

Annexes



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Annex A

Market Analysis of Broadband Service in Rural and Remote Canada

Because of the increasingly important role information and communications technologies (ICTs) will play in supporting economic development, improved delivery of public services and social inclusion, the Panel concludes that affordable and reliable broadband services should be available in all regions of Canada by 2010, and recommends that this be a central goal of the national ICT adoption strategy.

In developing recommendations on how this goal could be achieved, one of the key questions facing the Panel was whether market forces alone could meet the objective of providing ubiquitous broadband access.

Submissions received by the Panel during the consultation process presented different views on this question. On the one hand, a study by the consulting firm SECOR¹ suggested that market forces would indeed be capable of bringing broadband coverage to every corner of Canada. On the other hand, the majority of participants in the Whitehorse Access Forum² doubted the likelihood of an entirely market-funded solution. Given this divergence of views, the Panel decided to undertake its own analysis.

The Panel's study found that although the broadband market is likely to continue to expand in rural and remote areas, it is unlikely to completely bridge the coverage gap, leaving a substantial population without access to high-speed Internet service in the medium term.

The Panel's study began by mapping the current availability of high-speed Internet service in Canada. Using geospatial software, data on the location of broadband access services were plotted to as fine level of detail as possible on a map of Canada. These data were provided by more than 80 facilities-based, high-speed Internet service providers, including wireless, cable modem and DSL providers, and were current as of mid-2005. Additional data gathered from provincial, territorial, and federal broadband program plans were then added to the map. These data included the location of all the broadband points of presence (PoPs) planned to be established by 2007 through the Alberta Supernet, Network BC, Saskatchewan Community Net and New Brunswick DSL projects.

To estimate how many people will have access to broadband by 2007, very detailed population data from the 2001 Census were added to the map.³ As a result of this analysis, the Panel estimated that 26 788 000 Canadians, or 89.3 percent of Canada's total population of 30 005 000, will have one or more land-based, high-speed Internet access services available to them by 2007. The total population has increased since 2001 when the census counted

¹ Appendix E-3 of the Bell Canada submission to the first round of comments to the Consultation Paper, titled "Broadband Access for Every Canadian Home: The Business Case" by SECOR.

² The Access Forum was held in Whitehorse, Yukon on September 9, 2005. The Panel heard presentations and discussion related to broadband connectivity and the difficulties of implementing it in rural and remote areas.

³ Census Block population data from Statistics Canada Geosuite 2001 Census Catalogue no. 92F0150XCB.

30 005 000; however, the rural and remote population has remained constant. An additional 200 000 Canadians are expected to receive a satellite-based broadband service offering as a result of the National Satellite Initiative within this time frame. However, this would leave some three million Canadians without access to broadband by 2007.

Having estimated the size of the population that is likely to remain unserved by 2007, the Panel investigated whether and to what extent a sustainable economic case could be made to provide broadband service to these three million Canadians.

To do this a computer model was constructed. The model assumed that, to achieve ubiquitous access as economically as possible, these three million Canadians would access broadband either through land-based, fixed wireless technology such as WiMAX or in the most remote cases through a Ka-Band satellite solution.⁴

In addition, the model assumed that because of the limited capacity of current satellite systems, the maximum number of broadband subscribers in areas not currently covered by a land-based service that could be served by Ka-Band satellite would be 40 000.⁵ Since 40 000 subscribers is equivalent to a population of approximately 300 000 people, the model assumed that 2.7 million Canadians would need to be served by land-based wireless technology in order to reach the goal of ubiquitous access.⁶

The population of 2.7 million people that would need to be connected by land-based wireless was segmented into some 6000 geographical areas, each of which contained a central place with a local maximum population density such as a village or dense cluster of dwellings that could logically house a broadband PoP. The typical distance between the centre points of adjacent geographical areas was between 10 and 20 kilometres. This reflected the anticipated spacing of microwave links at line-of-sight on moderately high towers.

In order to help determine which of these geographical areas could potentially be served by market forces alone and which would require public subsidy, the model began by identifying the most efficient way of using fixed wireless technology to provide access to broadband in each of the 6000 geographical areas, beginning with the most populous areas and working toward the least populous areas.

