TELUS

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2017 ANNUAL REPORT

Management's discussion and analysis

Caution regarding forward-looking statements

This document contains forward-looking statements about expected events and the financial and operating performance of TELUS Corporation. The terms *TELUS*, *the Company*, *we*, *us* and *our* refer to TELUS Corporation and, where the context of the narrative permits or requires, its subsidiaries.

Forward-looking statements include any statements that do not refer to historical facts. They include, but are not limited to, statements relating to our objectives and our strategies to achieve those objectives, our targets, outlook, updates, and our multi-year dividend growth program. Forward-looking statements are typically identified by the words *assumption*, *goal*, *guidance*, *objective*, *outlook*, *strategy*, *target* and other similar expressions, or future or conditional verbs such as *aim*, *anticipate*, *believe*, *could*, *expect*, *intend*, *may*, *plan*, *predict*, *seek*, *should*, *strive* and *will*.

By their nature, forward-looking statements are subject to inherent risks and uncertainties and are based on assumptions, including assumptions about future economic conditions and courses of action. These assumptions may ultimately prove to have been inaccurate and, as a result, our actual results or events may differ materially from expectations expressed in or implied by the forward-looking statements. Our general outlook and assumptions for 2018 are presented in *Section 9 General trends, outlook and assumptions* in this Management's discussion and analysis (MD&A).

Risks and uncertainties that could cause actual performance or events to differ materially from the forward-looking statements made herein and in other TELUS filings include, but are not limited to, the following:

- Competition including: our ability to continue to retain customers through an enhanced customer service experience, including through the deployment and operation of evolving wireless and wireline networks; the ability of industry competitors to successfully launch their respective platforms and to combine a mix of residential local voice over Internet protocol (VoIP), long distance, high-speed Internet access (HSIA) and, in some cases, wireless services under one bundled and/or discounted monthly rate, along with their existing broadcast or satellite-based TV services; the success of new products, new services and supporting systems, such as Internet of Things (IoT) services for Internet-connected devices; continued intense rivalry across all services among wireless and wireline telecommunications companies, cable-TV providers, other communications companies and over-the-top (OTT) services, which, among other things, places pressures on current and future average revenue per subscriber unit per month (ARPU), cost of acquisition, cost of retention and churn rate for all services, as do customer usage patterns, flat-rate pricing trends for voice and data, inclusive rate plans for voice and data and availability of Wi-Fi networks for data; mergers and acquisitions of industry competitors; pressures on high-speed Internet and TV ARPU and churn rate resulting from market conditions, government actions and customer usage patterns; residential and business network access line (NAL) losses; subscriber additions and retention volumes, and associated costs for wireless, TV and high-speed Internet services; and our ability to obtain and offer content on a timely basis across multiple devices on wireless and TV platforms at a reasonable cost.
- Technological substitution including: reduced utilization and increased commoditization of traditional wireline voice local and long distance services from impacts of OTT applications and wireless substitution, a declining overall market for paid TV services, including as a result of content piracy and signal theft and as a result of a rise in OTT direct to consumer video offerings and virtual multichannel video programming distribution platforms; the increasing number of households that have only wireless and/or Internet-based telephone services; potential wireless ARPU declines as a result of, among other factors, substitution to messaging and OTT applications; substitution to increasingly available Wi-Fi services; and disruptive technologies such as OTT IP services, including Network as a Service in the business market, that may displace or re-rate our existing data services.
- Technology including: subscriber demand for data that may challenge wireless networks and spectrum capacity levels in the future and may be accompanied by increases in delivery cost; our reliance on information technology and our need to streamline our legacy systems; technology options, evolution paths and roll-out plans for video distribution platforms and telecommunications networks (including broadband initiatives, such as fibre to the premises (FTTP), wireless small-cell deployment, 5G wireless and availability of resources and ability to build out adequate broadband capacity); our reliance on wireless network access agreements, which have facilitated our deployment of wireless technologies; choice of suppliers and those suppliers' ability to maintain and service their product lines, which could affect the success of upgrades to, and evolution of, technology that we offer; supplier concentration and market power for network equipment, TELUS TV and wireless handsets; the performance of wireless technology; our expected long-term need to acquire additional spectrum capacity through future spectrum auctions and from third parties to address increasing demand for data; deployment and operation of new wireline broadband networks at a reasonable cost and availability and success of new products and services to be rolled out on such networks; network reliability and change management; self-learning tools and automation that may change the way we interact with customers; and uncertainties around our strategy to replace certain legacy wireline networks, systems and services to reduce operating costs.
- Capital expenditure levels and potential outlays for spectrum licences in spectrum auctions or from third parties, due to: our broadband initiatives, including connecting more homes and businesses directly to fibre; our ongoing deployment of newer wireless technologies, including wireless small cells to improve coverage and capacity and prepare for a more efficient and timely evolution to 5G wireless services; utilizing acquired spectrum; investments in network resiliency and reliability; subscriber demand for data; evolving systems and business processes; implementing efficiency initiatives; supporting large complex deals; and future wireless spectrum auctions held by Innovation, Science and Economic Development Canada (ISED). Our capital expenditure levels could be impacted if we do not achieve our targeted operational and financial results.
- Regulatory decisions and developments including: the potential of government intervention to further increase wireless competition; the CRTC wireless wholesale services review, in which it was determined that the CRTC will regulate wholesale GSM-based domestic roaming rates and the setting of such rates charged to wireless service providers (WSPs); the Governor in Council's order to the CRTC to reconsider whether Wi-Fi networks should be considered a home network for WSPs seeking mandated roaming; future spectrum auctions and spectrum policy determinations, including the recently announced repurposing of 600 MHz spectrum (and including limitations on established wireless providers, proposed spectrum set-aside that favours certain carriers and other advantages provided to new and foreign participants, and the amount and cost of spectrum acquired); restrictions on the purchase, sale and transfer of spectrum licences; the impact of the CRTC's wireline wholesale services review, with a formal review of rates for wholesale FTTP access still to be commenced for TELUS; disputes with certain municipalities regarding rights-of-way

bylaws; and other potential threats to unitary federal regulatory authority over telecommunications, including provincial wireless legislation; the potential impacts of the CRTC's decision to require pro-rated refunds when customers terminate their services; the CRTC's proposed phase-out of the local service subsidy regime and corresponding establishment of a broadband funding regime to support the enhancement of high-speed Internet services focusing on underserved areas in Canada; the impact of the review of the Minister of Canadian Heritage's new Creative Canada policy framework announced on September 28, 2017; the CRTC's consultation and report on distribution models of the future; vertical integration in the broadcasting industry resulting in competitors owning broadcast content services, and timely and effective enforcement of related regulatory safeguards; the review of the *Copyright Act* scheduled to begin in early 2018; the federal government's stated intention to review the *Broadcasting Act* and *Telecommunications Act* as announced in the March 22, 2017 federal budget; TELUS' applications for renewal of its broadcasting distribution licences; the North American Free Trade Agreement renegotiation; and restrictions on non-Canadian ownership and control of TELUS Common Shares and the ongoing monitoring and compliance with such restrictions.

- Human resource matters including: recruitment, retention and appropriate training in a highly competitive industry, and the level of employee engagement.
- Operational performance and business combination risks including: our reliance on legacy systems and ability to implement and support new products and services and business operations in a timely manner; our ability to implement effective change management for system replacements and upgrades, process redesigns and business integrations (such as our ability to successfully integrate acquisitions, complete divestitures or establish partnerships in a timely manner, and realize expected strategic benefits, including those following compliance with any regulatory orders); the implementation of complex large enterprise deals that may be adversely impacted by available resources, system limitations and degree of co-operation from other service providers; our ability to successfully manage operations in foreign jurisdictions; information security and privacy breaches, including data loss or theft of data; intentional threats to our infrastructure and business operations; and real estate joint venture re-development risks.
- Business continuity events including: our ability to maintain customer service and operate our networks in the event of human error or human-caused threats, such as cyberattacks and equipment failures that could cause various degrees of network outages; supply chain disruptions; natural disaster threats; epidemics; pandemics; political instability in certain international locations; and the completeness and effectiveness of business continuity and disaster recovery plans and responses.
- Ability to successfully implement cost reduction initiatives and realize planned savings, net of restructuring and other costs, without losing customer service focus or negatively affecting business operations. Examples of these initiatives are: our operating efficiency and effectiveness program to drive improvements in financial results, including the future benefits of the immediately vesting transformative compensation initiative; business integrations; business product simplification; business process outsourcing; offshoring and reorganizations, including any full-time equivalent (FTE) employee reduction programs; procurement initiatives; and real estate rationalization. Additional revenue and cost efficiency and effectiveness initiatives will continue to be assessed and implemented.
- Financing and debt requirements including: our ability to carry out financing activities, and our ability to maintain investment grade credit ratings in the range of BBB+ or the equivalent.
- Ability to sustain our dividend growth program through 2019. This program may be affected by factors such as the competitive environment, economic performance in Canada, our earnings and free cash flow, our levels of capital expenditures and spectrum licence purchases, acquisitions, the management of our capital structure, and regulatory decisions and developments. Quarterly dividend decisions are subject to assessment and determination by our Board of Directors (Board) based on the Company's financial position and outlook. Shares may be purchased under our normal course issuer bid (NCIB) when and if we consider it opportunistic, based on the Company's financial position and outlook, and the market price of TELUS shares. There can be no assurance that our dividend growth program or any NCIB will be maintained, not changed and/or completed through 2019.
- Taxation matters including: interpretation of complex domestic and foreign tax laws by the tax authorities that may differ from our interpretations; the timing of income and deductions, such as tax depreciation and operating expenses; changes in tax laws, including tax rates; tax expenses being materially different than anticipated, including the taxability of income and deductibility of tax attributes; elimination of income tax deferrals through the use of different tax year-ends for operating partnerships and corporate partners; and tax authorities adopting more aggressive auditing practices, for example, tax reassessments or adverse court decisions impacting the tax payable by us.
- Litigation and legal matters including: our ability to successfully respond to investigations and regulatory proceedings; our ability to defend against existing and potential claims and lawsuits, including intellectual property infringement claims and class actions based on consumer claims, data, privacy or security breaches and secondary market liability; and the complexity of legal compliance in domestic and foreign jurisdictions, including compliance with anti-bribery and foreign corrupt practices laws.
- Health, safety and the environment including: lost employee work time resulting from illness or injury, public concerns related to radio frequency emissions, environmental issues affecting our business including climate change, waste and waste recycling, risks relating to fuel systems on our properties, and changing government and public expectations regarding environmental matters and our responses.
- Economic growth and fluctuations including: the state of the economy in Canada, which may be influenced by economic and other developments outside of Canada, including potential outcomes of yet unknown policies and actions of foreign governments; future interest rates; inflation; unemployment levels; effects of fluctuating oil prices; effects of low business spending (such as reducing investments and cost structure); pension investment returns, funding and discount rates; and Canadian dollar: U.S. dollar exchange rates.

These risks are described in additional detail in *Section 9 General trends, outlook and assumptions* and *Section 10 Risks and risk management* in this MD&A. Those descriptions are incorporated by reference in this cautionary statement but are not intended to be a complete list of the risks that could affect the Company.

Many of these factors are beyond our control or our current expectations or knowledge. Additional risks and uncertainties not currently known to us or that we currently deem to be immaterial may also have a material adverse effect on our financial position, financial performance, cash flows, business or reputation. Except as otherwise indicated in this document, the forward-looking statements made herein do not reflect the potential impact of any non-recurring or special items or any mergers, acquisitions, dispositions or other business combinations or transactions that may be announced or that may occur after the date of this document.

Readers are cautioned not to place undue reliance on forward-looking statements. Forward-looking statements in this document describe our expectations and are based on our assumptions as at the date of this document and are subject to change after this date. Except as required by law, we disclaim any intention or obligation to update or revise any forward-looking statements.

This cautionary statement qualifies all of the forward-looking statements in this MD&A.

Review of Canada's cultural policies

On September 28, 2017, the Minister of Canadian Heritage announced a new policy framework for a Creative Canada. This policy framework focuses on 1) investing in Canadian creators and cultural entrepreneurs; 2) promoting discovery and distribution of Canadian content at home and globally; and 3) strengthening public broadcasting and support for local news. The Minister has indicated in her official speech unveiling this new policy framework that the federal government would not support any new levy on Internet service providers, similar to the levy on broadcasting distribution undertakings. As a result, this new policy framework is not expected to have any negative material impact on TELUS.

Review and modernizing of the Broadcasting Act and Telecommunications Act

In its budget announcement on March 22, 2017, the federal government recognized the impact of the digital age on Canada's media and broadcasting industries and indicated its intention to review and modernize the *Broadcasting Act* and the *Telecommunications Act*, looking specifically at issues relating to content creation in the digital age, net neutrality and cultural diversity. This announcement dovetails with CRTC consultations regarding distribution models of the future, described below. It is not expected to have any material negative impact on TELUS.

CRTC ordered to report back to federal government on distribution models of the future

On September 22, 2017, the Governor-in-Council (federal cabinet) issued an Order in Council pursuant to section 15 of the *Broadcasting Act* to request that the CRTC hold hearings and report on distribution models of the future and how Canadians will access programming. The deadline for the CRTC's report back to the federal government is June 1, 2018. On October 12, 2017, the CRTC launched a two-phase consultation process, which began with a written process on December 1, 2017. TELUS participated in the first phase, and will participate in the second phase by the February 13, 2018, deadline. While the CRTC's report to the federal government will likely form part of the record for the parallel review of the *Broadcasting Act* and *Telecommunications Act*, it is not expected to have any negative material impact on TELUS.

