as a group.

3.1 Australia

73. Regulations of telecommunications in Australia is shared between the Australian Communications and Media Authority (ACMA) and the Australian Competition and Consumer Commission (ACCC). The ACCC takes the lead on economic regulation (e.g., regulating the rates, terms and conditions for services), while the ACMA oversees technical matters, spectrum management and administers the universal service obligation.

74. The government in Australia created the National Broadband Network (NBN Co) almost ten years ago with the initial intention of it providing a full-fibre network throughout Australia. The plan was scaled back in 2013 to permit a mix of network technologies, including fibre-rich FTTN and HFC, following a change in government and concerns over the feasibility and costs of a full-fibre network.³⁷

75. When the deployment is complete, NBN Co will operate as a monopoly throughout almost all of Australia. In addition, steps have been taken to shield NBN Co's revenue base from any potential impact of alternative facilities-based competitors. Competing carriers may also be required to contribute to a Regional Broadband

³⁶ CRTC, Telecom Regulatory Policy 2015-326, paragraphs 246 to 248. Separation was considered as part of a proposal by resale-based competitors to introduce Equivalence of Inputs regulations, which was rejected.

³⁷ The fibre-based network assets of Telstra, the incumbent telecom network operator, and Optus, a cable network operator, were sold to NBN Co to facilitate the build-out of the network.

Scheme to supplement the costs of NBN Co to extend networks to higher-cost areas.³⁸

76. NBN Co is strictly limited to providing only wholesale services under terms set by the government. The scope for competition is limited to the retail service level, which in turn, depends on the regulated rates, terms and conditions for NBN Co’s wholesale operations. Complaints from consumers and retail operators³⁹ draw attention to the challenge of such an intensive regulatory approach to replicating a competitive market structure.

77. The ACCC currently regulates Telstra, the incumbent network operator, although almost all of Telstra’s wholesale access services are scheduled to be deregulated between 2019 and 2022,⁴⁰ corresponding to the planned date for NBN Co to complete its network deployment.

78. Table 3.1 provides a summary of the regulation of wholesale access in Australia, according to the various regulatory remedies, as discussed in section 1.1.1.

Table 3.1 – Wholesale Access Regulatory Remedies in Australia

<i>Type of remedy</i>	Incumbent Telecom Operators	Incumbent Cable operators
Mandated access	Legacy and fibre-rich loops, most to be deregulated by 2022	<i>Not regulated</i>
Non-discriminatory treatment		
Negotiated terms	NBN Co FTTH/B (during transition)	
Cost-based regulated rates	All mandated access services	
Quality of Service measures		
Separation of retail and wholesale operations	NBN Co wholesale-only	

79. Australia is on track to have a national monopoly broadband network in the form of NBN Co. This required the government to invest tens of billions of dollars and oversee considerable restructuring of the telecommunications industry. Moreover, it

³⁸ ACCC, “Communications Sector Market Study, Final Report,” April 2018,, pages 163-164. The RBS may amount to an additional \$7.10 per premise per month.

³⁹ Ibid., pages 51-53, 138. See also Bourreau et al (December 2017) *op cit*, Annex A: Case study on New Zealand and Australia.

⁴⁰ Ibid., page 17. Only local bitstream access service has not been scheduled for deregulation.

will require traditional utility style regulation of NBN Co for the foreseeable future. Australia is the only country among those studied in this report to have so completely abandoned facilities-based competition. In light of this approach, Australia does not offer useful lessons for Canada.

3.2 Member States of the European Union

80. Belgium, France, Germany, Italy, the Netherlands, Portugal and the United Kingdom are member states of the European Union. In order to support the single market initiative, they are required to regulate their telecommunications market according to common guidelines and directives established by the European Commission (EC).

81. The EC's directives include a process for determining what, if any, regulatory remedies must be imposed. The process includes defining the relevant market, assessing the state of competition and identifying service providers that can exercise significant market power. The regulator may only impose some form of *ex ante* regulatory remedy in markets where effective competition is unlikely to occur, and a company is found to have significant market power. The Body of European Regulators for Electronic Communications (BEREC), which is comprised of senior representatives of the national regulators in each member state, provides further guidance on the remedies that are considered best practice.

82. The EC updates the framework for the above market analysis from time to time, which affects the scope of services likely to be subject to *ex ante* regulation. The revisions have contributed to an overall reduction in such regulation.

“Since the adoption of the 2014 Recommendation, the Commission observes a progressive reduction of *ex ante* regulation as the competition in the telecommunications markets across the EU developed.”⁴¹

83. The Ladder of Investment theory played a prominent role throughout the evolution of the EC's directives on wholesale access regulation. Several countries continue to mandate access to wireline facilities at higher rungs, such as unbundled loops, particularly those based on legacy copper, but have reduced or completely removed regulation of facilities at lower rungs, such as bitstream.

84. The following countries have reduced regulation of bitstream wholesale access. The regulator in the United Kingdom, Ofcom, progressively reduced the geographic availability of bitstream over the past several years to less than 2% of premises.⁴²

⁴¹ European Commission, “Europe’s Digital Progress Report 2017 – Connectivity,” May 10, 2017, page 34; available at: <https://ec.europa.eu/digital-single-market/en/news/europes-digital-progress-report-2017>

⁴² Ofcom, “Wholesale Broadband Access Market Review 2018, Final Statement,” July 31 2018, paragraphs 1.10 to 1.16.

The Netherlands fully deregulated bitstream services within the wholesale central access market, while Germany and Portugal have partially deregulated services in this market.⁴³ Germany deregulated wholesale access to bitstream services delivered over full-fibre networks. Portugal mandates wholesale access to ADSL-based bitstream only in specific non-competitive areas.

85. Several countries have adapted the regulatory remedies at higher rungs for full-fibre or fibre-rich facilities as part of their initiatives directed at promoting investment in NGA networks, further to specific guidance issued by the EC.

“Most significantly, the 2013 Recommendation specified conditions under which regulators would now be expected to desist from setting the wholesale prices for ‘virtual’ or passive NGA products...The aim here was to allow operators the freedom to set wholesale prices for NGA products in a way which better reflected market demand...rather than requiring the regulator to set a single ‘cost oriented’ price derived from some assessment of the costs of the underlying network assets.”⁴⁴

86. In France, full-fibre facilities are available in urban centres only on terms that require entrants to co-invest. There is no mandated access to fibre-based active facilities (e.g., bitstream) in France. Portugal provides no regulated access to fibre facilities at either lower or higher rungs, choosing instead to focus its regulations on access to support structures.⁴⁵ The United Kingdom and the Netherlands have mandated virtual unbundled loops for fibre-rich loops.

87. Wireline wholesale access services were subject to cost-based rates that had to be given prior approval by the regulator when the services were first mandated. However, this strict form of remedy is giving way to more flexible approaches, such as setting rates at a premium to provide additional compensation for new investment, and allowing for negotiated terms based on a published reference offer.⁴⁶ The reference offer model has been applied in wireline wholesale markets by regulators in Belgium, France, Germany, Italy and the United Kingdom.

88. Another example of more flexible regulation of prices is the “anchor price” approach. This was used in the United Kingdom where the incumbent telecom operator, BT,

⁴³ European Commission, “Europe’s Digital Progress Report 2017 – Connectivity,” May 10, 2017, page 35. Wholesale central access services are labeled “market 3b” and include aggregation to a central point of interconnection.

⁴⁴ Feasey and Cave (2017), *op cit*, page 25.

⁴⁵ Portugal allows for access to dark fibre in cases where there is no spare capacity available in conduits that would allow a competitor to place its own fibre facilities.