With networking requirements identified, the economic viability of providing broadband access to each of the 6000 geographical areas was then tested. This was done by estimating the cost of building and operating the transmission towers and other facilities required to make broadband available in each area, and then comparing these costs with potential revenues from

⁴ Fixed wireless service is the most economical rural solution studied, requiring the user to have a small flat panel antenna fed from the personal computer typically via a wire and mounted to the side of her or his home, directed at the main transmission tower to achieve a connection of up to 2 megabits per second to the Internet.

⁵ The figure of 40 000 remote subscribers was chosen rather than the theoretical total capacity of 125 000, since it could not be assumed that the entire satellite would be reserved for the most remote and costly customers from a land-based perspective.

⁶ The figure of 300 000 population was derived from the base case of a rural take rate of 30 percent, and a population to household ratio of 2.2 applied to the 40 000 subscribers.

the population living in the area. When the cost of making broadband available exceeded projected revenues over a five-year period, the area was considered economically unviable and therefore unlikely to be served by market forces alone. This analysis found that areas with fewer than 1200 people living within a 5–10-kilometre radius from the broadband PoP generally were not economic to serve, and that the economics worsened as the terrain became more mountainous.

In conducting this analysis, various assumptions were made with respect to the monthly price of Internet service, the CAPEX and the OPEX, the discount rate, topography as a factor of cost⁷ and the take-up rate of a high-speed Internet service.

In the model, the topography factor distributed tower locations more closely in areas of hilly or mountainous terrain in proportion to the bumpiness. The economic case became more difficult as the terrain became bumpier and as the population became less dense. The estimated cost of providing broadband access increased by 50 percent or more in approximately one-quarter of the areas because of topography.

Capital costing of wireless Internet access is dependent on the cost of the tower, the backhaul radios and the access point that communicates directly with subscribers on the ground. A study of 20 BRAND wireless business cases concluded the cost of a wireless PoP is approximately \$100 000. This figure was verified by a large wireless Internet service provider operating in western Canada. It is also generally consistent with SECOR's analysis, which estimates the total cost at closer to \$130 000.

Using this base cost, the study estimated that about 1.2 million Canadians could be served economically with new WiMAX technology (i.e. broadband access providers could potentially break even in five years using this technology). In addition, as previously mentioned, the study estimated that the 300 000 most difficult to reach Canadians could be served by a Ka-Band satellite solution. According to the model, this would mean that about 1.5 million Canadians, or 5 percent of the population, could not be served economically.⁸

On the basis of this analysis, the Panel concluded that a specific, targeted government subsidy program should be established to ensure that affordable and reliable broadband access is available to the significant number of Canadians who are unlikely to be served by market forces alone by 2010.

⁷ Topography was finely mapped and a factor of terrain "bumpiness" was calculated as the standard deviation of elevation among hundreds of evenly distributed sample locations for each unit of geography based on data taken from the Natural Resources Canada Digital Elevation Model (Can3d30).

⁸ Unlike the SECOR methodological assumption that among the remaining unserved areas the economic ones would subsidize the uneconomic ones, the Panel's study assumed the market would make decisions on an area-by-area basis, halting investment when it was no longer profitable to dig deeper geographically.

Annex B

List of Persons and Organizations Making Submissions

Note: The submissions may be viewed online at the following website:

http://www.telecomreview.ca/epic/internet/intprp-gecrt.nsf/en/h_rx00025e.html

Accelteon Management Consulting
Alcan Inc.
Alcatel Canada
Aleph Experts-Conseils
Aliant Telecom Inc.
Alliance of Canadian Cinema Television and Radio Artists (ACTRA)
Alliance québécoise des techniciens de l'image et du son (AQTIS)
AOL Canada Inc.
APT Prophet Technologies Incorporated: Maxwell J. Toms
ARCH: A Legal Resource Centre for Persons with Disabilities
ARDICOM Digital Communications Inc.
Arney, Patricia
Association des producteurs de films et de télévision du Québec (APFTQ)
Association des réalisateurs et réalisatrices du Québec (ARRQ)
Association of Canadian Community Colleges (ACCC)
Association québécoise de l'industrie du disque, du spectacle et de la vidéo (ADISQ)
Astral Media Inc.
ATCO Electric Ltd.
Atlantic Provinces Economic Council (APEC)
Audlaluk, Larry
BC Rural Women's Network
BC3 and NetWorkBC
Bell Canada
Board of Trade of Metropolitan Montréal
Brand, Chris
British Columbia Hydro and Power Authority (BC Hydro)
Brockville Public Library
Business Council of British Columbia
Cablevision du Nord de Québec Inc. (CNQ)
Call-Net Enterprises Inc.
Canadian Advanced Technologies Alliance and the Canadian Association of Internet Providers (CATA-CAIP)
Canadian Alliance of Publicly-Owned Telecommunications Systems (CAPTS)
Canadian Association of Broadcasters (CAB)
Canadian Bankers Association (CBA)
Canadian Bar Association, National Competition Law Section
Canadian Cable Telecommunications Association (CCTA)

Canadian Chamber of Commerce
Canadian Electricity Association (CEA)
Canadian Independent Record Production Association (CIRPA)
Canadian Internet Policy and Public Interest Clinic
Canadian Library Association (CLA)
Canadian Manufacturers and Exporters (CME)
Canadian Pacific Railway Company (CPR)
Canadian Radio-television and Telecommunications Commission (CRTC)
Canadian Recording Industry Association (CRIA)
Canadian Research Alliance for Community Innovation and Networking (CRACIN)
Canadian Telecommunications Employees' Association (CTEA)
Canadian Wireless Telecommunications Association (CWTA)
CANARIE Inc.
CANCAP
CGI Group Inc.
Chambre de commerce de Québec (CCQ)
CHUM Limited
City of Calgary
Coalition des Fournisseurs Internet du Québec
Coalition for Better Competition
Coalition for Competitive Telecommunications
Communications, Energy and Paperworkers Union of Canada (CEP)
Communications Management Inc.: Kenneth J. Goldstein
Communications Research Centre Canada (CRC)
Competition Bureau
Conférence régionale des éluEs du Bas-Saint-Laurent
Conseil du partoniat du Québec (CPQ)
Consumers Association of Canada
Contact North
Crawley, Pat
Cybersurf Corp.
Directors Guild of Canada (DGC)
DNA13 Inc.
ENMAX Power Corporation
Ergas, Henry
Federation of Canadian Municipalities
First Nations Technology Council
Geist, Michael
Global Television Network Inc.
Goldstein, Dr. Stanley
Government of Alberta
Government of British Columbia: Office of the Chief Information Officer; and Minister of
Economic Development, Minister of Labour and Citizen Services, Minister of Small Business
and Revenue

Government of New Brunswick: Minister of Business
Government of Newfoundland and Labrador: Minister of Innovation Trade and Rural
Development
Government of Northwest Territories
Government of Nova Scotia
Government of Ontario: Ministry of Economic Development and Trade
Government of Prince Edward Island: Minister of Development and Technology
Government of Saskatchewan
Government of Yukon
Hadfield, Perry
Hudson, Dr. Heather E.
Hydro-Québec Distribution
Independent Members of the Canadian Association of Internet Providers (IMCAIP)
Information Technology Association of Canada (ITAC)
International Institute of Telecommunications
Keewaytinook Okimakanak (the Kuhkenah Network, K-Net)
Kitikmeot Corporation
Kitikmeot Economic Development Commission
MacPherson, Debbi
Manitoba Energy, Science and Technology
Manitoba Information & Communications Technologies (MICT)
Matthews, Terry
McDonald, Ben
MCI Canada
McLean, Robert
McOrmond, Russell
Montreal Economic Institute
Montreal International
Motorola Canada Limited
MTS Allstream Inc.
Mullins, Roy
Municipal Information System Association of Canada (MISA-ASIM Canada)
Municipality of Clyde River
National Anti-Poverty Organization
Network BC
Neufeld, Kathaleen
Nortel
North Peace Tribal Council (NPTC): Lloyd A. MacKenzie
NorthernTel
Northwestel Inc.
Nunavut Broadband Development Corporation (NBDC)
Office of the Commissioner of Official Languages
Ontario 9-1-1 Advisory Board (OAB)
Ontario Chamber of Commerce (OCC)