Review of the Copyright Act and Copyright Board

The *Copyright Act*'s mandated five-year review was due in 2017 and the process for review was announced in December 2017. Hearings are to be conducted by the Standing Committee for Industry, Science and Technology, in co-operation with the Standing Committee on Canadian Heritage, and are expected to begin in early 2018. The policy approach for copyright has traditionally been based on a balance of interests of creators and consumers. As a result, changes to the *Copyright Act* are not expected to have any negative material impact on TELUS.

North American Free Trade Agreement Negotiations

The Office of the United States Trade Representative has released its summary of objectives for the renegotiation of the North American Free Trade Agreement (NAFTA) between Canada, the United States and Mexico. The United States government has identified a number of items, including trade in services (including telecommunications services), digital trade in goods and services and cross-border data flows, intellectual property (including copyright) and competition policy, among others, as potential items for negotiation. The Government of Canada has since outlined Canada's 10 priorities for NAFTA renegotiation, none of which include detailed telecommunications or intellectual property objectives. On the issue of cultural exemptions, the Government of Canada has clearly stated that it is committed to maintaining the current exemption for the cultural industries found in NAFTA. NAFTA negotiations have begun and are ongoing. It remains unclear what issues will be negotiated, the outcome of negotiations, and the potential impact that the NAFTA negotiations may have on TELUS.

10 Risks and risk management

10.1 Overview

In the normal course of our business activities, we are exposed to both risks and opportunities. Risk oversight and management processes are integral elements of our risk governance and strategic planning efforts.

Board risk governance and oversight

We maintain strong risk governance and oversight practices, with risk oversight responsibilities as outlined in the Board's and the Board committees' terms of reference. The Board is responsible for ensuring the identification of material risks to our business and overseeing the implementation of appropriate systems and processes to identify, monitor and manage material risks.

In addition:

- Risks on the enterprise key risk profile are assigned for Board or committee oversight
- Board committees provide updates to the Board on risks overseen by those committees based on their respective terms of reference
- Board or Board committees may request risk briefings by our executive risk owners. The Vice-President, Risk Management and Chief Internal Auditor attends and/or receives a summary of these briefings.

Risk governance and culture

We have a strong risk governance culture across TELUS that starts with clear risk management leadership and transparent communications, supported by our Board and Executive Leadership Team. Accountability for the management of risks and reporting of risk information is clearly defined through our approach to risk governance. Training and awareness programs, appropriate resources and risk champions help to ensure we have the risk management competencies necessary to support effective decision-making across the organization. Ethics are integral to TELUS' risk governance culture and our code of ethics and conduct directs team members to meet the highest standards of integrity in business decisions and actions.

Responsibilities for risk management

We use a multi-step approach to manage risks, with responsibility shared across the organization. The first line of defence is executive and operating management, whose members have integrated risk management into core decision-making processes (including strategic planning processes) and day-to-day operations. We have risk management and compliance functions across the organization, including Finance, Legal,

Privacy, Security and Business Continuity offices, which form the second line of defence. These functions work collaboratively with management to monitor the design and operation of controls. Internal Audit is the third line of defence and provides independent assurance regarding the effectiveness and efficiency of risk management and controls across all aspects of the business.

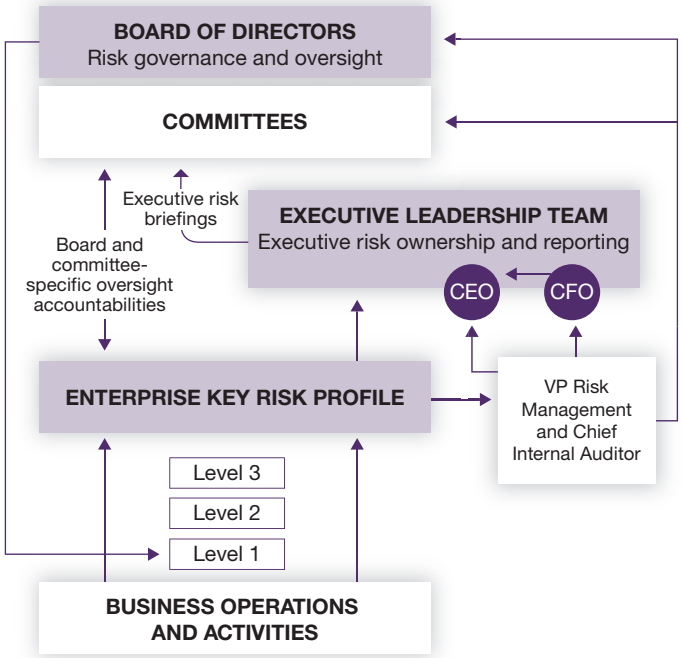
Definition of business risk

We define business risk as the degree of exposure associated with the achievement of key strategic, financial, organizational and process objectives in relation to the effectiveness and efficiency of operations, the reliability and integrity of financial reporting, compliance with laws, regulations, policies, procedures and contracts, and safeguarding of assets within an ethical organizational culture.

Our enterprise risks arise primarily from our business environment and are fundamentally linked to our strategies and business objectives. We strive to proactively mitigate our risk exposures through performance planning, business operational management and risk response strategies, which can include mitigating, transferring, retaining and/or avoiding risks. For example, residual exposure for certain risks is mitigated through insurance coverage, where we judge this to be efficient and commercially viable. We also mitigate risks through contract terms, as well as through contingency planning and other risk response strategies, as appropriate.

We strive to avoid taking on undue risk whenever possible and work to ensure alignment of risks with business strategies, objectives, values and risk tolerances.

TELUS ENTERPRISE RISK GOVERNANCE AND MANAGEMENT



Risk and control assessment process

We use a three-level enterprise risk and control assessment process that solicits and incorporates the input of team members from all areas of TELUS and enables us to track multi-year trends in key risks and the control environment across the organization.

THREE-LEVEL ENTERPRISE RISK AND CONTROL ASSESSMENT PROCESS	
Level one: Annual risk and control assessment	Annually, we undertake a comprehensive review that brings together interviews with executive leaders, information from our ongoing strategic planning process, consideration of recent internal and external audits, SOX (*Sarbanes-Oxley Act of 2002*) compliance and risk management activities, and an enterprise-wide risk and control environment assessment aligned with the COSO (Committee of Sponsoring Organizations of the Treadway Commission) enterprise risk management and internal control integrated frameworks. The assessment is widely distributed to our leadership team (including all executive vice-presidents and vice-presidents) and a random sample of management professional team members. More than 1,600 individuals participated in the assessment in 2017. Key enterprise risks are identified, defined and prioritized. Risk appetite and effectiveness of risk management integration are evaluated by risk category and fraud risks are considered. Executive-level risk owners are assigned for each key risk and Board and committee risk oversight responsibilities are defined in our Board Policy and Terms of Reference. Board members also complete an annual assessment in which they provide perspectives on our key risks and approach to enterprise risk management, and gauge our risk appetite by risk category. Results of the assessments are shared with senior management, our Board of Directors and the Audit Committee and inform the development of our risk-focused internal audit program, which is approved by the Audit Committee. Risk assessments are also incorporated into our strategic planning, operational risk management and performance management processes.
Level two: Quarterly risk assessment	We conduct quarterly risk assessment reviews with our executive-level risk owners and designated risk primes across all business units to capture and communicate changing business risks, assess perceptions on inherent and residual risk, identify key risk mitigation activities, and provide quarterly updates and assurance to the Audit Committee and other applicable Board committees.
Level three: Granular risk assessment	We conduct granular risk assessments for specific audit engagements and various risk management, strategic and operational initiatives (e.g. strategic planning, project and environmental management, safety, business continuity planning, network and IT vulnerability, and fraud and ethics). The results of the multiple risk assessments are evaluated, prioritized, updated and integrated into the key risk profile, policies and processes throughout the year.

Principal risks and uncertainties

The following subsections describe our principal risks and uncertainties and associated risk mitigation activities. The significance of these risks is such that they alone or in combination may have material impacts on our business operations, results, reputation and brand, as well as the valuation used by investment analysts to evaluate TELUS.

Although we believe the measures taken to mitigate risks described in each risk section below are reasonable, there can be no expectation or assurance that they will effectively mitigate or fully address the risks described or that new developments and risks will not materially affect our operations or financial results. Forward-looking statements in this section and elsewhere in this MD&A are based on the assumption that our risk mitigation measures will be effective. See *Caution regarding forward-looking statements*.

10.2 Competition

Customer experience

Our customers' loyalty and their likelihood to recommend TELUS are both dependent upon our ability to provide a service experience that meets or exceeds their expectations. Consequently, if our service experience or sales practices do not meet or exceed customer expectations, TELUS' reputation and brand could suffer, potentially resulting in higher rates of customer churn. Meanwhile, our profitability could be negatively impacted should customer net additions decrease and/or the costs to acquire and retain customers increase.

Risk mitigation: Our top corporate priority is putting customers first and earning our way to industry leadership in the likelihood to recommend from our clients. In addition, 55% of our scorecard is weighted to team member engagement and customer experience. Effective and fair compensation plans are part of achieving high team member engagement and include measures on how well we serve the customer – through the eyes of the customer. To enhance the customer experience, we continue to invest in our products and services, system and network reliability, team members and system and process improvements. Additionally, we endeavour to introduce innovative products and services, enhance our current services with integrated bundled offers and invest in customer-focused initiatives to bring greater transparency and simplicity to our customers, all in order to help differentiate our services from those of our competitors. With respect to sales practices at TELUS, the primary performance objective for TELUS call centre team members in sales functions is customer satisfaction levels. TELUS has a policy in place requiring that each customer enjoy any new TELUS service for a minimum of 60 days before the customer service representative involved is rewarded in any fashion. (See *Strategic imperatives* in *Section 2.2* and *Corporate priorities* in *Section 3*.)

Intense wireless competition is expected to continue

At the end of 2017, there were eight facilities-based wireless competitors operating in Canada, three national carriers, including TELUS, Rogers and Bell, along with five other regional carriers. (See *Competition overview* in *Section 4.1*.) Shaw Communications' Freedom Mobile will lead to increased competitive intensity in wireless services across major urban markets in B.C., Alberta and Ontario. In addition, the national carriers each operate three distinct brands to better compete across various customer segments. In late 2017, BCE launched its third brand, Lucky Mobile, a new service targeting the prepaid segment. Lucky Mobile will initially be available to customers in B.C., Alberta and Ontario and is expected to increase the competitive intensity for prepaid services.

Also in 2017, BCE completed its acquisition of Manitoba Telecom Services (MTS). The acquisition also included a sale of certain MTS wireless customers and retail locations to both TELUS and Xplornet Communications. As part of regulatory approval, BCE also divested certain wireless spectrum licences previously held by MTS to Xplornet.

All wireless competitors use various promotional offers to attract customers, including price discounting on both handsets and rate plans, large allotments of data, flat-rate pricing for voice and data, and bundling with other wireline services. Such promotional activity, as well as the sustained consumer appetite for higher-value smartphones, combined with the effect of the ongoing weakness in the Canadian dollar to U.S. dollar exchange rate, may continue to lead to higher costs of acquisition and retention. Meanwhile, more inclusive rate plans, including larger allotments of data for data sharing and international roaming, and substitution to increasingly available Wi-Fi networks could lead to pressure on data usage, resulting in pressure on average revenue per subscriber unit per month (ARPU) and customer churn. (See *Wireless trends and seasonality* in *Section 5.4*.) In addition, changes to the Wireless Code (see *Regulatory and federal government reviews* in *Section 9.4*), including the removal of unlocking fees and the requirement to sell all devices unlocked as of December 1, 2017, may increase the risk of customer churn.

We also expect increased competition based on the use of unlicensed spectrum to deliver higher-speed data services, such as the use of Wi-Fi networks to deliver entertainment to customers beyond the home. In addition, satellite operators such as Xplornet are augmenting their existing high-speed Internet access (HSIA) services by launching high-throughput satellites. See also *Section 9.4 Telecommunications industry regulatory developments and proceedings*.

Risk mitigation: Our 4G wireless networks cover approximately 99% of Canada's population, facilitated by network access agreements with Bell Canada and SaskTel. Wireless 4G technologies have enabled us to establish and maintain a strong position in smartphone and data device selection and expand roaming capability to more than 225 countries. Faster data download speeds provided by these technologies enable delivery of our Optik on the go service to mobile devices when customers are beyond the reach of Wi-Fi.

To compete more effectively in a variety of customer segments, we also offer two flanker brands, Koodo Mobile and Public Mobile. These two brands are in addition to our full-service TELUS brand. We believe that by leveraging our three brands through uniquely targeted value propositions and distinct distribution channels, including web-based channels, we are well positioned to compete with other wireless providers.

We continue our disciplined long-term strategy of investing in the growth areas of our Company and executing upon our customers first priority. We intend to continue to market and distribute innovative and differentiated wireless services; offer bundled wireless services (e.g. voice, text and data), including data sharing plans; invest in our extensive network and systems to support customer service; evolve technologies; invest in our distribution channels; and acquire the use of spectrum to facilitate service development and the expansion of our subscriber base, as well as to address the accelerating growth in demand for data usage. Our investments in our fibre-optic network are supporting our small-cell technology strategy to improve coverage, capacity and back-haul while preparing for a more efficient and timely evolution to a converged 5G network. In addition, we continue to implement operational effectiveness

initiatives to drive improvements in EBITDA. (See *Reorganizations and integration of acquisitions* in *Section 10.6*.)

Wireline voice and data competition

We expect competition to remain intense from traditional telephony, data, IP and information technology (IT) service providers, as well as from VoIP-focused competitors in both consumer and business markets. This competitive intensity, including the use of various promotional offers, also places pressures on ARPU, churn and costs of acquisition and retention.

The industry continues to transition from legacy voice infrastructure to IP telephony and Unified Communications, and from legacy data platforms to mature data platforms such as Ethernet, IP virtual private networks, multi-protocol label switching IP platforms and emerging software-defined networking solutions. These transitions continue to create both uncertainties and opportunities. Legacy data revenues and margins continue to decline, and this has been only partially offset by growth in demand and/or migration of customers to IP-based platforms. IP-based solutions are also subject to downward pricing pressure, lower margins and technological evolution.