⁴⁶ A reference offer describes the rates, terms and conditions for the service that apply if negotiated arrangements are unsuccessful.

was obligated to provide wholesale access to virtual unbundled loops at regulated rates only for the service tier with 40 Mbps downstream and 10 Mbps upstream. Ofcom concluded that this more flexible model provided incentives for investment in higher speed internet services by allowing BT the “opportunity to achieve a fair return on risky investments”.⁴⁷

89. Quality of service regulation is commonly applied in the EC countries studied in this report, including the requirement to monitor and file reports on the quality of service for wholesale access services.⁴⁸ In the case of the United Kingdom, quality of service requirements were imposed along with the separation of the wholesale and retail operations of the incumbent telecom operator, BT, as a component of the regulatory requirement referred to as Equivalence of Inputs. Equivalence of Inputs regulation requires functional or structural separation of the wholesale and retail operations, such that the retail arm of the network operator receives from its wholesale operations exactly the same services, facilities, terms and conditions as any resale-based entrant would receive.
90. The United Kingdom had been the only EC member country among those studied to have imposed functional separation, followed by full structural separation of BT’s retail operations and Openreach. The incumbent telecom operator, Telecom Italia (TIM), in Italy had been subject to some degree of separation of its retail and wholesale operations. Most recently, TIM proposed to voluntarily structurally separate its operations, although approval and implementation of the proposal is expected to be a “long process”.⁴⁹
91. The EC also recognized the importance of improving access to support structures to facilitate the deployment of telecom networks when it issued the Broadband Cost Reduction Directive.⁵⁰ The most recent Digital Progress Report of the EC described the measures in the directive as including “facilitating access to physical infrastructures of all network operators (i.e. telecom operators, as well as energy, or other utilities)”.⁵¹ EU member states were to have adopted legislation enacting the directive by January 2016, and the six countries in this group have either fully or

⁴⁷ Ofcom, “Wholesale Local Access Market Review: Statement – Volume 1,” March 28, 2018, paragraph 1.35.

⁴⁸ Belgium, France, Germany, Italy, and the United Kingdom.

⁴⁹ Ovum, summary of TIM’s proposal, available at: <https://ovum.informa.com/resources/product-content/glb005-000028>

⁵⁰ European Commission, “Broadband Cost Reduction Directive,” (Directive 2014/61/EU).

⁵¹ European Commission, “Europe’s Digital Progress Report 2017, Connectivity, Broadband market developments in the EU,” (April 2017), page 32; available at: <https://ec.europa.eu/digital-single-market/en/news/europes-digital-progress-report-2017> .

partially fulfilled this requirement.⁵² While the EC's directives on support structures send a strong signal to regulators to promote facilities-based competition, access to support structures remains challenging in most countries, with the exception of France and Portugal.

92. Portugal has been noted as having had considerable success in using access to support structures to promote investment in infrastructure by entrants.

“As stated above, the duct network is extensive and has good quality (compared to other European countries), and so the access obligation is effective in encouraging alternative operator investment. Therefore, a special note is made to the pioneering role of the reference duct access offer determined by ANACOM (and in operation since 2006), an offer which facilitates investment in NGA.”⁵³

93. Where there is no spare capacity in the conduit, regulations in Portugal provide access to dark fibre as a backstop provision. The British government recently endorsed this model with the goal of incenting entrants to invest in and expand their networks.⁵⁴ This forms one element of a multi-pronged strategy to bring about full-fibre networks in Britain.

94. The regulatory remedies for wireline wholesale access discussed so far have been entirely directed at the incumbent telecom network operators. There is only one country, Belgium, where regulation has been actively directed at the incumbent cable network operators. It should be noted that the regulator in the Netherlands recently proposed wholesale access regulations that could be applied to the largest cable operator, VodafoneZiggo following its merger.⁵⁵ However, the Dutch regulations are still in draft form and past procedures raise some doubt as to whether these will come into force.⁵⁶ The following provides a brief summary of cable wholesale access regulations in Belgium.

⁵² Ibid, page 33. Germany, Italy and the United Kingdom were identified as having completed the requirement as of April 2017.

⁵³ BEREC, “Challenges and drivers of NGA rollout and infrastructure competition,” BoR (16) 171 (2016), page 109.

⁵⁴ United Kingdom, Department for Digital, Culture, Media & Sport, “Future Telecoms Infrastructure Review,” July 2018, paragraphs 72-73.

⁵⁵ The Authority for Consumers and Markets (ACM), “Draft version of the market analysis decision on wholesale access,” ACM/17/019945, February 27, 2018; summary in English available at: <https://www.acm.nl/en/publications/draft-version-market-analysis-decision-access-fixed-telecom-networks-wholesale-fixed-access>

⁵⁶ Challenges in the courts and from the EC in the Netherlands have resulted in the withdrawal of regulations in the past, particularly in the case of cable operators. See Body of European Regulators for Electronic Commerce (BEREC), “Assessment of the need to review the BEREC Common Positions on Markets 3a, 3b and 4,” BoR(18) 24, March 8, 2018 page 11; and WIK-Consult, “Competition & investment: An analysis of the drivers of superfast broadband,” study prepared for Ofcom, July 2015, pages 50-51.

3.2.1 – Belgium regulation of cable network operators

95. The Belgian regulator, the Belgian Institute for Postal Services and Telecommunications (BIPT)⁵⁷, had imposed wholesale access regulation on the cable operators in 2013 that gave wholesale access to competitors seeking to offer retail television services, and as part of that service bundled cable broadband services. Prices were set on a retail-minus basis, with discounts ranging from 20% to 30%. The wholesale access service was not widely used because of the requirement for end-users to subscribe to both television and broadband services.⁵⁸
96. Belgium regulators recently revised the wholesale access regulations imposed on cable operators to allow for a broadband-only bitstream service.⁵⁹ The draft regulations were proposed for comment in 2017, and following further procedures, received authorization from the EC to adopt the measures on May 25, 2018.⁶⁰
97. The EC noted concerns with some of the regulatory analysis underpinning the decision to impose wholesale access regulation on both the telecom and cable network operators.⁶¹ Specifically, it questioned the appropriateness of conducting the analysis on the basis of defining the relevant market for the wholesale access products separately for the telecom and cable operators. The EC noted evidence of entrants switching between the two platforms. The EC also noted that the test for significant market power may have been distorted due to using prices for cable wholesale access based on retail-minus compared to prices for telecom wholesale access based on costs.
98. Notwithstanding these concerns, the EC did not object to going forward with the regulations as proposed based on alternative market analysis of the potential for tacit collusion between the telecom and cable operators. There has been no similar finding of tacit collusion between the telecom and cable operators in Canada.⁶²

⁵⁷ Regulatory authority in Belgium is shared between BIPT and the Conference of Regulators of the electronic communications sector (CRC).

⁵⁸ BEREC, BoR(18) 24, *op cit*, page 11.

⁵⁹ European Commission, “Commission Decision concerning: Case BE/2018/2073: Wholesale local access provided at a fixed location in Belgium; Case BE/2018/2074: Wholesale central access provided at a fixed location for mass-market products in Belgium; Case BE/2018/2075: Wholesale TV broadcasting in Belgium; Comments pursuant to Article 7(3) of Directive 2002/21/EC,” c(2018)3410 final, May 25, 2018.

⁶⁰ EC rules require regulators to notify it and other regulatory authorities of any draft regulations and may be required to revise or withdraw the draft regulations based on comments by the EC, as indicated in Article 7 of the Electronic Communications Framework Directive – 2002/21/EC.

⁶¹ European Commission, c(2018)3410, *op cit*, pages 15-17.

⁶² Competition Bureau, response to Bureau(Primus)29Aug14-9, filed in the proceeding leading to Telecom Regulatory Policy CRTC 2015-326.

99. The Belgian regulations will require the three main regional cable operators to provide wholesale access on non-discriminatory terms, with quality of service obligations, and at rates that are “fair” and based on costs with a risk premium so as to encourage investment in fibre-based infrastructure.⁶³ The rates are expected to be finalized late in 2018 or early 2019, with rates in the interim based on a proxy derived from retail-minus rates established for the cable TV-broadband wholesale service.⁶⁴
100. Table 3.2 summarizes the regulations for the seven European countries that are subject to EC directives.

Table 3.2 – Wholesale Access Regulatory Remedies in European countries

<i>Type of remedy</i>	Incumbent Telecom Operators	Incumbent Cable Operators
Mandated access	All: legacy unbundled loops Most: legacy bitstream (except UK, the Netherlands that mandate access to fibre-rich unbundled loops) deregulation in some markets All: support structures (most effective in France, Portugal)	Belgium – legacy and fibre-rich bitstream
Non-discriminatory treatment*		
Negotiated terms	Required where cost-based rates not applied	
Cost-based regulated rates	Legacy and some fibre-rich loops; flexibility for full-fibre (where mandated) Support structures (Portugal, United Kingdom)	Belgium (under development)
Quality of Service measures	Broadly applicable	Belgium
Separation of retail and wholesale operations	Italy, United Kingdom	

**Non-discriminatory treatment applies as a general principle under EC framework directives.*

101. The EC and regulators in each of the seven countries are generally supportive of initiatives that promote facilities-based competition and, increasingly, seek to

⁶³ European Commission, c(2018)3410 final, pages 12, 17.