Ontario Telecommunications Association (OTA)
Optical Regional Advanced Network
Orecklin, Mel
Ottawa Centre for Research and Innovation (OCRI)
Ottawa Chamber of Commerce
Paterson, Nancy
Primus Telecommunications Canada Inc.
Public Interest Advocacy Centre
Quebecor Media Inc.
Ramirez, Ricardo
Real Property Association of Canada (RealPac)
Research on Information and Communication Technologies with Aboriginal Communities
(RICTA)
Réseau d'informations scientifiques du Québec (RISQ)
Roberts, Jeff
Rogers Communications Inc.
Sakku Investments Corporation
Shaw Communications Inc.
Smart Communities Society
Société d'Administration des Tarifs d'Accès des Télécommunicateurs (SATAT)
Société de gestion du réseau informatique des communications scolaires
Société des auteurs de radio, télévision et cinéma (SARTEC)
Stark, Chris and Marie
Stewart, Art
Télébec
TeleCommunities Canada
Telesat Canada
TELUS Communications Inc.
TeraGo Networks Inc.
Township of the Archipelago
Tretheway, Dr. Michael W.
Turows Inc.
United Telecom Council of Canada (UTC Canada)
University of Manitoba
University of Toronto
Van Horne Institute for International Transportation and Regulatory Affairs
Vancouver Board of Trade
Wireless Nomad Co-op
Women North Network
Womenspace
Woods Bay Community Association: Glyn Jones
Writers Guild of Canada (WGC)
Xit Telecom Inc.
Yak Communications (Canada) Inc.

Annex C

Members of the Telecommunications Policy Review Panel Secretariat

Executive Director — Allan MacGillivray

Research and Analysis

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Jerry Beausoleil
Andrew Briggs
Gerry Briggs
Ian Currie
Lawrence Dunbar
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George Hariton
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Sarah Lussier
Don MacLean
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Rajiv Pancholy
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Bob Lyle

Annex D

Glossary and List of Acronyms

2.5G (so-called “second-and-a-half generation”) service; see GPRS.

3G (third-generation mobile telephone technology) provides an enhanced range of high-speed multimedia services (meeting the International Telecommunication Union’s IMT-2000 specification).

ACCC (Australian Competition and Consumer Commission) is responsible for ensuring that individuals and businesses comply with the Australian competition, fair trading and consumer protection laws, including those sector-specific provisions that address competition issues in the telecommunications industry.

ACMA (Australian Communications and Media Authority) is responsible for the regulation of broadcasting, radiocommunication, telecommunications and online content in Australia.

Ad hoc is a Latin phrase meaning “for the special or particular purpose.”

Administrative incentive pricing applies higher fees in areas where there is a high demand (congestion) and lower fees where there is less demand.

Allocative efficiency is achieved when prices are close to cost, which ensures that all customers who value a product at more than its cost are able to purchase it and customers who value it at less than its cost do not purchase it.

Analog refers to communication in which the information is represented by a continuous electronic representation of itself in a communication channel.

Backbone refers to the core network segments that connect two or more network nodes together for the purpose of transiting network traffic.

Backhaul refers to the transmittal of data to a network backbone. In wireless network technology, backhaul refers to the transmission of voice and data traffic from a cell site to a switch; that is, from a remote site to a central site. In satellite technology, backhaul relates to the transmittal of data to a point from which it can be uplinked to a satellite.

Bandwidth is the maximum data-carrying capacity of a telecommunications connection as a result of the range of frequencies available to be occupied by signals, and the modulation techniques utilized, usually expressed in terms of hertz (Hz) in analogue systems and as a number of bits per second in digital systems.