Business

In the business wireline market, traditional facilities-based competitors continue to compete on the basis of network footprint and reliability, while over-the-top (OTT) providers emphasize price, flexibility and ease of use. Having made significant investments in voice over IP (VoIP), security and IT services for business, cable-based competitors are using price discounting to drive new customer acquisition and retention. In addition, larger cloud service providers, such as Amazon and Microsoft, leverage global scale to deliver low-cost data storage and cloud computing services, but lack the depth and breadth of capabilities to deliver integrated solutions, as well as the local implementation and adoption support required for customers to realize the full value of their investments in managed IT and security services. Rapidly advancing technologies, such as software-defined networks and virtualized network functions, enable the layering of new services in cloud-centric solutions. Evolving customer needs represent both a growth opportunity and a risk to TELUS' legacy voice and data revenue, as businesses seek to migrate fixed local line, long distance and/or voicemail services to the new cloud-centric market paradigm.

Consumer

In the consumer wireline market, cable-TV companies and other competitors continue to combine a mix of residential local VoIP, long distance, HSIA and, in some cases, wireless services under one bundled and/or discounted monthly rate, along with their existing broadcast or satellite-based TV services. In 2017, Shaw Communications, our primary cable competitor in Alberta and B.C., continued to offer deeply discounted promotional offers, including bundled Internet and BlueSky TV offers. BlueSky TV is Shaw's next-generation TV service, licensing the platform developed by Comcast, a U.S.-based cable company. In 2017, other Canadian cable companies, including Rogers Communications and Quebecor, have announced plans to license the Comcast TV platform. Rogers plans to begin rolling out its next-generation TV service in 2018, while Quebecor has not announced its roll-out schedule. In addition, Canadian cable competitors continue to increase the speed of their HSIA offerings and their roll-out of Wi-Fi services in metropolitan areas. To a lesser extent, other non-facilities-based competitors offer local and long distance VoIP services over the Internet and resell HSIA solutions. Technological innovation has resulted in a dramatic improvement in the performance and speed of satellite-based Internet access services and significantly enhanced their competiveness. Xplornet recently launched a high-throughput low orbit 4G broadband satellite, allowing it to provide high-speed Internet access services with speeds and performance comparable to or better than available wireline Internet access service. Erosion of our residential network access lines (NALs) is expected to continue due to this competition and ongoing technological substitution to wireless and VoIP. Legacy voice revenues are also expected to continue to decline. It is expected that competition in the consumer space will remain intense.

Risk mitigation: To improve our competitive position, we are making significant investments in our wireline broadband infrastructure, including connecting more homes and businesses directly to our gigabit-capable fibre-optic network. These investments meet customer demand for faster Internet service, including symmetrical download and upload speeds, expand the coverage of our high-speed Internet service and extend the coverage, capability and content lineup of our IP-based TV services, including Optik TV in B.C., Alberta and Eastern Quebec and Pik TV in Western Canada (see Broadcasting below). Additionally, we offer customers in underserved communities a fixed wireless Internet service over our LTE network, further expanding our broadband reach. Our broadband investments extend the reach and functionality of our business and healthcare solutions and will support a more efficient and timely evolution to a converged 5G network.

The provision of our IP TV services and service bundles helps us attract and pull through Internet subscriptions and mitigate residential NAL losses. TELUS Satellite TV service in B.C. and Alberta, made possible through an agreement with Bell Canada, complements our expanding IP TV service footprint and enables us to serve households where our IP TV service is not currently available. We also continue to invest in other product development initiatives, including connected home capabilities, such as home security and monitoring, and consumer health solutions. In 2017, we launched Pik TV, a new self-install TV service created to embrace the changing environment where content is increasingly available from OTT services. The new TV service provides a streamlined offer for customers who have ceased and/or never subscribed for TV services. Pik TV customers can access live TV and On Demand channels, as well as popular OTT services and certain other apps, and the Pik TV app lets customers watch certain channels on the go on their tablet or smartphone. Pik TV complements our full-service Optik TV service offering. We also continue to enhance our TV content capabilities through greater choice and flexibility by offering specific channel theme packs and channels on an individual basis, and increased multi-cultural content, as well as by embracing OTT solutions and facilitating those services directly through the set-top box, and enabling ultra-high definition 4K content.

We continue to add to our capabilities in the business market through prudent product development initiatives, including new advanced cloud-based solutions, a combination of acquisitions and partnerships, a focus on key vertical markets (public sector, healthcare, financial services, energy and telecommunications wholesale) and expansion of solution sets in the enterprise market, as well as our modular approach in the small and medium-sized business (SMB) market (including services such as TELUS Business Connect) and Internet of Things (IoT) solutions. In addition, we also have retention plans in place to mitigate the loss of business customers as their needs evolve. Through TELUS Health, we have leveraged our systems, proprietary solutions and third-party solutions to extend our footprint in healthcare and benefit from the investments in eHealth being made by governments. Additionally, through our business

process outsourcing services and our multi-site customer service centres, we enable experiences that realize efficiencies, cost savings and business growth for our customers.

Technological substitution may adversely affect market share, volume and pricing

We face technological substitution across all key business lines and market segments, including the consumer, SMB and large enterprise markets.

Technological advances have blurred the boundaries between broadcasting, Internet and telecommunications. (See *Section 10.3 Technology*.) Wireless carriers and cable-TV companies continue to expand their offerings and launch next-generation TV platforms, resulting in intensified competition for high-speed Internet services in residential and certain SMB markets, as well as for TV services and local access and long distance. OTT services such as Netflix, Amazon Prime Video and YouTube compete for share of viewership, which may accelerate the disconnection of TV services or affect subscriber and revenue growth in our TV and entertainment services. Wireless voice ARPU continues to decline as a result of, among other factors, substitution to messaging and OTT applications. We expect industry pressure from customer acquisition efforts and content distribution, costs and pricing to continue across most product and service categories and market segments.

Risk mitigation: Our IP TV and OTT multimedia initiatives provide the next generation of IP TV and, importantly, tie our OTT environment to one platform, enabling TELUS to be agile in the delivery of OTT services, such as Netflix and YouTube. They also facilitate cloud-based media delivery and ultimately everything on demand, on any device, on any network. Active monitoring of competitive developments and internal prototyping in product and geographic markets enable us to respond rapidly to competitor offers and leverage our full suite of integrated wireless and wireline solutions and national reach, and we also monitor global telecom carriers for their next-generation OTT offers. To mitigate losses in legacy services in our incumbent areas of B.C., Alberta and Eastern Quebec, investments are being made in our broadband networks, including our fibre-optic network, in order to increase speeds, improve network reliability, expand our reach and provide an industry-leading customer experience. We also continue to enhance and introduce innovative products and services, such as Pik TV, enable ultra-high definition 4K content, provide integrated bundled offers across our services, and invest in customer-focused initiatives to improve our customers' experience. The adoption of new technologies and products is pursued to improve the efficiency of our service offerings.

Broadcasting

We offer IP TV services to more than three million households and businesses in B.C., Alberta and Eastern Quebec, and we continue targeted roll-outs in new areas. Our TV services provide numerous interactivity and customization advantages over cable-TV and we have achieved significant market share with more than 1.0 million TV subscribers at December 31, 2017. However, there can be no assurance that subscriber growth rates will be maintained, or that we will achieve planned revenue growth and greater operating efficiency, in the context of a high level of industry market penetration, a declining overall market for paid-TV services and actions by our competitors and content suppliers. In addition, competition from OTT services, content piracy and signal theft could also affect subscriber and revenue growth by accelerating the disconnection of TV services or reducing spending on those services.

Risk mitigation: We have broadened the addressable market for our IP TV services through the deployment of advanced broadband technologies, including the continued expansion of our fibre-optic network to homes and businesses in communities across B.C., Alberta and Eastern Quebec. We continue to introduce new features and capabilities to our TV services, including OTT offerings such as Netflix and YouTube, and strengthen our leadership position in Western Canada in the number of high-definition linear channels, video-on-demand services and ultra-high definition 4K content.

Vertical integration into broadcast content ownership by competitors

We are not currently seeking to be a broadcast content owner, but some of our competitors own and continue to acquire broadcast content assets. Greater vertical integration could result in content being withheld from us or being made available to us at inflated prices or on unattractive terms.

Risk mitigation: Our strategy is to aggregate, integrate and make accessible content and applications for our customers' enjoyment, on a timely basis across multiple devices. We do not believe it is necessary to own content in order to make it accessible to customers on an economically attractive basis, provided there is timely and strict enforcement of the CRTC's regulatory vertical integration safeguards to prevent abusive practices by vertically integrated competitors.

We support a regime under the *Broadcasting Act* that ensures all Canadian consumers continue to have equitable access to broadcast content irrespective of the distributor or platform they choose. We continue to advocate for the timely and strict enforcement of the CRTC vertical integration safeguards and for further meaningful safeguards, as required. We also actively intervene in broadcast licence renewals of vertically integrated competitors. (See *Enforcement of vertical integration framework* in *Section 9.4 Telecommunications industry regulatory developments and proceedings*.)

10.3 Technology

Technology is a key enabler of our business; however, its evolution brings risks and uncertainties, as well as opportunities. We maintain short-term and long-term strategies to optimize our selection and timely use of technology while minimizing the associated costs, risks and uncertainties. Following are the main technology risks and uncertainties for TELUS and a description of how we proactively address them.

High demand for data challenges wireless networks and may be accompanied by increases in delivery cost

The demand for wireless data services continues to grow rapidly, driven by greater broadband penetration, growing personal connectivity and networking, increasing affordability and selection of smartphones and high-usage data devices, richer multimedia services and applications, IoT services (including machine-to-machine (M2M) data applications and other wearable technology), growth in cloud-based services and wireless price competition. Given the highly competitive wireless market in Canada, we expect that wireless data revenues will grow more slowly than demand for bandwidth. For example, according to the CRTC Communications Monitoring Report 2017, the average data usage per subscriber over mobile wireless networks increased by 25% in 2016, while the CRTC's measure of retail wireless data revenue increased by 9.4% over the same period. Rising data traffic levels and the fast pace of data device innovation present challenges to providing adequate capacity and maintaining high service levels.

Risk mitigation: Our ongoing investments in our 4G LTE network, including LTE advanced technology, as well as foundational investments in early 5G capabilities, allow us to manage data capacity demands by more effectively utilizing the spectrum we hold. We intend to implement further standards-based technologies that are ready for commercial deployment to these networks in order to provide higher-performance connectivity solutions. In addition, the evolution to LTE advanced technologies is supported by our investments in IP networks, IP/fibre back-haul to cell sites, including our small cells, and a software-upgradeable radio infrastructure. The LTE advanced expansion is expected to further increase network capacity and speed, reduce delivery costs per megabyte, enable richer multimedia applications and services, and deliver a superior subscriber experience. Our 4G LTE network covers 99% of Canada's population, up from 97% at the end of 2016. Meanwhile, our LTE advanced network covers 88% of the Canadian population, up from 74% at the end of 2016.

Mobile network infrastructure investment will increasingly be directed to systems based on network function virtualization (NFV) that offer greater capacity for computing and storage, higher resiliency, and more flexible software design. Our large-scale move to national, geographically distributed data centres that use generalized commercial off-the-shelf computing and storage solutions enables the utilization of broad-scale NFV and software-defined network technologies, which will allow us to virtualize much of our infrastructure and will also facilitate a common control plane for coordination of our virtualized and non-virtualized network assets. We architect the intelligence and content capabilities to reside at the edge of our mobility network close to our customers. The distributed smaller-scale computing power and storage deliver faster services better, while managing the traditional need to continually scale the IP/fibre core network infrastructure.

Rapid growth of wireless data volumes requires optimal and efficient utilization of our spectrum holdings, which have more than doubled through our 2014 and 2015 purchases of 700 MHz, AWS-3 and 2500 MHz spectrum licences and provide added capacity to mitigate risks from growing data traffic. We began deploying 700 MHz and 2500 MHz spectrum holdings and we plan to utilize other spectrum licences purchased in recent years in combination with unlicensed supplementary spectrum, as network and device ecosystems evolve. The spectrum licences previously used for our CDMA network are being repurposed for use with LTE technology. Our public Wi-Fi service increasingly integrates seamlessly with our 4G network and offloads data traffic from our wireless spectrum to a continually growing number of available Wi-Fi hotspots. Our deployment of small-cell technology, coupled with both licensed and licence-exempt spectrum technologies, further increases the efficient utilization of our spectrum holdings.

Roll-out and evolution of wireless broadband technologies and systems

As part of a natural 4G network progression, we are committed to LTE advanced, LTE and HSPA+ technology to support medium-term and long-term growth of mobile broadband services. Our business depends on the deployment of wireless technology. We began a staged decommissioning of our iDEN network in 2016, while continuing to support our Mike® private network customers. The repurposing of spectrum holdings must be managed appropriately to ensure optimal use of capital and resources. Overall, as wireless broadband technologies and systems evolve, there is the risk that our future capital expenditures may be higher as our ongoing technology investments could involve costs higher than those historically recorded.