⁶⁴ Ibid., pages 13 and 19.

promote the deployment of more advanced network infrastructure. The aim has been to reduce reliance on regulated wholesale access, particularly at the lower rungs of the Ladder of Investment. The review of regulations in these countries indicates that several have taken steps to reduce regulation for more active facilities at lower rungs as more competition has been enabled based on passive services at higher rungs, notably support structures.

3.3 Japan

102. In Japan, regulation of the telecommunications market is under the authority of the Ministry of Internal Affairs and Communications (MIC). In principle, the MIC has imposed wireline wholesale access regulations on the incumbent telecom network operators (NTT East and NTT West). The reality is that facilities-based competition is the primary source of entry, with a small and declining share attributed to regulated wholesale services. A succinct summary of the approach was provided in a recent report.

“First, on the broadband supply side, the government coordinated and supported the roll-out by private actors. It kept the regulatory burden on fibre lower than on the unbundled copper loops, gave incentives for investment, and created a framework for sustainable infrastructure competition. An important factor in the promotion of the latter was the permission for aerial deployment of fibre, resulting in much lower deployment cost”⁶⁵

103. NTT, the incumbent telecom operator, also noted that growth in full-fibre networks in Japan was driven not by regulated unbundling of its network but through facilities-based competition among multiple, independent network providers.⁶⁶

104. The MIC had mandated wholesale access to the incumbent telecom operators’ legacy and NGA wireline facilities. However, beginning in 2010, the MIC adopted a strategy of *ex post* regulation with emphasis on negotiated terms, in place of the prior approval, *ex ante* regulatory model.⁶⁷ The emphasis on negotiations is demonstrated by the fact that regulated wholesale access to FTTH facilities was ineffective⁶⁸ and, in its place, NTT provided an alternative form of wholesale access on a voluntary basis.

⁶⁵ Bourreau, M., Feasey, R., and Hoernig, S., “Demand-Side Policies to Accelerate the Transition to Ultrafast Broadband,” Centre on Regulation in Europe (CERRE), Annex B: Case study on Japan (December 2017).

⁶⁶ NTT, “Comments on Broadband Study Conducted by the Berkman Center for Internet and Society,” (2010).

⁶⁷ MIC, “Broadband Competition Policy in Japan,” presentation by the regulator, November 4, 2011.

⁶⁸ Wallsten, S. (2014) *op cit.*, page 22.

105. As the quote above indicates, access to poles has been an important enabler for the deployment of competing fibre infrastructure. All poles owned by public utilities are available to third parties on non-discriminatory terms, where rates are based on an approved formula, subject to available capacity.⁶⁹
106. A summary of the types of regulatory remedies for wholesale access services in Japan is provided in Table 3.6.

Table 3.3 – Wholesale Access Regulatory Remedies in Japan

<i>Type of remedy</i>	Incumbent Telecom Operators	Incumbent Cable operators
Mandated access	Support Structures Legacy and fibre-rich loops, although facilities largely overtaken by FTTH/B	<i>Not regulated</i>
Non-discriminatory treatment	<i>Ex post</i> complaints basis	
Negotiated terms	FTTH/B (voluntary)	
Cost-based regulated rates	Support structures (specified formula)	
Quality of Service measures		
Separation of retail and wholesale operations		

107. While Table 3.3 suggests that Japan has imposed certain regulatory remedies on the incumbent telecom operators, in practice the MIC has adopted a light-touch approach to regulation.

3.4 Switzerland

108. Switzerland is a European country but not a member state of the European Union. It relies on its own legislation rather than the regulatory frameworks and guidance issued by the EC.
109. Regulation of telecommunications in Switzerland is undertaken by the Federal Communications Commission (ComCom). The nature and scope of regulations is

⁶⁹ MIC, “Guidelines for Use of Poles, Ducts, Conduits and Similar Facilities Owned by Public Utilities,” last revised October 2015.

limited under the Telecommunications Act to *ex post* regulatory intervention only.⁷⁰ Parties seeking wholesale access to the facilities of the incumbent telecom operator, Swisscom, must rely on negotiations. ComCom may intervene only if negotiations are unsuccessful.

110. The Telecommunications Act further limits the scope of wholesale access regulation to copper-based facilities. Mandated wholesale access to fast bitstream services was in place for a limited period of four years. There is currently no mandated access to fibre-based facilities.⁷¹ However, alternative providers may obtain access through commercial terms or by co-investing in fibre facilities.

111. ComCom mandates third party access to support structures, specifically conduits at cost-based rates. However, access is limited to circumstances where spare capacity exists.

112. Table 3.4 summarizes the regulatory remedies applicable to wholesale access in Switzerland.

Table 3.4 Wholesale Access Regulatory Remedies in Switzerland

<i>Type of remedy</i>	Incumbent Telecom Operators	Incumbent Cable operators
Mandated access	Copper-based loops Support structures	<i>Not regulated</i>
Non-discriminatory treatment	Services found to have a dominant market supplier	
Negotiated terms	Copper-based loops	
Cost-based regulated rates	Support structures (conduit)	
Quality of Service measures		
Separation of retail and wholesale operations		

113. Switzerland represents one of the least interventionist countries in the regulation of wireline telecommunications, given its strict *ex post* approach. Recent analysis of the

⁷⁰ ComCom, “2017 Activity Report of the Federal Communications Commission (ComCom),” page 15; available at: <https://www.comcom.admin.ch/comcom/en/Homepage/documentation/annual-reports.html>

⁷¹ The Telecommunications Act is undergoing a review, including adopting a technology-neutral approach to wholesale access regulations that would lift the restriction on regulating only copper facilities.

drivers of investment in NGA networks attributed Switzerland's success in this regard to its "light-touch regulation".⁷²

3.5 United States

114. The United States at one point had extensive wireline wholesale access regulations that applied to the incumbent telecom operators. These regulations were largely the result of the *Telecommunications Act of 1996*. However, subsequent regulatory and legal proceedings resulted in the removal of almost all wholesale access obligations by 2005.⁷³ The wholesale access regulations have not been applied to the cable operators, which combined, are able to deliver high-speed internet services to the vast majority of American households. Wholesale access obligations were not extended to fibre-rich or full-fibre facilities of either the telecom or cable network operators.
115. One of the few areas where the federal regulator, the Federal Communications Commission (FCC), continues to focus its attention is access to support structures, specifically access to utility poles. The FCC's interventions have sought to lower the rates and streamline the process for accessing poles with the stated intention of enabling facilities-based competitors to deploy more broadband infrastructure.⁷⁴ A ruling issued by the FCC in early August 2018 introduced more provisions that it described as continuing "our efforts to promote broadband deployment by speeding up the process and reducing the costs of attaching new facilities to utility poles."⁷⁵
116. A summary of the state of wholesale access regulation in the United States is presented in Table 3.5.

⁷² BERC, BoR (16) 171, *op cit*, page 129.

⁷³ There are still regulated terms for accessing the legacy, copper-based unbundled local loops of the incumbent telecom operators in some geographic markets. State regulatory authorities establish the specific rates based on the FCC's methodology and price ceilings.

⁷⁴ FCC, "Implementation of Section 224 of the Act, A National Broadband Plan for Our Future, Order on Reconsideration," FCC 15-151, (November, 2015), paragraph 1. The FCC's regulations apply to all utility poles, including those owned by the incumbent telecom network operators and electrical utilities. However, the provisions do not apply to the incumbent telecom network operators' access to poles.

⁷⁵ FCC, "Third Report and Order and Declaratory Ruling, In the Matter of Accelerating Wireline Broadband Deployment by Removing Barriers to Infrastructure Investment; In the Matter of Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment," FCC 18-111, paragraph 1.