Bluetooth® is an industrial specification for wireless short-range (a few metres) networks. Bluetooth provides a means to connect and exchange data between devices such as mobile phones, personal digital assistants (PDAs), personal computers (PCs), printers, digital cameras and laptops via a secure, low-cost, globally available radio frequency.

BRAND (Broadband for Rural and Northern Development) is a federal government pilot program that assists Aboriginal, rural and northern communities to establish high-capacity Internet access services.

Cable modem is a device that allows a computer end terminal to initiate and effect a dedicated communications link via a coaxial cable (“cable television”) network, usually using Internet Protocol (IP) at the network layer and interconnecting with the Internet to provide the cable modem with Internet access.

CAP (Community Access Program) is a federal government initiative administered by Industry Canada that helps people in communities across Canada benefit from public access to computers and the Internet.

Capital expenditure is the cost of procuring, constructing and installing new, durable plant, machinery and equipment, whether for replacement of worn or obsolete assets, or as additions to existing assets, or for lease or rent to others.

CCA (capital cost allowance) is a yearly deduction or depreciation on the cost of certain assets, which is used for income tax purposes.

Circuit refers to the physical connection of channels, conductors and equipment between two given points through which an electric current may be established.

CISC (CRTC Interconnection Steering Committee) is an organization established by the Canadian Radio-television and Telecommunications Commission (CRTC) in *Implementation of Regulatory Framework: Development of Carrier Interfaces and other Procedures*, Telecom Public Notice CRTC 96-28, August 1, 1996, to assist in developing information, procedures and guidelines as may be required in various aspects of the CRTC’s regulatory activities.

CITEL (Inter-American Telecommunication Commission) is an entity of the Organization of American States, in which government and private sector representatives meet to coordinate regional efforts to develop the Global Information Society.

CLEC (competitive local exchange carrier) offers local telecommunications service in competition with incumbent service providers.

Cognitive radio is a radio or system that senses its operating environment and can be trained to dynamically and autonomously adjust its radio operating parameters.

Constant dollar calculations factor out the impact of inflation and allow for comparisons by converting the value of the dollar in other time periods to present-day dollars.

Contribution fund is a national contribution collection mechanism introduced by the CRTC through *Changes to the Contribution Regime*, Decision CRTC 2000-745, November 30, 2000. Pursuant to ss. 46.5(1) of the *Telecommunications Act*, the CRTC requires telecommunications service providers to contribute to the contribution fund to support continuing access by Canadians to basic telecommunications services in HCSAs.

CRC (Communications Research Centre) is a federal government-operated advanced communications research and development lab.

Cross subsidy occurs when a company sells a product below its incremental cost, which is financed by a more profitable product or products offered by the company.

Current dollar calculations involve the statement of economic activity in present-day dollars.

Dark fibre is an optical fibre infrastructure that is in place but is not connected to in-service transmission equipment and therefore is without any optical or electronic signalling.

Deferral account was established by the CRTC through *Regulatory Framework for Second Price Cap Period*, Telecom Decision CRTC 2002-34, May 30, 2002, and *Implementation of Price Regulation for Télébec and TELUS Québec*, Telecom Decision CRTC 2002-43, July 31, 2002.

Deus ex machina is a Latin phrase meaning a person or thing that appears or is introduced suddenly and unexpectedly and that provides a contrived solution to an apparently insoluble difficulty.

Digital refers to communication in which the information is approximated by a discrete series of on and off states that is an abstraction of its natural continuous form.

DMT (discrete multi-tone) is a robust signalling scheme used on copper wires to deliver data speeds required for DSL service.

Downstream in Internet access refers to traffic handled at the service provider end and terminated at the customer end.

DSL (digital subscriber line) is a specification for dedicated, full-duplex data service between a customer's premises and a service provider's point of presence via a conventional copper telephone wire's upper (4 kHz to 2.2 MHz) frequency band.

DTH (direct-to-home) satellite broadcasting is the distribution of video and audio signals from geostationary satellites to small dish antennas and satellite receivers.

DTV (digital television) uses digital modulation and compression to broadcast video, audio and data signals to television sets.