Meanwhile, 5G technology is evolving rapidly and the world's first standards-based commercial launches are expected in 2019, while smartphones are generally expected to support 5G technology in late 2019 or 2020. It is expected that early 5G ecosystems will operate on three distinct spectrum bands: 3.5 GHz, millimetre wave (mmWave) spectrum (28 GHz and 37–40 GHz) and 600 MHz. Globally, 3.5 GHz spectrum is becoming the primary band for 5G mobile coverage. In Canada, 3.5 GHz was auctioned for fixed wireless access (FWA) between 2004 and 2009; it is currently not licensed for mobile applications and is largely held by Inukshuk (a joint venture owned by Bell and Rogers) in most urban markets. Innovation, Science and Economic Development Canada (ISED) is expected to claw back a portion of Inukshuk's 3.5 GHz spectrum holdings and re-auction it for flexible use (permitting the deployment for mobile applications, such as 5G). Depending on the amount of 3.5 GHz spectrum clawed back and re-auctioned, there is a risk that TELUS and the other regional operators could end up with less 3.5 GHz spectrum and would not be able to compete equally on network speeds and 5G capacity. Meanwhile, if ISED converts 3.5 GHz spectrum to mobile use before the 3.5 GHz auction concludes, current holders would have access to 5G spectrum before TELUS and could gain a time to market advantage.

With regard to the other spectrum bands, mmWave is expected to be used for very high data demand locations where customers are not only very close to the antenna but also have an unobstructed view of the transmitting site, as this spectrum is limited in propagation to hundreds of metres and can't cover large areas or penetrate obstacles or buildings. Services using this particular spectrum are expected to be an alternative to fibre to the home (FTTH) deployments. The 600 MHz spectrum band is being targeted for 5G in the United States, particularly by T-Mobile USA. The 600 MHz auction is expected to proceed in Canada in 2019; ISED's initial proposals for the 600 MHz auction rules included a set-aside of 30 MHz out of 70 MHz of 600 MHz spectrum for regional service providers. Depending on the final rules set by ISED, there is a risk that TELUS may not be able to provide 5G services on 600 MHz at the same level of capability as regional wireless carriers. Furthermore, there is no guarantee that rural Canada, which 600MHz propagation is best suited for, will realize the full potential of 5G networks.

Risk mitigation: Our practice is to continually optimize capital investments in order to ensure reasonable payback periods for generating positive cash flows from investments and flexibility in considering future technology evolutions. Some capital investments, such as wireless towers, leasehold improvements and power systems, are technology-neutral.

Our wireless networks evolve through software upgrades to support enhancements in systems based on the third generation partnership project (a project that unites seven telecommunications standard development organizations and provides their members with a stable environment to produce the reports and specifications that define third generation partnership technologies) and the Institute of Electrical and Electronics Engineers that improve performance, capacity and speed. We expect to be able to leverage the economies of scale and handset variety of the North American and global ecosystems.

Reciprocal network access agreements, principally with Bell Canada, have facilitated our deployment of wireless technologies for the benefit of our customers and provided the means for us to better manage our capital expenditures. These agreements are expected to provide ongoing cost savings, as well as the flexibility to invest in service differentiation and support systems.

We maintain close co-operation with our network technology suppliers and operator partners in order to influence and benefit from developments in LTE advanced, LTE, HSPA+ and Wi-Fi technologies.

In order to influence the timing, rules and policy regarding the 3.5 GHz spectrum, TELUS has highlighted to ISED the need for early, fair and timely access to 3.5 GHz for all operators in order to ensure that Canada stays at the top of the G8 countries in terms of wireless speeds and capabilities. TELUS is arguing for a fair treatment of this band and for ISED to accelerate its release for mobile use to all industry players while avoiding a head start for specific operators.

In its responses to the 600 MHz consultation, TELUS suggested alternate proposals, including a reduction of the set-aside from 30 MHz to 20 MHz (to create a fair opportunity for all operators to compete for 600 MHz spectrum for 5G), and the elimination of a spectrum set-aside in rural markets where TELUS has demonstrated a strong track record of deployment in contrast to regional players and their historical focus on only the largest urban markets.

In order to prepare for the future deployment of mmWave spectrum, TELUS has continued to conduct 5G trials in the mmWave spectrum bands. TELUS' trials have established a platform which will form the basis for evaluating TELUS' future 5G use cases and will help TELUS prepare for network planning in the mmWave bands. Additionally, TELUS will continue to collaborate with ISED, sharing trial results in discussions to help guide the regulator as it finalizes its decisions on establishing the policy and timing for the release of mmWave spectrum for 5G. The auction for mmWave spectrum is expected to occur in the 2020–2021 timeframe. Furthermore, TELUS investment in small cells will help TELUS densify its network and mitigate potential speed and capacity disadvantages created by 3.5 GHz availability, as well as improve future mmWave deployment feasibility, cost and time to market.

Disruptive technology

A paradigm shift with the consumer adoption of alternative technologies, such as video and voice OTT offerings (e.g. Netflix, FaceTime) and increasingly available Wi-Fi networks, has the potential to negatively affect TELUS revenue streams. For example, Wi-Fi networks are being used to deliver various entertainment services to customers beyond the home. OTT content providers are competing for a share of entertainment viewership. These factors, including increasing consumer demand for access to Wi-Fi outside of their home, and OTT services on demand, on any device, may drive increased churn rates for our wireless, TELUS TV and high-speed Internet services. (See *Intense wireless competition is expected to continue* in *Section 10.2 Competition* and *OTT services present challenges to network capacity and conventional business models* below.) Advanced self-learning technologies and automation will change the way we manage our operations and support customer experience innovation.

Risk mitigation: Since early 2014, we have worked with thousands of businesses and many major sports and entertainment venues to continue to expand our public Wi-Fi network. This public Wi-Fi service is part of our network strategy of deploying small cells that increasingly integrates seamlessly with our 4G wireless network, automatically shifting our smartphone customers to Wi-Fi and offloading data traffic from our wireless spectrum. Integrated public Wi-Fi infrastructure build activity naturally extends service and channel opportunities with small-medium enterprises and improves customers' likelihood-to-recommend. Integration of home Wi-Fi increases propensity for higher data usage on smartphones within and outside the home, while benefiting, in part, uptake of TELUS Internet service. Our customer service delivery sites experiment with different automation and self-learning tools to assess the impact such technology may have on customer experiences and operating efficiencies.

Supplier risks

Restructuring of vendors or discontinuance of products may affect our networks and services

We have relationships with a number of vendors, including large cloud service providers such as Amazon and Microsoft, which are important in supporting network and service evolution plans and delivery of services to our customers. Vendors may experience business difficulties, privacy and/or security incidents, restructure their operations, be consolidated with other suppliers, discontinue products or sell their operations or products to other vendors, which could affect the future development and support of products or services we use, and ultimately, the success of upgrades and evolution of technology that we offer our customers, such as TELUS TV. There can be no guarantee that the outcome of any particular vendor strategy will not affect the services that we provide to our customers, or that we will not incur additional costs to continue providing services. Certain customer needs and preferences may not be aligned with our vendor selection or product and service offering, which may result in limitations on growth or loss of existing business.

Supplier concentration and market power

The popularity of certain models of smartphones and tablets has resulted in a growing reliance on certain manufacturers, which may increase their market power and adversely affect our ability to purchase certain products at an affordable cost. In addition, owners of popular broadcasting content may raise their distribution charges and attempt to renegotiate broadcasting distribution agreements we have with them, which could adversely affect our entertainment service offerings and/or profitability. See also *Wireline* in *Section 9.2*, *Broadcasting-related issues* in *Section 9.4* and *Vertical integration into broadcast content ownership by competitors* in *Section 10.2*.

Risk mitigation: We consider possible vendor strategies and/or restructuring outcomes when planning for our future growth, as well as the maintenance and support of existing equipment and services. We have reasonable contingency plans for different scenarios, including working with multiple vendors, maintaining ongoing strong vendor relations with periodic reviews of vendor performance and working closely with other product and service users to influence vendors' product or service development plans. In addition, we regularly monitor the risk profile of our key vendors and review the applicable terms and conditions of our agreements to determine whether additional contractual safeguards are required, and promote our Supplier Code of Conduct based upon generally accepted standards of ethical business conduct.

In respect of supplier market power, we offer and promote alternative devices or programming content to provide greater choice for consumers and to help lessen our dependence on a few key suppliers.

Support systems will be increasingly critical to operational efficiency

We have a large number of interconnected operational and business support systems, and their complexity has been continually increasing, which can affect system stability and availability. The development and launch of a new service typically requires significant systems development and integration efforts. Effective management of all associated

development and ongoing operational costs is a significant factor in maintaining a competitive position and profit margins. As next-generation services are introduced, they must work with next-generation systems, frameworks and IT infrastructures, while being compatible with legacy services and support systems. There can be no assurance that any of our proposed IT systems or process change initiatives will be implemented successfully, that they will be implemented in accordance with anticipated timelines, or that sufficiently skilled personnel will be available to complete such initiatives. If we fail to implement and maintain appropriate IT systems on a timely basis, fail to create and maintain an effective governance and operating framework to support the management of staff, or fail to understand and streamline our significant number of legacy systems and proactively meet constantly evolving business requirements, any such failure could have an adverse effect on our business and financial performance.

Risk mitigation: In line with industry best practice, our approach is to separate business support systems (BSS) from operational support systems (OSS) and underlying network technology. Our aim is to decouple the introduction of new network technologies from the services we sell to customers so that both can evolve independently. This allows us to optimize network investments while limiting the impact on customer services, and also facilitates the introduction of new services. In addition, due to the maturing nature of telecommunications vendor software, we adopt industry standard software for BSS/OSS functions and avoid custom development where possible. This enables us to leverage vendor knowledge and industry practices acquired through the implementation of those platforms at numerous global telecommunications companies. We have established a next-generation BSS/OSS framework to ensure that, as new services and technologies are developed, they are part of the next-generation framework that will ease the retirement of legacy systems in accordance with TeleManagement Forum's next-generation operations systems and software program. We also continue to make significant investments in system resiliency and reliability in support of our ongoing customers first initiatives.

Evolving wired broadband access technology standards may outpace projected access infrastructure investment lifetimes

The technology standards for broadband access over copper loops to customer premises are evolving rapidly, enabling higher broadband access speeds. The evolution is fuelled by consumer demand for faster connectivity, the need to address growing competitor capabilities and offerings, the increasing use of OTT applications and the delivery of IP TV, all of which require greater bandwidth. In general, the evolution to higher broadband access speeds is achieved by deploying fibre-optic cable further out from the central office, thus shortening the copper loop portion of the access network, and by using faster modem technologies on the shortened copper loop. However, new access technologies are evolving faster than the historical investment cycle for access infrastructure. The introduction of these new technologies and the pace of adoption could result in requirements for additional capital funding not currently planned, as well as shorter estimated useful lives for certain existing infrastructure, which would increase depreciation and amortization expenses.

Risk mitigation: To advance our broadband network, we are actively deploying fibre-to-the-premises (FTTP) technologies across our incumbent footprint in B.C., Alberta and Eastern Quebec. FTTP technology supports significantly greater bandwidth, including symmetrical download and upload speeds. We also continue to invest in our fibre-to-the-neighbourhood (FTTN) technology to maintain our ability to support competitive services – most recently, the upgrade to VDSL2 and bonding technologies.

In addition, we actively monitor the development and carrier acceptance of competing proposed FTTx standards (such as FTTP and fibre-to-the-distribution point or FTTDp). One or more of these fibre-based solutions may be a more practical technology to deploy in brownfield neighbourhoods or multiple dwelling units than the current xDSL deployments on copper loops. We are exploring business models for financially viable deployment of fibre-based technologies in areas currently connected by copper.

The evolution of these access architectures and corresponding standards, enabled with quality of service standards and network traffic engineering, all support our strategy to deliver IP-based Internet, voice and video services over a common broadband access infrastructure.

IP-based telephony as a replacement for legacy analogue telephony is evolving and cost savings are uncertain

We continue to monitor the evolution of IP-based telephony technologies and service offerings, and we have developed a consumer solution for IP-based telephony through access to our broadband infrastructure. This solution is being deployed and is replacing legacy analogue telephone service in areas that are served by fibre-based facilities. The solution can be expanded to provide additional telephone services over the existing analogue service infrastructure and is designed to replace the current platform in use today. We are also in the process of deploying our next-generation IP telephony solution for business users, which is intended to replace existing business VoIP platforms, as well as addressing areas that are served through fibre access. We are deploying converged IP solutions in the consumer segment that deliver telephony, video and Internet access on the same broadband infrastructure. However, the exchange of information between service providers with different broadband infrastructures is still at an early stage.

Our long-term technology strategy is to move all services to IP to simplify our network, reduce costs, enable advanced solutions and converge wireless and wireline services. Pursuing this strategy fully would involve transitioning our standard telephone service offering to IP-based telephony and phasing out legacy analogue-based telephone service. We could support this strategy by discontinuing regular analogue telephone lines and using digital-only broadband access lines. However, digital-only broadband access may not be feasible or financially viable in many areas for some time, particularly in rural and remote areas. Accordingly, we expect to support both legacy and IP-based voice systems for some time and incur costs to maintain both systems. There is a risk that investments in IP-based voice systems may not be accompanied by a reduction in the costs of maintaining legacy voice systems. There is also the risk that IP-based access infrastructure and corresponding IP-based telephony platforms may not be in place in time to avoid the need for some reinvestment in traditional switching platforms to support the legacy public switched telephone network access base in certain areas, which could result in some investment in line adaptation in non-broadband central offices.

Risk mitigation: We continue to deploy residential IP-based voice technologies into fibre-based communities, and we work with vendors and the industry to assess the technical applicability and evolving cost profiles of proactively migrating legacy customers onto IP-based

platforms while striving to meet CRTC commitments and customer expectations. Our ongoing investments in advanced broadband network technologies, including FTTP, should enable a smoother future evolution of IP-based telephony. We are also working with manufacturers to optimize the operations, cost structure and life expectancy of analogue systems and solutions so that some of this infrastructure can be adapted to a point where it will form part of the overall evolution towards IP. Additionally, IP-based solutions that we are currently deploying are capable of supporting a wide range of customers and services, which helps limit our exposure to any one market segment. Going forward, as our wireless services evolve, we will continue to assess the opportunity to further consolidate separate technologies into a single voice service environment. One example is the consolidation of our new IP-based consumer VoIP solution into the same platform that supports wireless telephony. We are looking at opportunities to rationalize our existing legacy voice infrastructure in order to manage costs. We are also working with our vendors and partners to reduce the cost structure of VoIP deployments.