Table 3.5 – Wholesale Access Regulatory Remedies in the United States

<i>Type of remedy</i>	Incumbent Telecom Operators	Incumbent Cable operators
Mandated access	Telephone poles Legacy copper loops (limited)	<i>Not regulated</i>
Non-discriminatory treatment	<i>Ex post</i> complaints basis	
Negotiated terms		
Cost-based regulated rates	Telephone poles (rate cap) Legacy copper loops (limited)	
Quality of Service measures		
Separation of retail and wholesale operations		

117. The United States stands out as the country with the least amount of regulation of wholesale access. The other notable characteristic is the absence of regulated access to wholesale facilities at the lower rungs of the ladder, such as the bitstream wholesale services mandated in Canada. Instead, regulatory intervention in the United States has been largely directed at support structures that reside at the very top of the Ladder of Investment.

4.0 Market Characteristics in Canada and Other Countries

118. This section provides information on the market characteristics in Canada and the other eleven countries studied in this report.

4.1 Network coverage

4.1.1 Canada

119. Virtually all Canadians have access to high-speed internet, including 92% with access to at least 5 Mbps using wired facilities and 99% using all technology platforms.⁷⁶ In addition, 84% of households have access to a service capable of delivering 50 Mbps downstream and 10 Mbps upstream, with 96% of households in urban areas having access to such service.⁷⁷ The CRTC established 50 Mbps

⁷⁶ CRTC, Communications Monitoring Report, 2017, Figure 5.3.15.

⁷⁷ Ibid., page 254. Telecom Regulatory Policy 2016-496.

downstream and 10 Mbps upstream as the universal service objective, with the expectation this service level will be available in 90% of homes by the end of 2021.⁷⁸

120. Most Canadians can choose from among more than one independently-owned facilities-based operator. At least 90% of households have access to two or more platforms capable of delivering services with downstream speeds of at least 5 Mbps, while approximately 60% of households have a choice of service providers delivering speeds of at least 30 Mbps.⁷⁹ More than 92% of Canadian households currently have access to at least one of the telecom or cable networks, and approximately 80% have access to both.⁸⁰
121. Mobile network operators provide a further means of achieving internet connectivity, with at least three independently-owned operators providing high-speed internet service to more than 98% of Canadians.⁸¹ Three-quarters of Canadians have access to three or more mobile networks,⁸² and choices are expected to increase over time as newer entrants expand their network coverage.
122. In addition to these network operators, there are other facilities-based service providers that use fixed wireless and satellite technology to deliver high-speed internet service. Satellite-based services are available ubiquitously. Current fixed wireless and satellite technologies are capable of providing speeds of more than 5 Mbps, although achieved speeds do not reach the threshold of 30 Mbps on a consistent basis.⁸³ These services are not considered in the analysis because of the slower speeds and other limitations in service quality.

4.1.2 Country Comparisons

123. All of the countries studied in this report have nearly ubiquitous coverage by the wireline networks of the incumbent telecom operators, but only six have widely available cable networks. The countries that share Canada's widespread coverage by cable network operators are Belgium, the Netherlands, Portugal, Switzerland and the United States. As a result, the remaining countries provide consumers with less choice among independent wireline facilities-based competitors. All of the countries

⁷⁸ CRTC, Telecom Regulatory Policy 2016-496, paragraph 114.

⁷⁹ CRTC, Communications Monitoring Report, 2015, Table 5.3.12, as of 2014. Availability of service at lower speeds includes fixed-wireless and mobile broadband network facilities. Data not published for later years.

⁸⁰ CRTC, Communications Monitoring Report, 2017, Figures 5.3.15 and 5.3.16. Coverage by both telecom and cable networks estimated based on information from past CRTC reports and regulatory proceedings.

⁸¹ *Ibid.*, Figure 5.3.15 and Table 5.5.15, as of 2016

⁸² *Ibid.*, Table 5.5.16, as of 2016.

⁸³ Xplornet offers both fixed wireless and satellite-based internet services with advertised speeds of up to 25 Mbps downstream.

have widely available mobile wireless networks that have been upgraded to LTE or 4G capability.

124. Most of the 12 countries studied have widespread availability of wireline networks capable of delivering high-speed internet with downstream speeds of at least 30 Mbps. Network coverage at very high speeds is almost ubiquitous in Japan, Belgium, the Netherlands and Switzerland, with availability reported at 98% or above. Portugal, the United States and the United Kingdom achieved coverage of more than 90% of households, followed by Canada, Italy and Germany with coverage between 84% and 86%. At the lower end of the scale in terms of coverage is France at 56% and Australia at 34%.
125. The six countries with widely available telecom and cable networks all exhibit more than 90% coverage by NGA networks delivering at least 30 Mbps, except for Canada. Canada falls just below the 90% threshold for coverage. This could be attributed to Canada's lower population density, and more rural population, which raises the cost of deploying networks. However, the United States has similar pockets of rural population and has exceeded 90% coverage. The other notable differences between Canada and the United States is the latter's concerted efforts to improve access to support structures and lack of wireline wholesale access obligations.
126. Table 4.1 provides the detailed statistics on network coverage for each country.

Table 4.1 – Network Coverage

Percentage of Households with Access by Technology/Speed, 2016*

	Copper/ fibre (telecom)		Coax/ fibre (cable)	Fibre to the home	All wired networks		Mobile wireless – LTE/4G
	All speeds	30 Mbps+	All speeds		All speeds	30 Mbps+	
CANADA	77%	60% ⁸⁴	85%	34% ⁸⁵	92%	86%	99%
Australia	91%	6%	28%	18%	95%	34%	98%
Belgium	100%	94%	97%	1%	100%	98%	100%
France	100%	18%	28%	21%	100%	56%	94%
Germany	97%	59%	64%	7%	99%	84%	97%
Italy	98%	66%	0%	19%	99%	86%	98%
Japan	100%	n/a	40%	97%	100%	99%	99%
Netherlands	100%	70%	95%	30%	100%	98%	100%
Portugal	99%	<i>not avail.</i>	79%	86%	100%	93%	99%
Switzerland	99%	90%	84%	29%	100%	98%	100%
United Kingdom	100%	85%	48%	2%	100%	94%	100%
United States	90%	40%	90%	35%	95%	91%	99%

Sources: Canada: CRTC, Communications Monitoring Report, 2017, Figures 5.1.5, 5.3.15 and 5.3.16, Tables 5.3.14 and 5.5.15; other countries: Ofcom, “International Communications Market Report 2017,” (December 2017) Figures 8, 10, 23, 24, 25 and 33 for all countries excluding Belgium and Switzerland; and European Commission, “Digital Progress Report 2017,” for Belgium and Switzerland; and European countries’ data on coverage of networks with at least 30 Mbps.

*Data from the European Commission’s “Digital Progress Report 2017” is as of June 2017.

⁸⁴ Estimated based on responses to questions from the CRTC submitted by the incumbent telecom network operators in the proceeding initiated by Telecom Notice of Consultation 2015-134: Bell et al(CRTC)14Aug15-17; MTS Allstream(CRTC)14Aug15-14, SaskTel(CRTC)14Aug15-12, and TELUS(CRTC)14Aug15-14. The supplemental responses to these questions disclosed the availability of facilities capable of delivering at least 5 Mbps upstream, which ranged from 53% to 79% of broadband-capable households. Facilities capable of such upstream speeds typically are also capable of sustaining downstream speeds of at least 25 Mbps.

⁸⁵ CRTC, Communications Monitoring Report, 2017, Figure 5.1.5 indicates 4.76 million households passed by full-fibre (FTTP or FTTP and FTTN) facilities. This represents 34% of the 14 million Canadian households (private occupied dwellings) reported in the 2016 Census.

4.2 High-speed internet service penetration

127. The take-up of high-speed internet service reached 87% of Canadian households in 2016.⁸⁶ Among subscribing households, 97% subscribed to a service with at least 5 Mbps downstream speed, while 39% of subscribers had a service with speeds of at least 30 Mbps.⁸⁷
128. The take-up of high-speed internet services is measured internationally on the basis of the proportion of the population with a subscription, rather than as a percentage of households subscribing.⁸⁸ When measured on this basis, the penetration of high-speed internet in the 12 countries studied ranges from 42 subscriptions per 100 persons in the Netherlands to 27 subscriptions per 100 persons in Italy.⁸⁹ Canada ranks in the middle at 37 subscriptions per 100 persons.
129. There are also significant differences in the penetration of high-speed internet services with downstream speeds of at least 30 Mbps. At this higher speed threshold, Switzerland ranks first with 37 subscriptions per 100 persons, accounting for 74% of subscriptions, followed by Belgium with 30 subscriptions per 100 and 80% of total subscriptions. Japan ranks third, at 21 subscriptions per 100 persons, equal to two-thirds of all subscriptions. Canada ranks fifth, with a penetration rate of 18 subscriptions per 100 persons, equal to one-half of the total.
130. Table 4.2 provides a comparison of the penetration rates of high-speed internet at all speeds, and at speeds of at least 30 Mbps downstream for the 12 countries studied in this report.