Dynamic efficiency is achieved when firms have the correct incentives to invest and innovate.

Economic efficiency is the maximization of economic welfare.

Economies of density occur when unit costs decline as volume of output increases at a given location.

Essential facility is a facility or service that is needed by a competitor so it can build its own network and/or offer competing services, but that cannot technically or economically be duplicated.

EVDO (evolution data optimized) is an evolution of the CDMA (Code Division Multiple Access)-2000 wireless standard. EVDO technology boosts the ability of CDMA wireless networks to provide data rates of several megabits (million bits) per second in a spectrally efficient fashion. EVDO technology is being deployed primarily by North American operators to provide third-generation mobile data services.

Ex ante is a Latin phrase meaning “beforehand.”

Ex post is a Latin phrase meaning “after the fact.”

FCC (Federal Communications Commission) regulates interstate and international communications by radio, television, wire, satellite and cable in the United States.

Fixed wireless is a method for provisioning a network segment between two fixed locations using wireless devices or systems, whether analogue or digital. Fixed wireless devices normally derive their electrical power from utility mains, as opposed to portable wireless devices that normally derive their power from batteries. Most fixed wireless systems rely on digital radio transmitters placed on rooftops, aerial towers or other elevated locations and achieve point-to-point signal transmission via a microwave platform. Unlike a satellite system, fixed wireless is a terrestrial technology.

Frequency is the specified band or range within an overall spectrum of electromagnetic radio waves used as a channel for sending or receiving communications.

FTTH/FTTP (fibre-to-the-home/fibre-to-the-premises) is a fibre terminating at a residence or office and originating at a switching facility, either a concentrator, remote or central office.

FTTN (fibre-to-the-node) refers to the installation of optical fibre to within several hundred metres of the home or office. At that point, optical signals are converted into electronic signals for delivery into the home or office.

GPRS (general packet radio service) is a packet-based air interface designed as a GSM overlay, permitting the use of GPRS as an optional data networking service on GSM-based networks, including interoperability with the wireline Internet. GPRS can theoretically offer near-broadband data over mobile, but practical multi-user implementations are constrained to much lower throughput rates closer to dial-up Internet speeds. GPRS is a so-called “second-and-a-half generation” (2.5G) service.

GSM (global system for mobile) is a TDMA (time division multiple access)-based protocol implementation and a member of the so-called “second generation” family of mobile protocols. It is deployed widely across Europe and around the world, especially at the 900, 1800 and, in Canada, 1900 MHz frequency bands.

HCSA (high-cost serving area) refers to those areas where the cost of providing telephone service is so high that the CRTC has kept the price below cost, so as to maintain affordability, and has set up a subsidy mechanism to compensate service providers for the cap on their prices.

HFC (hybrid fibre coax) is a broadband access network architecture in which, initially, optical fibre is used to bring the signal closer to the customer's neighbourhood, and then coaxial cable is used to deliver signals to the customer's premises. Such hybrid fibre coax network topology is commonly used in contemporary cable networks for delivering video, Internet and VoIP signals.

ICT stands for information and communications technology.

ILEC (incumbent local exchange carrier) refers to existing telephone companies prior to the introduction of local competition.

Interconnection is the linking of at least two telecommunications network segments at a common physical point, where each interconnected network segment is managed by a separate party, in such a manner as to allow traffic from each party's network segment to be transferred onto the other party's network segment.

IP (Internet Protocol) is a connectionless, packet-switched network layer protocol for exchanging data between computers.

IP address is currently a 32-bit number that identifies each sender or receiver of information that is sent in packets across the Internet. IP addresses are assigned and overseen by the Internet Corporation for Assigned Names and Numbers (ICANN).

IP-TV (Internet Protocol television) refers to systems whereby television and/or video signals are distributed using a broadband connection over Internet Protocol.

IPv4 (Internet Protocol version 4) is the version of IP that is in common use today. IPv4 was formalized as a standard in 1981 and has an address field limited to 32 bits.