Convergence in a common IP-based application environment for telephony, Internet and video is complex

The convergence of wireless and wireline services in a common IP-based application environment, delivered over a common IP-based network, provides opportunities for cost savings and for the rapid development of more advanced services that are also more flexible and easier to use. However, the transformation from separate systems to a common environment is very complex and could be accompanied by implementation errors, design issues and system instability.

Risk mitigation: We mitigate implementation risk through modular architectures, lab investments, employee trials, partnering with system integrators where appropriate, using hardware that is common to most other North American IP-based technology deployments and introducing virtualization technologies, where feasible. We are also active in a number of standards bodies, such as the Metro Ethernet Forum and IP Sphere, in order to help influence a new IP infrastructure strategy that leverages standards-based functionality, which could further simplify our networks.

Delivery of fibre-based facilities leveraged by IP telephony solutions is expensive and complex, with long implementation schedules

The delivery of fibre-based facilities to new communities and regions requires significant investment and planning, as well as long implementation schedules. This may rule it out as a viable alternative in communities where the legacy voice equipment requires immediate replacement. It may not be cost-effective to deliver fibre-optic network access to customers who subscribe only to home phone services, which would prevent full migration away from legacy technologies.

Risk mitigation: We mitigate schedule risk by continuing to maintain our legacy switching environments and striving to maintain the necessary technological expertise, access to replacement hardware and regular maintenance programs. We support delivery of IP telephony through a copper-based access facility by deploying line access gateway technology that connects our customers' generic equipment with the IP telephony platforms, which gives us a more cost-effective way to provide those customers with the reliability and enhanced capabilities of these solutions.

OTT services present challenges to network capacity and conventional business models

OTT services compete directly with traditional pay-TV, video and wireless and wireline voice and messaging services. OTT video services, in particular, have rapidly become the largest source of traffic on the North American Internet backbone. OTT service providers do not invest in, or own, networks and growth in their services presents Internet service providers (ISPs) and network owners with the challenge of preventing network congestion. While we have designed an IP-based network that has not experienced significant congestion problems through 2017, there can be no assurance that we will not experience such congestion in the future.

Risk mitigation: As additional OTT providers launch services and offer higher-resolution video over the Internet, we continue to make investments in our network to support greater capacity. We are also developing new responses and service offerings, such as more flexible data plans, to the challenges posed by the OTT providers. These investments include the ongoing build-out of our fibre-optic network, including multi-year investments to connect homes and businesses in B.C., Alberta and Eastern Quebec to our gigabit-capable network.

In addition, our IP TV offerings, including Optik TV and Pik TV, easily make popular OTT services accessible, by making them directly available through our TV offerings. For further discussion of our IP TV offerings, see *Wireline voice and data competition, Technological substitution may adversely affect market share, volume and pricing* and *Broadcasting* in *Section 10.2 Competition*.

Capital expenditure levels and potential future outlays for spectrum licences may be impacted by our operating and financial results, as well as our ability to carry out financing activities

Our capital expenditure levels are affected by our broadband initiatives, including connecting more homes and businesses directly to fibre; our ongoing deployment of newer wireless technologies such as 5G; utilizing newly acquired spectrum; investments in network resiliency and reliability; increasing subscriber demand for data; evolving systems and business processes; implementing efficiency initiatives; supporting large complex deals; and participation in future wireless spectrum auctions held by ISED. There can be no assurance that investments in capital assets and wireless spectrum licences will not be affected by future operating and financial results.

Risk mitigation: We carry out a number of unique initiatives each year that are aimed at improving our productivity and competitiveness. See *Reorganizations and integration of acquisitions* and *Implementation of large enterprise deals* in *Section 10.6*. For a discussion of financing risks and risk mitigation activities, see *Section 10.7 Financing, debt requirements and returning cash to shareholders*.

10.4 Regulatory matters

The regulatory regime under which we operate, including the laws, regulations, and decisions in regulatory proceedings and court cases, reviews, appeals, policy announcements, and other developments such as those described in *Section 9.4 Telecommunications industry regulatory developments and proceedings*, imposes conditions on the products and services that we provide and how we provide them.

The regulatory regime sets forth, among other matters, rates, terms and conditions for the provision of telecommunications services, licensing of broadcast services, licensing of spectrum and radio apparatus, and restrictions on ownership and control by non-Canadians.

Changes to our regulatory regime

Changes to the regulatory regime under which we operate, including changes to laws and regulations, could materially and adversely affect our business, results of operations, operating procedures and profitability. Such changes may not be anticipated or, where they are anticipated, our assessment of their impact on us and our business may not be accurate. While we are involved or intervene in proceedings, court cases or inquiries related to the application of the regulatory regime, such as those described in *Section 9.4 Telecommunications industry regulatory developments and proceedings*, there is no certainty that the positions that we advocate in such proceedings will be adopted or that our prediction of the likely outcomes of such proceedings will be accurate. Changes to our regulatory regime could increase our costs, restrict or impede the way we provide our services or manage our networks, or alter customer perceptions of our operations. The further regulation of our broadband, wireless and other activities and any related regulatory decisions could also restrict our ability to compete in the marketplace and limit the return we can expect to achieve on past and future investments in our networks. Additionally, through TELUS Health, we are entering into new areas such as virtual care and electronic prescriptions, which are less predictable from a regulatory regime perspective, can be regulated differently in certain provinces, and can be subject to political intervention.

Risk mitigation: TELUS attempts to mitigate regulatory risks through its participation in CRTC and federal government proceedings, legal proceedings impacting our operations and other relevant inquiries (such as those relating to the exclusive federal jurisdiction over telecommunications), as described in *Section 9.4 Telecommunications industry regulatory developments and proceedings*. See also *Vertical integration into broadcast content ownership by competitors* in *Section 10.2 Competition*.

Spectrum and compliance with licences

We require access to radio spectrum to operate our wireless business. The allocation and use of spectrum in Canada are governed by ISED, which establishes spectrum policies, determines spectrum auction frameworks, issues licences, and sets radio authorization conditions. While we believe that we are substantially in compliance with our radio authorization conditions, there can be no assurance that we will be found to comply with all radio authorization conditions, or if we are found not to be compliant, that a waiver will be granted or that the costs to be incurred to achieve compliance will not be significant. Any failure to comply with the radio authorization conditions could result in the revocation of our licences and/or the imposition of fines. Our ability to provide competitive services, including by improving our current services and offering new services on a timely basis, is also dependent on our ability to obtain access to new spectrum licences at a reasonable cost as they are made available. The revocation of, or a material limitation on, certain of our spectrum licences, or our failure to obtain access to new spectrum as it becomes available, could have a material adverse effect on our business, results of operations and financial condition by, among other things, negatively affecting both the quality and reliability of our network and service offering, and our brand, and thereby impeding our ability to attract or retain our customers.

Risk mitigation: We continue to strive to comply with all licence and renewal conditions and plan to participate in future wireless spectrum auctions. We continue to advocate to the federal government for fair spectrum auction rules so that mobile wireless companies like TELUS can bid on an equal footing with other competitors for spectrum blocks available at auction and can purchase spectrum licences available for sale from competitors. We continue to strongly advocate that preferential treatment is not required for advanced wireless services (AWS) entrants who are now part of established, sophisticated and well-financed cable companies.

Restrictions on non-Canadian ownership and control

We are subject to Canadian ownership and control restrictions, including restrictions on the ownership of our Common Shares by non-Canadians, imposed by the *Canadian Telecommunications Common Carrier Ownership and Control Regulations* under the *Telecommunications Act* (collectively, the Telecommunications Regulations) and the *Direction to the CRTC (Ineligibility of Non-Canadians)*, as ordered by the Governor in Council pursuant to the *Broadcasting Act* (the Broadcasting Direction). Although we believe that we are in compliance with the relevant legislation, there can be no assurance that a future CRTC or Canadian Heritage determination, or events beyond our control, will not result in us ceasing to be in compliance with the relevant legislation. If such a development were to occur, the ability of our subsidiaries to operate as Canadian carriers under the *Telecommunications Act* or to maintain, renew or secure licences under the *Radiocommunication Act* and the *Broadcasting Act* could be jeopardized and our business could be materially adversely affected.

Under the Telecommunications Regulations, to maintain our eligibility to operate certain of our subsidiaries that are deemed to be Canadian carriers by law, among other requirements, the level of non-Canadian ownership of TELUS Common Shares cannot exceed 33⅓% and we must not otherwise be controlled by non-Canadians. The Broadcasting Direction further provides for a qualified corporation, which can be a subsidiary corporation whose parent corporation or its directors do not exercise control or influence over any programming decisions of the subsidiary corporation where:

(a) Canadians beneficially own and control less than 80% of the issued and outstanding voting shares of the parent corporation and less than 80% of the votes
(b) the chief executive officer is a non-Canadian or
(c) less than 80% of the directors of the parent corporation are Canadian.

Risk mitigation: The Telecommunications Regulations give TELUS, which is a holding corporation of Canadian carriers, certain powers to monitor and control the level of non-Canadian ownership of our Common Shares. These powers have been incorporated into TELUS' Articles and were extended to ensure compliance under both the *Broadcasting Act* and the *Radiocommunication Act* (under which the requirements for Canadian ownership and control were subsequently cross-referenced to the *Telecommunications Act*). These powers include the right to: (i) refuse to register a transfer of Common Shares to a non-Canadian; (ii) require a non-Canadian to sell any Common Shares; and (iii) suspend the voting rights attached to the Common Shares held by non-Canadians in inverse order of registration. We have reasonable controls in place to monitor foreign ownership levels through a reservation and declaration system. On August 10, 2017, in response to levels of foreign ownership of shares exceeding 20% and in accordance with the Broadcasting Direction,

the TELUS Board of Directors appointed an independent programming committee to make all programming decisions relating to its licensed broadcasting undertakings.

10.5 Human resources

Employee retention, recruitment and engagement

Our success depends on the abilities, experience and engagement of our team members. The loss of key employees through attrition and retirement – or any deterioration in overall employee morale and engagement resulting from organizational changes, unresolved collective agreements or ongoing cost reduction initiatives – could have an adverse impact on our growth, business and profitability and our efforts to enhance the customer experience.

The level of employee engagement at TELUS continues to place our organization within the top 10% of all employers surveyed.

Risk mitigation: We aim to attract and retain key employees through both monetary and non-monetary approaches. Our compensation and benefits program is designed to support our high-performance culture and is both market-driven and performance-based. Where required, we implement targeted retention solutions for employees with talents that are scarce in the marketplace.

We also have a succession planning process to identify and develop employees for key management positions.

Additionally, we strive to continuously improve our employee engagement. We believe that our relatively strong employee engagement score continues to be influenced by our focus on the customer experience, our success in the marketplace and our social purpose. We plan to continue our focus on other non-monetary factors that are clearly aligned with engagement, including performance management, career opportunities, training and development, recognition, our Work Styles® program (e.g. facilitating working remotely from home or other alternative work locations), and our community volunteerism. See also *Section 10.10 Team member health, wellness and safety.*

10.6 Operational performance

Systems and processes

We have numerous complex systems and process change initiatives underway. There can be no assurance that the full complement of our various systems and process change initiatives, including those required to improve delivery of customer services and support management decision-making, will be successfully implemented or that funding and sufficiently skilled resources will be available to complete all key initiatives planned. There is risk that certain projects may be deferred or cancelled and the expected benefits of such projects may be deferred or unrealized. Moreover, any ineffectiveness in the change management required to protect our complex systems and limit service disruptions could adversely impact our customer service, operating performance and financial results. Additionally, ongoing acquisition and post-merger integration of various TELUS Health Services operations may carry short-term risks from operational continuity, competition and process governance perspectives.

Risk mitigation: TELUS has change management policies, processes and controls in place, based upon industry best practices. In general, we strive to ensure that system development and process change are prioritized, and we apply a project management approach to such changes that includes reasonable risk identification and contingency planning, scope and change control, and resource and quality management. We also generally complete reasonable functional, performance and revenue assurance testing, as well as capturing and using any lessons learned. Where a change involves major system and process conversions, we often move our business continuity planning and emergency management operations centre to a heightened state of readiness in advance of the change.

Reorganizations and integration of acquisitions

We carry out a number of unique operational consolidation, cost reduction and rationalization initiatives each year that are aimed at improving our productivity and competitiveness. Examples of these initiatives include operational effectiveness programs to drive improvements in EBITDA, including business integrations; business process outsourcing; offshoring and reorganizations, including any full-time equivalent (FTE) employee reduction programs; procurement initiatives; and real estate rationalization. We may record significant cash and non-cash restructuring charges and other costs for such initiatives, which could adversely impact our operating results. There can be no assurance that all planned initiatives will be completed, or that such initiatives will provide the expected benefits or will not have a negative impact on our customer service, work processes, employee engagement, operating performance and financial results. Additional revenue and operational effectiveness initiatives will continue to be assessed and implemented, as required.

Post-acquisition activities include the review and alignment of accounting policies, corporate policies such as ethics and privacy policies, employee transfers and moves, information systems integration, optimization of service offerings and establishment of control over new operations. Such activities may not be conducted efficiently and effectively, which may negatively impact service levels, competitive position and financial results. There can be no assurance that we will be able to successfully and efficiently integrate acquisitions, complete divestitures or establish partnerships in a timely manner, and realize expected strategic benefits.

Risk mitigation: We focus on and manage organizational changes through a formalized business transformation function by leveraging the expertise, key learnings and effective practices developed in recent years during the implementation of mergers, business integrations and efficiency-related reorganizations. We also have formal senior executive level reviews of major competitive enhancement programs, with monthly updates from key business units and a comprehensive tracking program to ensure all initiatives are tracked and properly governed.