⁸⁶ CRTC, Communications Monitoring Report, 2017, Table 5.3.4 (excluding dial-up subscribers), based on 14 million Canadian households in 2016.

⁸⁷ CRTC, Communications Monitoring Report, 2017, Table 5.3.12. Subscribing households include those using wireline plus fixed wireless and satellite technologies. It does not include households that subscribe to a mobile wireless service that includes a data plan.

⁸⁸ The penetration rate of fixed wireline internet service expressed as subscribers per 100 persons is biased upwards in countries with smaller average household size, compared to penetration rates based on the percentage of households. The difference occurs because there is usually only one fixed wireline internet connection per household. Household size is larger in Canada than most of the other countries included in this report.

⁸⁹ OECD, Broadband Portal, data for 2017; available at: <http://www.oecd.org/sti/broadband/broadband-statistics/>

Table 4.2

Penetration of Fixed Wireline High-Speed Internet, 2016

	All Speeds		30+ Mbps		
	Subscribers per 100	Rank	Subscribers per 100	Rank	% of Subscribers
CANADA	36.8	7	18.4	5	50%
Australia	30.1	11	5.6	12	19%
Belgium	37.8	6	30.3	2	80%
France	41.4	3	7.0	11	17%
Germany	38.6	4	10.8	9	28%
Italy	25.7	12	8.5	10	33%
Japan	30.6	10	20.6	3	67%
Netherlands	41.9	2	17.6	6	42%
Portugal	32.7	9	19.6	4	60%
Switzerland	50.1	1	37.0	1	74%
United Kingdom	38.5	5	16.1	8	42%
United States	32.8	8	16.4	7	50%

Source: OECD Broadband Portal, "fixed broadband subscriptions per 100 inhabitants, per speed tiers," as of December 2016.

4.3 High-speed internet market share

131. Market shares are measured according to the percentage of subscribers served by the incumbent telecom operator, the incumbent cable operator and non-incumbent entrants, both resale-based and facilities-based.

4.3.1 Canada

132. The incumbent cable operators in Canada accounted for the largest share of residential subscribers, serving 49% of the total, while the incumbent telecom operators accounted for 38% of subscribers.⁹⁰ These figures represent national averages for each of the two main categories of services providers. Each incumbent telecom operator has fixed wireline facilities that serve a specific region without overlapping with another telecom operator. However, these facilities do overlap with

⁹⁰ CRTC, Communications Monitoring Report, 2017, Table 5.3.4.

a cable operator in almost all instances. The same situation exists for the incumbent cable operators. Because of variations in the serving areas of each telecom and corresponding cable operator, it is not possible to derive specific market shares in any one region.

133. The remaining 13% of subscribers are served one of the numerous non-incumbent entrants using a mix of their own facilities and resold wireline wholesale access services provided by the telecom and cable operators.⁹¹
134. The entrants' share of subscribers served by their own facilities are estimated to represent approximately 5% of residential subscribers. The available data indicates that almost all of the residential market served by entrants' own facilities is based on fixed wireless and satellite platforms, although there are some locations where entrants have constructed their own fixed wireline facilities.⁹² The entrants' remaining share of residential subscribers, representing 8% of the market total, are served using resold wireline wholesale access services.⁹³ Most of the gains that entrants have made in the residential market have been based on resold wireline wholesale access facilities provided by the telecom and cable carriers.⁹⁴

4.3.2 Country Comparisons

135. The share of the market held by incumbent cable operators is substantially higher in those countries where there is widespread availability of cable networks, which includes Canada, Belgium, the Netherlands, Portugal, Switzerland and the United States. These are the only countries included in this report where the incumbent cable operators' share of the market exceeds 30%.

⁹¹ CRTC, Communications Monitoring Report, 2017, Tables 5.3.4, 5.6.7 and Figure 5.3.12.

⁹² CRTC, Communications Monitoring Report, 2017, Figure 5.1.5 indicates 40,000 households with access to FTTP service that is not provided by either an incumbent telecom or cable operators. It is not known what percentage of these households passed also subscribe to high-speed internet services using these facilities.

⁹³ CRTC, Communications Monitoring Report, 2017, Tables 5.3.4, 5.6.7 and Figure 5.3.12. Entrants' share based on owned facilities derived from information on shares of subscriptions by technology in Figure 5.3.12 which indicated fixed wireless and satellite accounted for 4%, with an additional 1% share adjustment to include other serving technologies. Entrants' market share based on resold wireline wholesale access services is derived from the number of subscribers served by wholesale high-speed access services in Table 5.6.7, adjusted down to exclude an estimate of business subscribers. These estimates were also compared to the number of residential high-speed subscribers in Table 5.3.4 and the percentage of residential subscribers by access technology in Figure 5.3.12.

⁹⁴ CRTC, Communications Monitoring Report, 2015, Tables 5.3.4 and 5.6.7 and Figure 5.3.7. Based on this information, the share of the market served by entrants using their own facilities increased from 3% to 5% between 2010 and 2016.

136. Another common characteristic among the countries studied in this report that have a high degree of coverage by cable operators is a relatively lower share of the market held by entrants that compete against the telecom and cable operators.
137. The high-speed internet market in the United States has several elements that are similar to Canada's. Notably, entrants in the American market serve approximately 14% of the subscribers to retail high-speed internet services – only one percentage point higher than in Canada. Entrants other than the incumbent telecom and cable operators held a 15% share in the Netherlands and a 19% share in each of Portugal and Switzerland. The share of the market served by entrants is only 3% in Belgium.
138. The countries studied in this report that do not have widely available cable networks tend to have higher market shares held by entrants, ranging from 55% in Italy to 32% in Australia. It was not possible to derive reliable statistics on the market share accounted for by entrants using their own facilities versus resold wireline wholesale access services. However, the EC publishes some information on the wireline wholesale access lines provided by the incumbent telecom operators.
139. The data indicates that, among the EC countries studied, the vast majority of the entrants' market share was served using resold wireline wholesale access services of the incumbent telecom operators.⁹⁵ The combined share of the retail high-speed internet market served directly or indirectly by the telecom operators' networks exceeded 75% in four of the European countries studied where cable network coverage is more limited.
140. This is not the case in Portugal, where the main competitive entrant, Vodafone, invested in FTTH/B facilities through co-investment arrangements with other carriers, including the incumbent telecom network operator. In a report by BEREC on the factors influencing the deployment of NGA networks, it stated that the investment in fibre by entrants in countries such as Portugal was among the "examples of how alternative operators used the ladder of investment to move up the ladder to deploy their own access infrastructure."⁹⁶
141. The detailed statistics on market shares for the 12 countries studied in the report are provided in Table 4.3.

⁹⁵ European Commission, "Digital Progress Report 2017", including detailed statistics on the number of lines supported by wholesale access services such as unbundled loops and bitstream.

⁹⁶ BEREC, BoR (16) 171, *op cit*, page 35.

Table 4.3
Competitor Market Share, 2016*

	Incumbent Telecom Operator	Incumbent Cable Operator	Entrant
CANADA	38%	49%	13%
Australia	51%	17%	32%
Belgium	46%	52%	2%
France	40%	8%	52%
Germany	40%	23%	37%
Italy	45%	0%	55%
Japan	54%	6%	40%
Netherlands	41%	45%	14%
Portugal	40%	41%	19%
Switzerland	50%	31%	19%
United Kingdom	37%	20%	43%
United States	32%	55%	14%

Sources: Canada, Canada: CRTC, *Communications Monitoring Report, 2017*, Figures 5.3.1 and 5.3.2, Table 5.3.4; Australia: ACCC, *“Communications Sector Market Study, Final Report, 2018”*; Table 4.1; European countries (except Portugal and Switzerland): European Commission, *“Digital Progress Report 2017”*; Japan: Ministry of Communications, Statistics Bureau, *“Statistical Handbook of Japan, 2016”*, Table 8.6; Portugal: ANACOM *Facts & Figures 3rd Quarter 2017*; Switzerland: Federal Communications Commission, *“ComCom, 2017 Activity Report,”* page 8; United States: Federal Communications Commission (FCC), Industry Analysis and Technology Division, Wireline Competition Bureau, *“Internet Access Services: Status as of December 31, 2016,”* (February 2018), Figures 11 and 13; and CableLabs, *“Gigabit Broadband Competition in the U.S.,”* presentation at ITU SG9 Workshop on TV and Content Delivery on Integrated Broadband Cable Networks (May 2017).