IPv6 (Internet Protocol version 6) is the emerging standard, which aims to rectify some of the problems seen with IPv4, in particular, the shortage of address space. It is the new proposed IP, with 128-bit addressing, auto configuration, new security features and support for real-time communications and multicasting.

ISP (Internet service provider) refers to any service provider, including providers of voice telephony or cable television services, that provides Internet connectivity on a retail or wholesale basis. Internet connectivity services include Internet access and Internet transit.

ITU (International Telecommunication Union), headquartered in Geneva, Switzerland, is an international organization within the United Nations organization where governments and the private sector coordinate global telecommunications networks and services.

KHz (kilohertz) refers to a unit of measurement of communication frequency defined as one thousand cycles per second.

LEC (local exchange carrier) offers local telecommunications service and includes both ILECs and CLECs.

Mandated wholesale access refers to the regulatory requirement that ILECs or other service providers make parts of their network available to their competitors at regulated rates.

Market externality exists where one person's actions generate benefits or costs that accrue to others and not to the actor. An example of a negative externality is production that generates pollution, the cost of which is borne by society and not by the producer. An example of a positive network externality is the addition of a subscriber to a telephone network, benefiting others who can reach an additional person.

MHz (megahertz) refers to a unit of measurement of communication frequency defined as one million cycles per second.

MMS (multimedia messaging service) is a wireless messaging service that adds images, text, audio clips and video clips to SMS.

MOU (minutes-of-use) refers to the holding time (length of time that a call makes use of the trunk or channel) or conversation time related to a call.

MVNO (mobile virtual network operator) is a mobile service operator that does not have its own licensed spectrum and does not have the infrastructure to provide mobile service to its customers. It does not own the network on which its voice and data traffic is carried. Instead, MVNOs lease wireless capacity from pre-existing mobile service providers and establish their own brand names different from the providers.

Natural monopoly exists when the entire market demand can be served at lowest aggregate cost by one supplier due to the nature of the economies of scale available, relative to total market size. Competition in such markets would likely be unsustainable due to the economies available to the incumbent supplier.

NGN (next-generation network) refers to the emerging computer network architectures and technologies.

NSI (National Satellite Initiative) was launched in October 2003 by Industry Canada in partnership with Infrastructure Canada and the Canadian Space Agency. It was created to make available affordable satellite capacity for the deployment of broadband services (such as tele-health, tele-education, e-commerce, etc.) to communities in the far to mid-north, and in isolated and remote areas of Canada, where satellite technology is the only practical broadband solution.

OBSI (Ombudsman for Banking Services and Investments) is an independent organization established to investigate unresolved complaints from small business customers and retail customers of banks, investment dealers, mutual fund dealers and investment fund companies.

OECD stands for Organisation for Economic Co-operation and Development.

Ofcom is the independent regulator and competition authority for the United Kingdom communications industries, with responsibilities across television, telecommunications and wireless communications services.

OFDM (orthogonal frequency division multiplexing) is a robust wireless modulation scheme used to boost speeds and spectral efficiency in wireless systems, having among its advantages the ability to relay data over non-line-of-sight paths.

Packet is a generic term for a bundle of data organized in a specific way for transmission. Data are broken up into packets for sending over a packet switching network. Each packet has a header containing its source and destination, a block of data content and an error-checking code. All the data packets related to a message may not take the same route to get to their destination; they are reassembled once they have arrived.

PCS (personal communications service) is a broad service description for communications protocols using radio frequencies in the 1900-MHz frequency band to provide mobile telecom services, including interoperability with the wireline PSTN. In Canada, PCS may be delivered using CDMA, TDMA or GSM TDMA protocols. Outside Canada and the U.S., the PCS service description often refers to the 1800-MHz frequency band.

Phishing refers to the impersonation of a trusted person or organization in order to steal a person's personal information, generally for the purpose of "identity theft."

PoP (point of presence) is a location that a LEC has designated as an interconnection site, and that may or may not contain a switch.

Price cap regulation uses a formula, set in advance, to determine the maximum allowable price increases for a firm's services over a specific period of time. The firm is encouraged to become more efficient, as it is allowed to keep the benefits of its productivity gains.