We have a post-merger integration (PMI) team that works in lockstep with acquiring business units and the acquired organizations, applying an integration model based on learnings from previous integrations, which enhances and accelerates the standardization of our business processes and is intended to preserve the unique qualities of each acquired operation.

During the year ended December 31, 2017, we completed a number of acquisitions. See *Highlights of 2017* in *Section 1.3* for further details.

Implementation of large enterprise deals

Large enterprise deals may be characterized by the need to anticipate, understand and respond to complex and multi-faceted customer-specific enterprise requirements, including customized systems and reporting requirements, service credits that lower revenues, and significant upfront expenses and capital expenditures required to implement the contracts.

There can be no assurance that service implementation will proceed as planned and expected efficiencies will be achieved, which may impact return on investment or projected margins. We may also be constrained by limits on available staff and system resources, by the level of co-operation from other service providers, which may in turn limit the number of large contracts that can be implemented concurrently in a given period and/or increase our costs related to such implementations.

Risk mitigation: We expect to continue being selective as to which new large contracts we will bid on and we continue to focus our efforts on the SMB market and mid market. We have a sales and bid governance process in place, which involves preparation, review and signoff of bids, with all of the related due diligence and authorizations. For each new large enterprise deal, we look to leverage existing systems and processes from previous contract wins while adding additional systems using a controlled methodology to form a new custom solution.

We also follow standard industry practices for project management, including executive and senior level governance and project oversight, commitment of appropriate project resources, tools and supporting processes, and proactive project-specific risk assessments and risk mitigation planning. As well, we conduct independent project reviews and internal audits of previous work to identify areas that may require additional focus and to identify any systemic issues and learnings in project implementations that could be shared among other future large enterprise deals.

Foreign operations

Our international operations present certain risks, which include: competition in foreign markets and industries such as business process and IT outsourcing; customer rights to terminate contracts on notice; infrastructure and security challenges; employee recruitment and retention; customer concentration; country-specific risks (such as differences in and changes to political, economic and social systems, including changes to legal and regulatory regimes); different taxation regimes; differences in type, exposure to and frequency of natural disasters; and foreign currency exchange fluctuations. There can be no assurance that international initiatives and risk mitigation efforts will provide the benefits and efficiencies expected, or that there will not be significant difficulties in combining different management and cultures, which could have a negative impact on operating and financial results. See also *Legal and ethical compliance* in *Section 10.9 Litigation and legal matters* and *Business continuity* below, which may affect our international operations.

Risk mitigation: Our strategy is to differentiate ourselves by focusing on the continued development of our team, as well as our culture of giving where we live. In addition, we invest in service development and process improvements, and we regularly survey customers for feedback and monitor quality of service metrics to ensure we proactively address our customers' concerns and exceed their expectations. Our sales focus on winning new clients, as well as our strategic business acquisitions, are diminishing our customer concentration risk on a continuing basis. In addition, in 2016, TELUS entered an agreement with Baring Private Equity Asia to acquire a 35% non-controlling interest in TELUS International (TI). Through this collaboration, TI is well positioned to leverage Baring Private Equity Asia's deep Asian markets presence and worldwide experience, and tap into its global network in order to further expand TI's operations. Our IT systems undergo a security and privacy assessment early in their development life cycle, where privacy and security controls are tested before any new systems are deployed. We use security technologies and adhere to certain standards, reviewing their effectiveness regularly to remain abreast of changes in the threat landscape. We make significant investments in support of our team members, including high-end workplace facilities, competitive benefits, ongoing training and development and recurring surveys to resolve areas of concern. We maintain a diverse base of operations, with facilities located in the North America, Asia, Europe and Central America. This diversity provides us with an opportunity to minimize country-specific risks and the ability to serve customers in multiple languages and in multiple time zones. It also provides us with network redundancy and contingency planning opportunities and the ability to divert operations in emergency situations. We continue to improve our international operations by updating operational practices to incorporate changes in regulation, best practices and customer expectations, including to our privacy, integrity, anti-bribery and procurement policies. We share best practices between international and domestic Canadian operations, as appropriate, and ensure that internal controls are implemented, tested, monitored and maintained. We also utilize foreign currency forward contracts, as well as hedge accounting on a limited basis, to mitigate currency risks (see *Currency risk* in *Section 7.9 Financial instruments, commitments and contingent liabilities*).

Data protection

We operate data centres and collect and manage data in our business and on behalf of our customers (including, in the case of TELUS Health, sensitive health information). Some of our efficiency initiatives rely on the offshoring of internal functions to our personnel in other countries or outsourcing to partners located in Canada and abroad. To be effective, these arrangements require us to allow personnel in other countries and domestic and foreign partners to have access to this data.

TELUS or its partners may be subject to software, equipment or other system malfunctions, or thefts or other unlawful acts that result in the unauthorized access to, or change, loss or destruction of, our data. There is a risk that such malfunctions or unlawful acts may compromise the privacy of individuals, including our customers, employees and suppliers. Despite our efforts to implement controls in domestic and offshore operations and at our partners' operations, unauthorized access to data could lead to data being lost, compromised or used for inappropriate purposes that could, in turn, result in financial loss (loss of subscribers or damage to our ability to attract new ones), harm our reputation and brand, expose us to claims of damages by customers and employees, and impact our customers' ability to maintain normal business operations and deliver critical services. Also see *Legal and ethical compliance* in *Section 10.9 Litigation and legal matters* and *Security* discussed below.

Risk mitigation: Certain new TELUS information technology systems undergo a security and privacy assessment early in their development life cycle, pursuant to which data that is to be used and/or collected is reviewed and classified, and design features such as audit, logging, encryption and access control restrictions are recommended, when applicable or possible. As part of TELUS' systems and software development life cycle and quality assurance processes, privacy and security controls are also tested before new systems are fully deployed.

Our Internet data centres (IDCs) have security threat detection and mitigation capabilities, and certain data centres and networks undergo yearly external independent third-party audits. A core component of that audit and certification process is the assessment of TELUS' logical, physical and policy-based security and privacy controls. Further, we have a vulnerability management program in place that monitors both our

Internet-facing and internal network and systems in order to track and mitigate vulnerabilities that may be detected.

To ensure the security of our customers' credit card transactions, we use security technologies such as encryption and segmentation, and we adhere to the principle of least privilege. We maintain these practices and review their effectiveness on a regular basis, giving consideration to industry standards and changes in the constantly evolving threat landscape.

Another component of our strategy is the stipulation that data generally resides in our facilities in Canada, with the deployment of infrastructure that supports partner connectivity to view our systems. We require partners and service providers to comply with privacy and security measures, including the reporting of any possible data-related threats. Personnel in other countries are provided with remote views of authorized data only and, where applicable, without the data being stored on local systems. These personnel are also required to comply with physical and process restrictions and participate in training designed to help prevent and detect unauthorized access to, or use of, our data.

Our strategy also includes reactive planning and business continuity planning processes that would be invoked in the event of a breach.

There can be no assurance that our controls will prove effective in all instances.

Security

We have a number of assets that are subject to intentional threats. These include physical assets that are subject to security risks such as vandalism and/or theft, including (but not limited to) distributive copper cable, corporate stores, network and telephone switch centres, and elements of corporate infrastructure, as well as IT systems and networks that we operate. The latter are subject to cyberattacks, which are intentional attempts to disrupt our business or gain unauthorized access to our information systems and networks for unlawful, unethical or improper purposes. Attacks may use a variety of techniques that include targeting individuals, the use of sophisticated malicious software and hardware or a combination of both to evade the technical and administrative safeguards that are in place (including firewalls, intrusion prevention systems, active monitoring, etc.). The risk and consequences of cyberattacks against our assets could surpass physical security risks and consequences because of the rapidly evolving nature and sophistication of these threats.

A successful disruption of our systems, networks and infrastructure or those of our third parties, vendors and partners, may prevent us from providing reliable service, impact the operations of our network or allow for the unauthorized interception, destruction, use or dissemination of our information or our customers' information. Such disruption or unauthorized access to information could cause us to lose customers or revenue, incur expenses, and experience reputational and goodwill damages. It could also subject us to litigation or governmental investigation and sanction. The costs of such events may include liability for information loss, as well as the costs of repairs to infrastructure and systems and any retention incentives offered to customers and business partners. Our insurance may not cover, or fully reimburse us for, these costs and losses.

Risk mitigation: We have implemented technical and administrative measures to mitigate the risk of threats, attacks and other disruptive events. Our security program addresses risk through a number of mechanisms, including implementing controls based on policies, standards and methodologies that are aligned with recognized industry frameworks and practices, monitoring of external activities by potential attackers, regular evaluation of our most important assets through our Crown Jewels program, the identification and regular re-evaluation of our known security risks, as well as regular review of our standards and policies to ensure they address current needs and threats, and business continuity and recovery planning processes that would be invoked in the event of a disruption.

We are building security into new initiatives through a standard secure-by-design process and methodology and constantly re-assessing our security posture through the full life cycle of our systems. Our technical capabilities help us identify security events, respond to possible threats and adjust our security posture appropriately. Additionally, our approach to cyber hygiene includes regular security vulnerability assessments and the prioritization and remediation of any identified issue through patching or other mechanisms. TELUS' Security Office works with law enforcement and other agencies to address the ongoing threat of cyberattacks and disruptions. While TELUS has reasonable physical security and cybersecurity programs in place, there can be no assurance that specific security incidents will not materially affect our operations and financial results.

Business continuity

We are a key provider of essential telecommunications infrastructure in Canada, along with operations and infrastructure in North America, Asia, Europe and Central America. Our networks, information technology, physical assets, team members, business functions, supply chain and business results may be materially impacted by exogenous threats, including:

- Natural hazards, such as forest fires, severe weather, earthquakes and other natural disasters
- Disruptions of critical infrastructure, such as power and telecommunications
- Human-caused threats, such as cyberattacks, labour disputes, theft, vandalism, sabotage, and political and civil unrest
- Public health threats, such as pandemics.

Risk mitigation: We have an enterprise-wide business continuity program, which is aligned with our corporate philosophy that includes ensuring the safety of our team members, minimizing the impacts of threats to our facilities and business operations, maintaining service to our customers and keeping our communities connected. These priorities have been demonstrated in a number of disruptive events in 2017, such as the British Columbia wildfires and the severe spring flooding in Ontario and Quebec.

Mitigation initiatives to address severe weather threats have been an increasing focus and we have operationalized enhanced severe weather monitoring, notification of key stakeholders, incident management processes and climate incident playbooks that leverage the learnings from prior events.

Our business continuity program aligns with the latest standards and business practices, and encompasses mitigation, preparedness, response, recovery and ongoing program improvements. The program focuses on mitigating the impacts of a disruption to our facilities, workforce, technology and supply chain. Although we have business continuity planning processes in place, there can be no assurance that specific events or a combination of events will not disrupt our operations or materially affect our financial results.

Ongoing risk-based optimization of our disaster recovery capabilities for our IT and telecommunications network assets is a key focus for preventing outages and reducing impacts to our operations and

customers. We are focused on driving closer alignment of IT and network recovery capabilities with business requirements. However, while disaster recovery is a focus for TELUS, not all of our systems have recovery and continuity capabilities.

Real estate joint ventures (TELUS Garden and TELUS Sky)
Risks associated with our real estate joint ventures include possible construction-related cost overruns, financing risks, reputational risks and the uncertainty of future demand, especially during market downturns. There can be no assurance that the real estate joint ventures will be completed on budget or on time, or will obtain lease commitments as planned. Accordingly, we are exposed to the risk of loss on our investment and loan amounts, and a potential inability to service debt payments should a project's business plan not be successfully realized. Additionally, reputational risks arise from the possibility that we may be unable to meet our stated commitments and/or that the quality of the development may not be consistent with TELUS brand expectations.

Risk mitigation: We have established joint ventures with partners experienced in large commercial and residential real estate projects to develop TELUS Garden (Westbank) in Vancouver and TELUS Sky (Westbank and Allied REIT) in Calgary. The TELUS Garden residential condominium project was substantially pre-sold prior to the commencement of construction, and all of the residential condominium units were transferred to the purchasers by the end of 2017. At the same time, lease commitments for the TELUS Garden office project represented 99% of leasable space, while the retail space within the TELUS Garden residential project was 99% leased.

For projects in progress, budget-overrun risks have been mitigated with fixed-price supply contracts (97% of TELUS Sky has had tenders approved and contracts awarded), expert project management oversight and insurance for certain risks. Costs for TELUS Sky continue to be consistent with the approved budget plan and we are applying the knowledge and experience gained on the TELUS Garden project to streamline and improve the cost-effectiveness of TELUS Sky.

In response to the current economic conditions in Calgary, the TELUS Sky partnership has taken a number of steps to better position the development for success, including: moving to a single-phase occupancy to delay the start dates of any potential office leases from the first quarter of 2018 to the first quarter of 2019; revising revenue projections and adjusting tenant inducements to align with current market expectations; and evaluating various approaches to adjusting the mix between office and residential, as well as creating a wider range of residential offerings to address current market demand.

10.7 Financing, debt requirements and returning cash to shareholders

Our business plans and growth could be negatively affected if existing financing is not sufficient to cover funding requirements
Risk factors, such as disruptions in capital markets, regulatory requirements for an increase in bank capitalization, a reduction in lending activity in general, or a reduction in the number of Canadian chartered banks as a result of reduced activity or consolidation, could reduce the availability of capital or increase the cost of such capital for investment grade corporate issuers, such as TELUS. External capital market conditions could potentially affect our ability to make strategic investments and meet ongoing capital funding requirements.