*Data as of year-end 2016, except Japan as of year-end 2015, European Commission’s *“Digital Progress Report 2017”* data as of June 2017, ANACOM (Portugal) data for September 2017 and ComCom (Switzerland) data for year-end 2017.

5.0 Lessons for Canada

142. There are some interesting lessons for Canada that can be gleaned from the comparison of regulatory models and market characteristics in Canada versus the other 11 countries. These lessons are derived from three key findings.
143. First, regulatory intervention in the wireline high-speed internet market has had limited influence on market structures in the presence of competing network operators. Second, a number of the studied countries are looking to promote private sector investment in NGA networks with a focus on lessening regulatory uncertainty and obligations associated with these investments. Third, facilities-based competition and investment by entrants can be promoted by applying more regulatory remedies at the higher rungs of the Ladder of Investment, rather than the lower rungs.
144. Each of these findings is elaborated upon in the following sections.

5.1 Market structure is determined more by the presence of competing facilities than regulatory frameworks

145. The 12 countries studied in the report present a range of regulatory models for wireline wholesale access in the high-speed market. The regulatory models involve varying degrees of intervention, including *ex ante* and *ex post*, and where intervention occurs, these target different rungs on the Ladder of Investment. However, there is little correlation between the extent of regulatory obligations for wireline wholesale high-speed access and the market structure, notably the network coverage by facilities-based and resale-based competitors and their respective market shares.
146. There are six countries where entrants' market share exceeded 30%. This group includes countries where wholesale access regulations are *ex ante* and remain comprehensive (e.g., Germany, Italy and the United Kingdom) as well as those with less regulation (e.g., Japan).
147. Entrants' market share is less than 20% in the other six countries. Again, this group includes those with fewer regulatory remedies (e.g., Portugal, Switzerland and the United States) and more regulations (e.g., Canada, Belgium and the Netherlands). What these six countries do have in common is they each exhibit extensive coverage by both telecom and cable networks.
148. Canada is the only country to have long-standing wireline wholesale access obligations applied to both the incumbent telecom and cable operators among those

countries where both are widely available. Canada also applies remedies at the lowest rungs, on an *ex ante* basis, with little intervention at the higher rungs.

149. With the exception of Belgium which only recently took steps to extend the regulations to cable operators, wireline wholesale access regulations apply to just the telecom operators in the studied countries that have both telecom and cable operator networks. The regulatory remedies for telecom operators apply to varying degrees, or not at all in the case of the United States. In Switzerland, wholesale access is regulated on *ex post* basis only with all terms set through negotiation, and excludes access to fibre facilities. Portugal limits mandated wholesale access primarily to passive facilities at higher rungs. The Netherlands has more detailed wholesale access regulations.
150. The lack of correlation between entrants' share and regulation demonstrates the limited influence of regulation on the market structure. This is particularly pronounced among the six countries with a strong presence of cable operators that rely on their own networks.
151. Recent studies offer some insight as to why there may be a mismatch between entrants' market share and the degree of regulation in countries where there is extensive facilities-based competition between the telecom and cable operators. In the first study, and also the most recent, the following was observed regarding lower market share of entrants in certain countries.

“The primary competitive constraint in these Member States has been provided by cable, suggesting either than entry by firms relying upon regulated ULL products may have been ‘crowded out’, or that regulators in those markets felt less inclined to battle to overcome the many challenges that arose in seeking to implement the unbundling model, described in the previous section, because the competitive benefits were considered less necessary.”⁹⁷

152. A second study also noted the ineffectiveness of wholesale access to unbundled loops (referred to as local loop unbundling or LLU in Europe) in countries with extensive coverage by telecom and cable operators.

“In countries with high – or even ubiquitous cable coverage and strong cable take-up, as is the case in the US, Canada and the Netherlands, there may be less economic space to allow the success of LLU-based

⁹⁷ Feasey and Cave (2017) *op cit*, page 36.

competitors. Therefore, even when regulation is mandated in these cases, often the take-up of LLU is more limited.”⁹⁸

153. A third study, prepared by BEREC, found that the factors that contributed the most to the deployment of fibre-rich and full-fibre networks were: infrastructure based competition; demand side factors; and factors that reduce the costs of FTTH/B rollout, such as widespread availability of high quality conduit.⁹⁹ The study further noted that these factors, “are largely or completely exogenous to regulatory interventions” by regulatory agencies. The implication is that regulatory remedies may have a limited role in developing NGA networks.
154. The findings in these studies strongly suggest that regulatory intervention directed at stimulating resale-based competition relying on mandated wholesale access is unlikely to have a significant impact on the market structure in countries with widespread coverage by two independent facilities-based network operators.

5.2 Promoting investment in NGA networks by lessening regulation

155. Canada shares with most other countries the common goal of promoting the widespread deployment of NGA networks. Public investment by governments can play a key role in achieving this goal. However, most countries rely on private sector companies to provide the bulk of the investment, as has been the case in Canada.
156. The alternative to facilitating private sector investment is to rely on a government-funded monopoly to provide NGA infrastructure, as exhibited in Australia. It would be entirely infeasible to apply the Australian approach to Canada, given the current widespread availability of both telecom and cable networks, each of which are well-endowed with fibre-rich and full-fibre facilities.
157. Private sector investment in NGA networks carries additional risk, beyond just the risk of whether demand will develop, when faced with the prospect that the new infrastructure will be subject to wholesale access. This risk can be reduced by providing greater certainty that investors will be afforded a fair opportunity to earn a return on the investment. The British government’s recent report, Future Telecoms Infrastructure Review, provides a useful comment on this point.

“Regulatory forbearance – by which we mean that the regulator refrains from intervening in markets or reduces the scope or level of regulation – could be key to giving investors the commercial flexibility, confidence and incentives they need

⁹⁸ Wik Consult, (July 2015), *op cit*, page 75.

⁹⁹ BEREC, BoR (16) 171, *op cit*, page 30.

to make large, risky investment in gigabit-capable networks. Regulatory forbearance has been successful in other countries in helping to drive investment in fibre networks.”¹⁰⁰

158. The United States has adopted the most hands-off approach to imposing regulations on private sector fibre investment, followed by Switzerland. Other countries studied in this report have adopted a more graduated approach. For example, regulators in European countries have experimented with reduced or zero wholesale access requirements for fibre-based facilities. Neither France nor Portugal require the incumbent telecom operator to provide any fibre-based active wholesale access services (e.g., bitstream), as discussed in Section 3.2. Japan also applies a ‘light-touch’, negotiations-based approach to regulating the fibre-based facilities of the incumbent telecom operator.
159. In contrast, the CRTC’s wireline wholesale access regulations promise ongoing regulation of wholesale access services provided over full-fibre networks, while slower speed access services delivered over legacy network facilities could be deregulated in the future. For Canada to move towards a lighter regulatory model like that adopted in the other countries studied, the CRTC would need to reverse its decision to mandate wholesale high-speed access to FTTH and fibre-rich facilities providing speeds above 100 Mbps downstream. Options for relaxing the regulatory obligations in a more gradual manner are discussed in the next section.

5.3 Focus regulatory remedies on higher rungs of the Ladder of Investment

160. The Ladder of Investment theory, which informed the regulatory framework in several of the countries studied, proposes that regulators mandate wholesale access to an incumbent operator’s facilities in a manner that incents entrants to progress from lower-risk and lower-investment forms of entry by using wholesale services at lower rungs to higher-risk and higher-investment entry based on services at higher rungs. Ultimately, entrants would become fully facilities-based.
161. The risk of such a regulatory model is that resale-based entrants provided with comprehensive regulated options to at lower rungs are less likely to migrate up the ladder and rely increasingly on their own facilities. Regulation must carefully balance incentives among the different rungs at different stages of the market development for it to successfully promote facilities-based competition and investment. The

¹⁰⁰ United Kingdom, Department for Digital, Culture, Media & Sport, “Future Telecoms Infrastructure Review,” July 2018, paragraph 100.

wireline wholesale access regulations in Canada appear to be overly weighted at the lower rungs, relative to most other countries studied in this report.