PSTN is an acronym for public switched telephone network.

Reseller is a company that engages in the subsequent sale or lease on a commercial basis, with or without adding value, of a distinct telecommunications service or distinct telecommunications facilities provided by a supplier generally on a wholesale basis.

Right-of-way is a form of easement. It enables a person to use a portion of land that is owned by another person in a particular way and for a limited purpose. For example, in a telecommunications context, a right-of-way might enable a carrier to bury cable or erect support structures on land owned by a third party.

SchoolNet is a partnership of the federal government with the provincial and territorial governments, the education community and the private sector, which promotes the effective use of ICT in learning.

SDR (software-defined radio) is a radio communication system that uses software to control a variety of modulation techniques, wide-band or narrow-band operation, communications security functions and waveform requirements of current and evolving standards over a broad frequency range.

SMS (short messaging service) is a wireless messaging service that permits the transmission of a short text message from and/or to a digital mobile telephone, regardless of whether the transmission originates and terminates on a mobile telephone, originates on a mobile telephone and terminates on a computer, or originates on a computer and terminates on a telephone.

Spam generally refers to any bulk commercial email sent without the express consent of recipients.

Spectrum refers to radio-frequency hertzian waves used as a transmission medium for cellular radio, radiopaging, satellite communication, over-the-air broadcasting and other services.

Spectrum cap limits the amount of spectrum that any single company is allowed to acquire.

Spectrum refarming is a process of redeploying spectrum from existing users and reallocating it to others.

Spyware is software that collects information about a computer user and may also modify the operation of a user's computer without the user's knowledge or consent.

Sunk costs are expenditures that have been incurred and cannot be recovered if operations are discontinued.

Supra-normal profits are profits that are larger than would be expected on average for an investment of comparable risk in a competitive financial market.

Switch is typically an intelligent electronic device capable of forwarding voice and data communications traffic from a multitude of sources to various destinations.

TAPAC (Terminal Attachment Program Advisory Committee) is an advisory committee that recommends to Industry Canada technical requirements and procedures for attaching terminal equipment to the facilities of telecommunications service providers.

TCA (Telecommunications Consumer Agency) is a proposed new "ombuds office" that would have the authority to resolve complaints from individual and small business retail customers; it is addressed in Chapter 6 of this report.

TCT (Telecommunications Competition Tribunal) is a proposed transitional tribunal that would address competition issues in the telecommunications sector; it is addressed in Chapter 4 of this report.

Terminal equipment is any fixed or mobile apparatus, including telephone handsets, private branch exchange (PBX) switching equipment, key and hybrid telephone systems and add-on devices.

TSP stands for telecommunications service provider.

U-CAN (Ubiquitous Canadian Access Network) is a proposed specific targeted government subsidy program; it is addressed in Chapter 8 of this report.

Upstream, in Internet access, is traffic originating at the customer end and travelling toward the service provider, possibly for transit to other points on the Internet.

UWB (ultra-wideband) is a wireless technology that can operate at very low-power density to communicate at high data rates over short distances using brief and rapid pulses of energy, as opposed to specific communications frequencies.

VoIP (voice over IP) is a software application that allows the use of IP packet networks, such as the Internet, to make ordinary (voice) telephone calls.

WDM (wavelength division multiplexing) equipment transmits several wavelengths of light simultaneously over a single fibre, allowing for extremely rapid broadband communication of data over long distances.

WiFi[®] is a limited-range wireless networking protocol based on the 802.11 family of standards. It uses spectrum in the 2.4 GHz range to exchange data at broadband speeds.

WiMAX is fixed wireless standard 802.16 set by the Institute of Electrical and Electronics Engineers (IEEE). It allows for long-range wireless communication at as much as 70 Mbps to over 50 kilometres, and can be used as a backbone Internet connection to rural areas.

XML (extensible markup language) is a general-purpose markup language for creating special-purpose markup languages, capable of describing many different kinds of data. Its primary purpose is to facilitate the sharing of data across different systems, particularly systems connected via the Internet.



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