Risk mitigation: We may finance future capital requirements with internally generated funds, borrowings under the unutilized portion of our bank credit facilities, use of securitized trade receivables, use of commercial paper and/or the issuance of debt or equity securities. We have a shelf prospectus in effect until April 2018, under which we can offer up to $1.2 billion of debt or equity securities as of the date of this MD&A. We believe that our investment grade credit ratings, coupled with our efforts to maintain a constructive relationship with banks, investors and credit rating agencies, continue to provide reasonable access to capital markets.

To enable us to meet our financial objective of generally maintaining $1 billion of available liquidity, we have a $2.25 billion credit facility that expires on May 31, 2021 ($1.1 billion available at December 31, 2017), as well as availability under other bank credit facilities (see *Section 7.6 Credit facilities*). In addition, TELUS Communications Inc. (TCI) has an agreement with an arm's-length securitization trust under which it is able to sell an interest in certain of its trade receivables up to a maximum of $500 million, of which $400 million was available at December 31, 2017 (see *Section 7.7 Sale of trade receivables*).

Ability to refinance maturing debt
At December 31, 2017, our long-term debt was approximately $13.8 billion, with maturities in certain years from 2018 to 2048 (see the *Long-term debt principal maturities chart* in *Section 4.3*). We operate a commercial paper program (maximum of $1.4 billion) that currently permits access to low-cost funding. At December 31, 2017, we had $1,140 million of commercial paper outstanding, all of which was denominated in U.S. dollars (US$908 million). When we issue commercial paper, it must be refinanced on an ongoing basis in order to realize the cost savings relative to borrowing on the $2.25 billion credit facility. Capital market conditions may prohibit the roll-over of commercial paper at low rates.

Risk mitigation: We successfully completed a number of debt transactions in 2016 and 2017 (see *Section 7.4*). As a result, the average term to maturity of our long-term debt (excluding commercial paper and the revolving component of the TELUS International credit facility) was 10.7 years at December 31, 2017 (as compared to 10.4 years at December 31, 2016). Foreign currency forward contracts are used to manage currency risk arising from issuing commercial paper and long-term debt denominated in U.S. dollars (excluding the TELUS International credit facility). Our commercial paper program is fully backstopped by our $2.25 billion credit facility.

A reduction in TELUS credit ratings could affect our cost of capital and access to capital
Our cost of capital could increase and our access to capital could be affected by a reduction in the credit ratings of TELUS and/or TCI. There can be no assurance that we will maintain or improve current credit ratings.

Risk mitigation: We manage our capital structure and make adjustments to it in light of changes in economic conditions and the risk characteristics of our telecommunications infrastructure. We have financial policies in place that are reviewed annually and are intended to help maintain our existing investment grade credit ratings in the range of BBB+ or the equivalent. The four credit rating agencies that rate TELUS currently have ratings that are in line with this target. A reduction in our ratings, from the current BBB+ or equivalent, could result in a modest increase in our funding cost but would not be expected to impact our ability to access

the public debt markets. Access to our $2.25 billion credit facility would be maintained, even if our ratings were reduced to below BBB+.

Lower than planned free cash flow could constrain our ability to invest in operations, reduce debt or return capital to shareholders
While future free cash flow and sources of capital are expected to be sufficient to meet current requirements, our intention to return capital to shareholders could constrain our ability to invest in our operations for future growth. Funding of future spectrum licence purchases, funding of defined benefit pension plans and any increases in corporate income tax rates will reduce the after-tax cash flow otherwise available to return as capital to our shareholders. Should actual results differ from our expectations, there can be no assurance that we will not change our financing plans, including our intention to pay dividends according to our payout policy guideline and to maintain our multi-year dividend growth program. Shares may be purchased under our normal course issuer bid (NCIB) when and if we consider it opportunistic, based on the Company's financial position and outlook, and the market price of our Common Shares. For further detail on our multi-year dividend growth program and 2018 NCIB program, see *Section 4.3 Liquidity and capital resources*.

Risk mitigation: Our Board of Directors reviews and approves the dividend each quarter, based on a number of factors, including our financial position and outlook.

Financial instruments
Our financial instruments, and the nature of credit risks, liquidity risks and market risks that they may be subject to, are described in *Section 7.9 Financial instruments, commitments and contingent liabilities*.

10.8 Taxation matters

We are subject to the risk that income and commodity tax amounts, including tax expense, may be materially different than anticipated, and a general tendency by tax collection authorities to adopt more interpretations and aggressive auditing practices could adversely affect our financial condition and operating results
We collect and pay significant amounts of commodity taxes, such as goods and services taxes, harmonized sales taxes, provincial sales taxes, sales and use taxes and value-added taxes, to various tax authorities. As our operations are complex and the related tax interpretations, regulations, legislation and jurisprudence that pertain to our activities are subject to continual change and evolving interpretation, the final outcome of the taxation of many transactions is uncertain. Moreover, the implementation of new legislation in itself has its own complexities, including those of execution where multiple systems are involved, and interpretation of new rules as they apply to specific transactions, products and services.

We have significant current and deferred income tax assets and liabilities, income tax expenses and cash tax payments. Income tax amounts are based on our estimates, using accounting principles that recognize the benefit of income tax positions only when it is more likely than not that the ultimate determination of the tax treatment of a position will result in the related benefit being realized. The assessment of the likelihood and amount of income tax benefits, as well as the timing of realization of such amounts, can materially affect the determination of Net income or cash flows. We expect the income taxes computed at applicable statutory rates to range between 26.7% and 27.3% in 2018. These expectations can change as a result of changes in interpretations, regulations, legislation or jurisprudence.

The timing concerning the monetization of deferred income tax accounts is uncertain, as it is dependent on our future earnings and other events. The amounts of deferred income tax liabilities are also uncertain, as the amounts are based upon substantively enacted future income tax rates that were in effect at the time, which can be changed by tax authorities. As well, the amounts of cash tax payments and current and deferred income tax liabilities are also based upon our anticipated mix of revenues among the jurisdictions in which we operate, which is also subject to change.

The audit and review activities of tax authorities affect the ultimate determination of the actual amounts of commodity taxes payable or receivable, income taxes payable or receivable, deferred income tax liabilities, taxes on certain items included within capital and income tax expense. Therefore, there can be no assurance that taxes will be payable as anticipated and/or that the amount and timing of receipt or use of the tax-related assets will be as currently expected.

TELUS International operates in certain foreign jurisdictions, including Barbados, Bulgaria, El Salvador, Guatemala, India, Ireland, Philippines, Romania, the United Kingdom and the United States, which increases our exposure to multiple forms of taxation.

Generally, each jurisdiction has taxation peculiarities in the forms of taxation imposed (e.g. value-added tax, gross receipts tax, stamp and transfer tax, and income tax), legislation and tax treaties, where applicable, as well as currency and language differences. In addition, the telecommunications industry faces unique issues that lead to uncertainty in the application of tax laws and the division of tax between domestic and foreign jurisdictions. Furthermore, there has been a more intense political, media and tax authority focus on taxation, with an intent to enhance tax transparency and to address perceived tax abuses. Accordingly, our activities may increase our exposure to tax risks, from both a financial and a reputational perspective.

Risk mitigation: We follow a comprehensive tax conduct and risk management policy that was adopted by our Board. This policy outlines the principles underlying and guiding the roles of team members, their responsibilities and personal conduct, the method of conducting business in relation to tax law and the approaches to working relationships with external tax authorities and external advisors. This policy recognizes the requirement to comply with all relevant tax laws. The components necessary for the effective control and mitigation of tax risk are outlined in the policy, as is the delegation of authority to management on tax matters in accordance with Board and Audit Committee communication guidelines.

In giving effect to this policy, we maintain an internal Taxation department composed of professionals who stay current on domestic and foreign tax obligations, supplemented where appropriate with external advisors. This team reviews systems and process changes for compliance with applicable domestic and international taxation laws and regulations. Its members are also responsible for the specialized accounting required for income taxes.

Material transactions are reviewed by our Taxation department so that transactions of an unusual or non-recurring nature are assessed from multiple risk-based perspectives. Tax-related transaction risks are regularly communicated to, and reassessed by, our Taxation department as a check to initial exposure assessments. As a matter of regular practice, large transactions are reviewed by external tax advisors, while

other third-party advisors may also be engaged to express their views as to the potential for tax liability. We continue to review and monitor our activities so we can take action to comply with any related regulatory, legal and tax obligations. In some cases, we also engage external advisors to review TELUS' systems and processes for tax-related compliance. The advice provided and tax returns prepared by such advisors and counsel are reviewed for reasonableness by our internal taxation team.

10.9 Litigation and legal matters

Investigations, claims and lawsuits

Given TELUS' size, investigations, claims and lawsuits seeking damages and other relief are regularly threatened or pending against us. It is not currently possible for us to predict the outcome of such matters due to various factors, including: the preliminary nature of some claims; unproven damage theories and demands; incomplete factual records; the uncertain nature of legal theories and procedures and their resolution by the courts, at both the trial and the appellate levels; and the unpredictable nature of opposing parties and their demands. There can be no assurance that financial or operating results will not be negatively impacted by any of these factors.

Subject to the foregoing limitations, management is of the opinion, based upon legal assessments and the information presently available, that it is unlikely that any liability, to the extent not provided for through insurance or otherwise, would have a material effect on our financial position and the results of our operations, excepting the items disclosed herein and in *Note 29(a)* of the Consolidated financial statements.

Risk mitigation: We believe that we have in place reasonable policies and processes designed to enable compliance with legal and contractual obligations and reduce our exposure to, and the effect on us of, legal claims. We also maintain a team of legal professionals who advise on and manage risks related to claims and possible claims. See other risk mitigation steps discussed below.

Class actions

We are defendant in a number of certified and uncertified class actions. Over the past decade or more, we have observed a willingness on the part of claimants to launch class actions whereby a representative plaintiff seeks to pursue a legal claim on behalf of a large group of persons. The number of class actions filed against us has varied from year to year, with claimants continually looking to expand the matters in respect of which they file class actions. The adoption by governments of increasingly stringent consumer protection legislation may increase the number of class actions by creating new causes of action, or may decrease the number of class actions by improving clarity in the area of consumer marketing and contracting. A successful class action lawsuit, by its nature, could result in a sizable damage award that could negatively affect a defendant's financial or operating results. Certified and uncertified class actions against us are detailed in *Note 29(a)* of the Consolidated financial statements.

Assessment of class actions

We believe that we have good defences to each of these certified and uncertified class actions. Should the ultimate resolution of these actions differ from management's assessments and assumptions, a material adjustment to our financial position and the results of our operations could result. Management's assessments and assumptions include that reliable estimates of the exposure cannot be made for the majority of these class actions, considering continued uncertainty relating to the causes of action that may ultimately be pursued by the plaintiffs and certified by the courts and the nature of the damages that may be sought by the plaintiffs.

Risk mitigation: We are vigorously defending each of the class actions brought against TELUS or pursuing settlements that we deem to be beneficial for us. This includes opposing certification of uncertified class actions. Certification is a procedural step that determines whether a particular lawsuit may be prosecuted by a representative plaintiff on behalf of a class of individuals. Certification of a class action does not determine the merits of the claim, so that, if we were unsuccessful in defeating certification, the plaintiffs would still be required to prove the merits of their claims. We regularly assess our business practices and actively monitor class action developments in Canada and the United States in order to identify and minimize the risk of further class actions against us.

Civil liability in the secondary market

Like other Canadian public companies, we are subject to civil liability for misrepresentations in written disclosure and oral statements, and liability for fraud and market manipulation. Such legislation has been adopted in most provinces and territories.

Risk mitigation: We continually monitor legal developments and annually re-evaluate our disclosure practices and procedures. In addition, we periodically consult external advisors to review our disclosure practices and procedures and the extent to which they are documented. We have a corporate disclosure policy that restricts the role of Company spokespersons to specifically designated members of senior management, provides a protocol for communicating with investment analysts and investors, as well as oral presentations, and outlines the communication approach to issues, and our Disclosure Committee reviews key disclosure documents.

Legal and ethical compliance

We rely on our employees, officers, Board of Directors, key suppliers and other business partners to demonstrate behaviour consistent with applicable legal and ethical standards in all jurisdictions within which we operate, including, but not limited to, anti-bribery laws and regulations. Situations might occur where individuals intentionally or inadvertently do not adhere to our policies, applicable laws and regulations or contractual obligations. For instance, there could be cases in which the personal information of a TELUS customer or employee is collected, retained, used or disclosed in a manner that is not fully compliant with legislation, contractual obligations or TELUS policies. In the case of TELUS Health, personal information includes sensitive health information about individuals who are our customers or healthcare providers' end customers. In addition, there could be situations where compliance programs may not be fully adhered to, or where parties may have a different interpretation of the requirements of particular legislative provisions. With TELUS Health beginning to offer new services (such as virtual care and electronic prescription), including directly to consumers and in some cases using third-party partnerships, new risks arise across parameters such as dependence on third-party suppliers for legal compliance / compliance with medical professional standards, as well as the increased possibility of political intervention. These various situations may expose us to litigation and the possibility of damages, sanctions and fines, or of being

disqualified from bidding on contracts, and may negatively affect our financial or operating results, reputation and brand.

We continue to expand our activities into the United States and other countries. When operating in foreign jurisdictions, we are required to comply with local laws and regulations, which may differ substantially from Canadian laws and add to the regulatory, legal and tax exposures that we face.

Risk mitigation: Although we cannot predict outcomes with certainty, we believe that we have reasonable policies, controls and processes in place, and levels of awareness sufficient for proper compliance, and that these are having a positive effect on reducing risks. We have a comprehensive code of ethics and conduct for our employees, including officers and Board of Directors, and mandatory annual integrity training for employees, officers and identified contractors, as well as a toll-free EthicsLine for anonymous reporting by anyone who may have concerns or complaints to bring forward. In early 2012, we implemented our supplier code of conduct. In 2013, a specific anti-bribery and corruption policy was approved by the Board of Directors and communicated to team members. We conduct targeted mandatory training on anti-bribery and corruption, as well as on our business sales code of conduct, and we have mandatory annual training on privacy for all of our team members. We have a designated Chief Data and Trust Officer, whose role is to work across the enterprise to ensure that the business has appropriate processes and controls in place to facilitate legal compliance and to report on compliance to the Audit Committee. For example, as a proactive measure on privacy compliance, we require a privacy impact assessment to be carried out in the development stage for projects involving the use of customer or team member personal information.