5.3.1 Lessening regulation of wholesale access at lower rungs

162. Canada continues to focus most of its regulatory efforts for wireline wholesale high-speed access on the bitstream services at the lower rung of the Ladder of Investment, while services at higher rungs, including unbundled loops and dark fibre, have been deregulated.
163. Several of the countries studied have targeted regulation at the higher rungs and reduced regulation at lower rungs. Some of the European countries have reduced regulation at the lower rungs, while maintaining obligations for virtual unbundled loops (e.g., United Kingdom) and promoting co-investment in fibre builds (e.g., France, Portugal).
164. It may not be realistic to remove regulatory obligations for wholesale access for bitstream services in Canada in the short term. However, changes in regulatory remedies adopted in other countries provide options for a more gradual approach.
165. The first option would be to allow increases in the tariffed rates for mandated wireline wholesale access services at the lower rungs of the Ladder of Investment. This would promote investment by reducing the incentives for entrants to use these facilities rather than invest in their own.
166. A second option would be to limit rate regulation of wireline wholesale access services to a single anchor product. Entrants would be able to reference the rate for the anchor product in negotiating the terms for other wireline wholesale services. Ofcom in the United Kingdom adopted the anchor product model for BT's (Openreach) virtual unbundled loops that provide 40 Mbps downstream.
167. A third option would be to adopt a "negotiate first" model in place of cost-based rates that require lengthy and complex regulatory proceedings. Negotiated rates, terms and conditions can be backstopped by a requirement to publish a reference offer and/or the threat of *ex ante* regulation if necessary. The Dutch regulator, ACM, promotes commercial negotiation for wholesale access.¹⁰¹ Both Japan and Switzerland rely on *ex post* regulation that requires parties to negotiate wholesale access arrangements.

¹⁰¹ ACM, "Commercial wholesale agreements in the Netherlands," presentation by Johan Keetelaar, Director ACM, at WIK Investment Workshop, March 7, 2017.

168. The incumbent operators and entrants in Canada have experience with negotiating wholesale access arrangements. However, the CRTC's *ex ante* process for approving rates, terms and conditions remains the default.
169. A recent study proposed that the presence of two independent facilities-based providers offering wholesale access on commercial terms would allow regulators to lift mandated access obligations, provided that entrants can be encouraged to accept negotiations, "rather than rely on obtaining better terms from the regulator if they refuse to deal."¹⁰²

5.3.1 Improving access to support structures

170. Support structures – poles and conduit – reside at the top of the Ladder. Several countries have identified support structures as a critical input to promoting investment in NGA networks and increasing facilities-based competition. The United States and the EC countries studied in this report have taken concerted actions to lower the cost and improve access to support structures. The FCC has issued several rulings in this regard, while the EC's Broadband Cost Reduction Directive has provided a solid framework for its member countries to improve access. Portugal, France and the United Kingdom provide further country-specific examples.
171. Canada differs from the other countries studied in terms of efforts to improve access to support structures. In Canada, recent rulings have resulted in higher rates without regard to the impact this could have on the cost of deploying infrastructure. Moreover, Canada has not launched any initiatives that seek to improve access to facilitate additional network deployment.
172. Canada could learn from the other countries studied in this report on how to improve access to support structures that would enable competitors to more readily invest in their own facilities. However, doing so is complicated by the fact that different regulatory bodies set the terms for support structures depending on whether the structures are owned by one of the incumbent telecom operators or electrical utilities. It would require legislative change to remedy these differences.
173. In summary, the experience in the other countries studied in this report provides Canada with multiple examples of alternative approaches to regulation – both positive and negative. Underpinning the more positive examples is the guiding principle that, if regulation is pursued, the regulator must commit to weakening the lower rungs and strengthening the higher rungs if it is hoping to influence the market towards greater facilities-based competition and investment in NGA networks.

¹⁰² Feasey and Cave (2017) *op cit*, pages 56-57.

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CRTC Reference #	Date	Cable/ Telco	Description
TD 96-1	30/01/96	Cable	Broadcast carriers (non-programming services) regulated as common carriers under Telecommunications Act
TD 97-8	1/05/98	Telco	Unbundled local loops mandated for 5 years (primarily for entry in local telephone market)
TD 98-9	9/07/98	Cable & Telco	Wholesale access obligation for cable (broadcast carriers) and telco confirmed (75-80); retail Internet forborne
TD 99-8	6/07/99	Cable	Cable third party internet access (TPIA) general principles (tariffs at cost-based rates, competitive safeguards)
TD 99-11	14/09/99	Cable	Mandated resale of retail Internet at -25% until TPIA launched
TO 99-591	25/06/99	Telco	Denied request to ensure retail Internet rates above wholesale
TO 2000-211	23/03/00	Cable & Telco	Wholesale high speed access (WWSA) not essential service
TO 2000/317	18/04/00	Cable	TPIA obligations apply to large cable carriers (defined); obligation to establish Carrier Services Group safeguard
TO 2000-789	21/08/00	Cable	Tariffed rates, terms & conditions for TPIA (equivalent treatment retail/wholesale, restrictions on use, ISPs to supply end-user modems)
TO 2000-983	27/10/00	Telco	DSL service providers same rights to unbundled loops (ULLs) as competitive local exchange carriers (CLECs)
TO 2001-184	1/03/01	Telco	ULL mandated obligation extended indefinitely (see TD 97-8)
TD 2002-34	30/05/02	Telco	Telco ADSL wholesale not essential
TD 2002-37		Telco	Denied request for ISPs to resell Bell retail Internet
TD 2003-47	14/07/03	Cable	TD 99-11 resale obligation extended to cable Lite retail Internet
TD 2003-49	21/07/03	Telco	Telco cannot deny access to residential retail or wholesale ADSL for end-users not subscribed to telco's telephone service
TD 2003-87	23/12/03	Cable	Further extension of TD 99-11 resale obligation and include resale of cable modem
TD 2004-5	27/01/04	Telco	Ethernet wholesale service available to DSL service providers
TD 2004-28	5/05/04	Cable & Telco	Cost-based rates for WWSA Lite services; denied request to set wholesale rates to guarantee competitor viability; rejected re-regulation of retail Internet
TD 2004-34	21/05/04	Telco	<i>same as TD 2003-49 for business market</i>
TD 2004-37	4/06/04	Cable	Terms and conditions for cable modems supplied by ISPs for use with TPIA
TD 2004-69	2/11/04	Cable	TPIA points of interconnection (POI) – rates, terms and conditions including level of aggregation (disaggregated)
TO 2005-62	17/02/05	Telco	Bell introduces Gateway access service (GAS) and High Speed Access (HSA) service based on negotiated terms
TO 2005-144	15/04/05	Telco	GAS offered over dry loops (no active telephony service on loop)
TO 2005-415	22/12/05	Telco	Discount on ULL used with GAS
TD 2006-61	21/09/06	Cable	Denied request for quality of service provisions for TPIA
TD 2006-77	21/12/06	Cable	Mandated speed matching for TPIA (wholesale offers mirror retail speeds); TPIA costing issues including non-essential treatment (higher mark-up), allocation of shared costs; denied

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			request for dedicated channel based TPIA; approved usage charges that mirror retail pricing scheme
TPN 2007-6	27/04/07	Cable & Telco	Federal Government Policy Direction (P.C. 2006-1534) mandated review of regulations
TO 2007-21	25/01/07	Telco	Imposed speed matching requirement; denied request to classify ADSL as essential (pending review – see <i>TD 2008-17</i>)
TD 2007-46	27/06/07	Telco	ADSL tariff changes and speed matching requirements suspended pending review
TD 2007-77	31/08/07	Telco	ADSL tariff changes and speed matching requirements rescinded (see <i>TD 2008-17</i>)
TO 2007-230	29/06/07	Cable	Clarification of POI requirements (TD 2004-69) permitting negotiated terms for line cards; ISP self-supply of equipment
TD 2008-17	3/03/08	Cable & Telco	Essential service definitions established; TPIA and aggregated ADSL classified conditional mandated non-essential (include access and transport); ULL and ADSL access classified conditional essential; classification “conditional” until market becomes more competitive; no speed matching for ADSL
TD 2008-108	20/11/08	Telco	Bell permitted to retain traffic shaping on WHSA products (pending review – see <i>TRP 2009-657</i>)
TO 2008-117	11/12/08	Telco	Telcos to provide speed matching for ADSL where requested
TRP 2009-34	26/01/09	Telco	Rescinded ADSL access obligation in TD 2008-17; denied request to reclassify aggregated ADSL conditional essential
TO 2009-111	3/03/09	Telco	Clarification of TO 2008-117: speed matching obligation applies to all WHSA ADSL services (not just copper facilities)
TO 2009-484	12/08/09	Telco	Telco speed matching for GAS with usage based billing (UBB) (UBB applied additional fees for usage above capped amount)
TRP 2009-657	21/10/09	Cable & Telco	Internet Traffic Management Practices (ITMPs) principles; (e.g., net neutrality); endorsed usage based billing for retail and wholesale applied on competitively neutral terms
TD 2010-255	6/05/10	Telco	Bell tariff for GAS with UBB and speed matching approved
TRP 2010-632	30/08/10	Cable & Telco	Confirmed speed matching requirement for telco and cable WHSA products; mandated aggregated TPIA service (consolidation of POIs) to replace disaggregated; various costing adjustments for setting rates; denied request for cable dedicated channel/head-end version of TPIA; next generation (FTTH) wholesale not mandated (case-by-case)
TD 2010-802	28/10/10	Telco	Clarification of TD 2010-255 to grandfather existing wholesale (and retail) Internet end-users from application of UBB
TD 2011-44	25/01/11	Cable & Telco	Approved UBB rates for WHSA products at retail -15% (suspended – see <i>TRP 2011-703</i> , <i>TRP 2011-704</i>)
TRP 2011-330	17/05/11	Cable	TPIA static IP address for end-users referred to CISC to resolve technical and operational matters (see <i>TD 2012-962</i>)
TO 2011-377	15/06/11	Cable	Approved TPIA tariff revisions from TRP 2010-632
TO 2011-482	10/08/11	Cable	Clarified phase-out of disaggregated TPIA during transition to aggregated TPIA (see <i>TRP 2010-632</i>)
TRP 2011-703 TRP 2011-704	15/11/11	Cable & Telco	Rescinded UBB and replaced with Capacity Based Billing (CBB) at cost-based rates with option to maintain flat-based

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			rates for WHSA products; adjusted costing inputs to lower rates
TD 2012-96	14/02/12	Cable	Approved two solutions for TPIA static IP (see TRP 2011-330)
TD 2012-141	8/03/12	Cable	Denied request to impose interim regulatory obligations on Bragg/Eastlink pending resolution of TPIA negotiations
TO 2012-203	3/04/12	Telco	Introduced WHSA for Northwestel (Wholesale Connect)
TD 2012-636	21/11/12	Cable & Telco	Finalized rates, terms and conditions for CBB (see TRP 2011-703, 704)
TO 2012-706	21/12/12	Cable	Modified Rogers proposed TPIA interim rates for new service speeds based on proxy method in lieu of cost studies
TD 2013-36	31/01/13	Cable	Denied request to impose speed matching for disaggregated TPIA services during phase-out period (see TRP 2010-632)
TRP 2013-70	21/02/13	Cable & Telco	Adjusted some elements of costing and rates for WHSA CBB component in response to applications to revise TRP 2011-703, TRP 2011-704, including removal of distinction between residential and business WHSA product and extended transition period for aggregated TPIA (see also TD 2013-71 to 2013-78)
TD 2013-399	9/08/13	Telco	Denied Bell's request to overturn TD 2013-71 requiring uniform treatment of CBB for residential and business WHSA
TD 2013-480	11/09/13	Telco	Uniform rates for residential and business WHSA legacy product (consistent with uniform rates in TD 2013-71 for non-legacy)
TD 2013-603	12/11/13	Telco	Confirmed finding in TRP 2013-70/73 to apply uniform WHSA tariffs in residential and business markets
TD 2013-659	6/12/13	Telco	Additional adjustments to costing and rates for legacy WHSA; modem testing requirements for telcos (similar to cable)
TRP 2013-711	18/12/13	Telco	Increased Northwestel WHSA rates (and markup on cost inputs) to restore investment incentives
TD 2014-4	8/01/14	Telco	Initiated review of telco's legacy WHSA rates
TD 2014-463	8/09/14	Telco	Revised terms for telco modem testing (see TD 2013-659)
TD 2015-40	12/02/15	Cable	Denied request to implement competitor quality of service standards for TPIA service; parties to negotiate improvements
TD 2015-320	20/07/15	Cable	Denied request to impose TPIA on Northwestel's cable network
TRP 2015-326	22/07/15	Cable & Telco	Update to essential services framework (TD 2008-17), notably to include wholesale access to FTTH/B based services: mandated disaggregated WHSA for all WHSA speeds above 100 Mbps; aggregated WHSA to be phased-out 3 years after launch of disaggregated (with some grandfathering); (note: aggregated TPIA mandated in TRP 2010-632); ULL no longer mandated and subject to 3 year phase-out period; denied request for Equivalence of Inputs regulation for WHSA
TD 2015-338	27/07/15	Cable	Partial revision of Shaw's TPIA rates to reflect cost studies instead of proxy approach
TD 2016-67	24/02/16	Cable	Bragg/Eastlink to provide resale of retail Internet at -25% discount with speed matching until TPIA available

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TD 2016-117	31/03/16	Cable & Telco	Streamlined process for setting rates for WHSA service by speed bands (to comply with speed matching requirement); adjustments to cost inputs including shorter 5 year study period
TD 2016-245	29/06/16	Telco	Denied application to reverse mandated disaggregated WHSA (see <i>TRP 2015-326</i>)
TD 2016-246 TD 2016-247	29/06/16	Telco	Denied application to reverse withdrawal of mandated ULL (see <i>TRP 2015-326</i>)
TD 2016-379	20/09/2016	Cable & Telco	Approval of service configurations for disaggregated WHSA that exclude transport components and include switching/interconnect at cable head-end or telco central office (also referred to as Layer 3 or bitstream) (see <i>TRP 2015-326</i>)
TO 2016-396	6/10/2016	Cable & Telco	Interim approval of rates for aggregated WHSA; CRTC rate levels significantly reduced from those proposed based on CRTC finding proposed rates did not comply with Phase II costing principles, past rulings and staff guidance
TD 2016-446	9/11/2016	Cable	Rogers directed to maintain aggregated TPIA service over facilities upgraded to FTTP
TRP 2016-496	21/12/16	Cable & Telco	Universal service objective for fixed-line Internet service minimum of 50/10 Mbps, to be supported by new broadband fund; access to the fund may include wholesale obligation (pending review in <i>TNC 2017-112</i>)
TRP 2017-104	20/04/17	Cable & Telco	Criteria for assessing if differential pricing practices are non-discriminatory (see also ITMPs/net neutrality <i>TRP 2009-657</i>); data allotments included in WHSA CBB tariffs to be monitored
TO 2017-312	29/08/17	Cable & Telco	Established interim rates for disaggregated WHSA, with adjustments to carriers' costing inputs and proposed rates (see <i>TRP 2015-326 and TD 2016-379</i>)
TD 2017-335	18/09/17	Telco	Bell permitted to apply different billing models for dedicated WHSA services (flat rate) and non-dedicated (CBB)
TD 2017-459	20/12/17	Telco	Denied Bell's request to not mandate an outside meet-me point for disaggregated WHSA (see <i>TD 2016-379</i>)
TD 2018-18	17/01/18	Telco	ULL ancillary services and ADSL line-sharing forborne (subject to demand levels); denied request to freeze rates for Bell's legacy WHSA service (GAS and HSA) dry loops
TD 2018-44	2/02/18	Cable & Telco	Denied request for transitional provision of aggregated WHSA for FTTP facilities; disaggregated WHSA available on interim basis where only FTTP facilities exist (see <i>TD 2016-446</i>)
TRP 2018-123	13/04/18	Cable & Telco	Competitor quality of service standards and monitoring mandated for aggregated and disaggregated WHSA; CISC to develop specifics for 4 indicators
TD 2018-200	5/06/18	Telco	Bell's ULL forborne in multiple exchanges; expected to promote investment in, and use of, more advanced facilities