We have an established review process to ensure that regulatory, legal and tax requirements are considered when pursuing opportunities outside of Canada. On an ongoing basis, we review our international structure, systems and processes to ensure that we mitigate regulatory, legal and tax risks, as our business activities expand outside Canada. We also engage with external counsel and advisors qualified in the relevant foreign jurisdictions to provide regulatory, legal and tax advice, as appropriate.

Defects in software and failures in data or transaction processing

We provide certain applications and managed services to our customers that involve the management, processing and/or storing of data, including sensitive personal medical records, and the transfer of funds. Software defects or failures in data or transaction processing could lead to substantial damage claims (including privacy and medical claims). For instance, a defect in a TELUS Health application could lead to personal injury or unauthorized access to personal information, while a failure in transaction processing could result in the transfer of funds to the wrong recipient.

Risk mitigation: We believe that we have in place reasonable policies, controls, processes (such as quality assurance programs in software development procedures) and contractual arrangements (such as disclaimers, indemnities and limitations of liability in most cases), as well as insurance coverage, to reduce our exposure to these types of legal claims. However, there can be no assurance that our processes will be followed by all team members at all times and that we have indemnities and limitations of liability covering all cases.

Intellectual property and proprietary rights

Technology evolution also brings additional legal risks and uncertainties. The intellectual property and proprietary rights of owners and developers of hardware, software, business processes and other technologies may be protected under statute, such as patent, copyright and industrial design legislation, or under common law, such as trade secrets. With the growth and development of technology-based industries, the value of these intellectual property and proprietary rights has increased. Significant damages may be awarded in intellectual property infringement claims advanced by rights holders. In addition, defendants may incur significant costs to defend such claims, and that possibility may prompt defendants to settle claims more readily, in part to mitigate those costs. Both of these factors may also encourage intellectual property rights holders to pursue infringement claims more aggressively.

Given the vast array of technologies and systems that we use to deliver products and services, and the rapid change and complexity of such technologies, disputes over intellectual property and proprietary rights can reasonably be expected to increase. As a user of technology, we receive communications from time to time, ranging from solicitations to demands and legal actions from third parties claiming ownership rights over intellectual property used by us and asking for settlement payments or licensing fees for the continued use of such intellectual property.

There can be no assurance that we will not be faced with other significant claims based on the alleged infringement of intellectual property rights, whether such claims are based on a legitimate dispute over the validity of the intellectual property rights or their infringement, or are advanced for the primary purpose of extracting a settlement. We may incur significant costs in defending TELUS against infringement claims, we may suffer significant damages and we could lose the right to use technologies that are essential to our operations should any infringement claim prove successful. As a developer of technology, TELUS Health depends on its ability to protect the proprietary aspects of its technology. The failure to do so adequately could materially affect our business. However, policing unauthorized use of our intellectual property may be difficult and costly.

Assessment of intellectual property claims

We believe that we have good defences to each of the intellectual property claims against us. Should the ultimate resolution of these claims differ from management's assessments and assumptions, a material adjustment to our financial position and the results of our operations could result. Management's assessments and assumptions include that reliable estimates of the exposure cannot be made for the majority of these claims considering continued uncertainty relating to the validity of the intellectual property at issue, whether or not technology used by us infringes upon that intellectual property, and the nature of the damages that will be sought by the plaintiffs.

Risk mitigation: We incorporate many technologies into our products and services. However, we are not primarily in the business of creating or inventing technology. In acquiring products and services from suppliers, it is our practice to seek and obtain contractual protections consistent with standard industry practices to help mitigate the risks of intellectual property infringements. Whenever creating or inventing technology (in the case of TELUS Health), it is the practice of TELUS Health to protect its intellectual property rights through litigation and other means.

10.10 Health, safety and environment

Team member health, wellness and safety

Lost work time resulting from team member illness or injury can negatively affect organizational productivity and employee benefit costs.

Risk mitigation: To support team members' overall well-being and to achieve a positive effect on absenteeism in the workplace, we support a holistic and proactive approach to team members' health that involves early intervention, health risk prevention, employee and family assistance, assessment and support services, and disability management. Our health and wellness strategy encourages our team members to develop optimal personal health through five dimensions of well-being, including physical, psychological, financial, social and environmental. To promote safe work practices, we offer training and orientation programs for team members, contractors and suppliers who access our facilities. There can be no assurance that these health, wellness and safety programs and practices will be effective in all situations.

Concerns related to radio frequency emissions from mobile phones and wireless towers

TELUS understands there are public concerns over potential impacts associated with low levels of non-ionizing radio frequency (RF) emissions from mobile phones and cell towers.

To address these concerns, TELUS looks to recognized experts with peer-reviewed findings, as well as government agencies, to provide guidance on potential risks. While a small number of epidemiological studies have revealed that exposure to RF fields might be linked to certain cancers, other studies have not supported this association. Furthermore, animal laboratory studies have found no evidence that RF fields are carcinogenic for laboratory rodents or cause damage to DNA.

The International Agency for Research on Cancer (IARC) and Health Canada have advised mobile phone users that they can take practical measures to reduce their exposure to RF emissions, such as limiting the length of cellphone calls, using hands-free devices and replacing cellphone calls with text messages. In addition, Health Canada encourages parents to take these same measures to reduce their children's RF emission exposure, since children are typically more sensitive to a variety of environmental agents. We also offer information and advice with respect to radio frequency emissions on our website at telus.com/support.

There can be no assurance that future studies, government regulations or public concerns about the health effects of RF emissions will not have an adverse effect on our business and prospects. For example, public concerns or government action could reduce subscriber growth and usage, and costs could increase as a result of the need to modify handsets, relocate wireless towers and address any incremental legal requirements and product liability lawsuits that might arise or have arisen. See *Class actions* in *Section 10.9 Litigation and legal matters*.

Risk mitigation: Canada's federal government is responsible for establishing safe limits for signal levels of radio devices. We are confident that the handsets and devices we sell, and our wireless towers and other associated devices, comply, in all material respects, with all applicable Canadian and U.S. government safety standards. We continue to monitor new published studies, government regulations and public concerns about the health impacts of RF exposure.

Concerns related to the environment

A detailed report of our environmental risk mitigation activities can be found in our annual sustainability report at telus.com/sustainability. Environmental issues affecting our business include:

Climate change

Failure of climate change mitigation and adaptation efforts is identified as one of the largest global risks in terms of impact, according to a World Economic Forum 2017 report. This could affect our business operations through potential disruption of our operations, damage to our infrastructure and the effects on the communities we serve caused by events such as those described in *Section 10.6 Operational performance*.

Waste and waste recycling; water consumption

Several areas of our operations raise environmental considerations, such as the handling and disposal of waste, electronic waste or other residual materials, appropriate management of our water use and the appropriate handling of materials and electronic equipment we use or sell. Aspects of our operations are subject to evolving and increasingly stringent federal, provincial and local environmental, health and safety laws and regulations. Such laws and regulations impose requirements with respect to matters such as the release of substances into the environment, corrective and remedial action concerning such releases, and the proper handling and management of substances, including wastes. Evolving public expectations and increasingly stringent laws and regulations could result in increased costs of compliance, while failure to recognize and adequately respond to the same could result in fines, regulatory scrutiny, or damage to our reputation and brand.

Fuel systems

We own or lease a large number of properties. We have fuel systems for backup power generation at some of these properties that enable us to provide reliable service, but they also pose an environmental risk. Because diesel spills or releases from these systems are infrequent, a significant portion of this risk is associated with sites contaminated by our earlier practices or by previous owners.

Failure to recognize and adequately respond to changing government and public expectations regarding environmental matters could result in fines, regulatory scrutiny or damage to our brand.

Risk mitigation: Our climate change strategy includes a mitigation component focusing on absolute energy use and carbon dioxide emission (CO_2e) equivalent reduction; an adaptation component focusing on business continuity planning and readiness for the potential effects of a changing climate on our operations (see *Section 10.6 Operational performance*); and an innovation component to help customers realize their climate change targets through product and service solutions. Our target is a 25% reduction in CO_2e from 2010 levels by 2020 and a 10% reduction in energy use over the same period. We are working to achieve these targets through a comprehensive energy management program focused on real estate transformation and consolidation (including leadership in energy and environmental design (LEED) standards certification), as well as network efficiency and technology upgrades. Greater use of video-conferencing and teleconferencing solutions in lieu of travel, decreasing the size and improving the efficiency of our fleet, and educating our team members are also helping us to reach our targets. We have also invested in renewable energy solutions and green building technology.

We have an e-waste management program that specifies approved recycling channels for both our external and internal electronic products.

We regularly examine our waste streams to identify new ways of reducing our impact on the environment through the diversion of waste from landfills, and we have corporate waste diversion targets focused on reducing our landfilled waste by the end of 2020. Our waste and recycling strategy is focused on education and awareness programs, as well as the expansion of recycling infrastructure in our administrative buildings.

Fuel systems risk is being addressed through a program to install containment and monitoring equipment at sites with systems of qualifying size. All of our remote sites, which rely on diesel generators for 24/7 power, have been fully upgraded with industry-leading spill containment. We are also leveraging our wireless network and using IoT technology to monitor these sites remotely. We have an ongoing program to assess and remediate contamination issues relating to historical activities and we disclose and report on these issues to regulatory bodies, as appropriate.

10.11 Economic growth and fluctuations

Slow or uneven economic growth and fluctuating oil prices may adversely affect us

We estimate economic growth in Canada will be approximately 2.2% in 2018 (see *Economic growth* in *Section 1.2*), but this growth may be influenced by developments outside of Canada. In addition, macroeconomic risks in Canada continue to include concerns about fluctuating oil prices and high levels of consumer and mortgage debt, which may cause consumers to reduce discretionary spending, even in a growing economy.

Economic uncertainty may cause consumers and business customers to delay new service purchases, reduce volumes of use, discontinue use of services or seek lower-priced alternatives from TELUS or from competitors. Weakness in the extractive energy sector beginning in 2015 has had a significant impact on Western Canada, including lower levels of investment and employment. This was partially mitigated by declining costs in non-extractive industries, such as manufacturing, which may experience growth if the U.S. dollar strengthens. The prolonged economic downturn in Western Canada improved significantly through 2017, with economic growth projected to be 3.9% in Alberta and 3.4% in British Columbia for 2017, as compared to 3.1% for Canada. Additionally, forecasts point to moderating but still positive growth in Western Canada in 2018. However, fluctuating oil prices, along with housing market and consumer debt risks in the Canadian economy, could adversely impact our customer growth, revenue, profitability and free cash flow, and could potentially require us to record impairments to the carrying value of our assets, including, but not limited to, our intangible assets with indefinite lives (spectrum licences and goodwill). Impairments to the carrying value of our assets would result in a charge to earnings and a reduction in owners' equity, but would not affect cash flow.

A further risk to the Canadian economy is the ongoing negotiation with the United States and Mexico around the North American Free Trade Agreement (NAFTA). While NAFTA negotiations occurred throughout most of 2017, recent reports suggest that there may be a stalemate over key issues, leaving the entire agreement at risk. If the NAFTA Agreement were to be terminated, this would result in significant trade-related risk in the Canadian economy.

In 2017, the Canadian dollar exchange rate with the U.S. dollar was volatile. Fluctuating oil prices, as well as the U.S. presidential administration's activities and certain U.S. monetary policy changes, may put further downward pressure on the Canadian dollar relative to the U.S. dollar in 2018. This will be particularly pronounced if the Federal Reserve hikes overnight rates at a faster pace than the Bank of Canada, as a growing interest rate differential would lift the U.S. dollar. Certain of our revenues, capital asset acquisitions and operating costs are denominated in U.S. dollars. Therefore, a continuing weakness in the Canadian dollar to U.S. dollar exchange rate may negatively impact our financial and operating results. Additionally, certain capital asset acquisitions and inventory purchases from outside Canada, although priced in Canadian dollars, may be negatively impacted by a continuing weakness in the Canadian dollar to U.S. dollar exchange rate.

Risk mitigation: While economic risks cannot be completely mitigated, our top priority of putting customers first and pursuing global leadership in the likelihood of our clients to recommend our products, services and people, support our efforts to acquire and retain customers. We will also support customers negatively affected by fluctuating oil prices with cost-effective solutions that help them realize efficiencies in their operations, and we will continue to pursue cost reduction and efficiency initiatives in our own business (see discussions in *Section 2.2 Strategic imperatives* and *Section 3 Corporate priorities*). See *Section 4.3 Liquidity and capital resources* for our capital structure financial policies and plans. Our foreign currency exchange risk management includes the use of foreign currency forward contracts and currency options to fix the exchange rates on U.S. dollar-denominated transactions, commitments, commercial paper and U.S. Dollar Notes, but does not eliminate this risk entirely.

Pension funding

Economic and capital market fluctuations could adversely affect the investment performance, funding and expense associated with the defined benefit pension plans that we sponsor. Our pension funding obligations are based on certain actuarial assumptions relating to expected plan asset returns, salary escalation, retirement ages, life expectancy, the performance of the financial markets and future interest rates.

The employee defined benefit pension plans, in aggregate, were in a $334 million deficit position at December 31, 2017 (as compared to a $79 million deficit position at the end of 2016). Our solvency position, as determined under the *Pension Benefits Standards Act, 1985*, was estimated to be a surplus of $255 million (as compared to a $253 million surplus position at the end of 2016). There can be no assurance that our pension expense and funding of our defined benefit pension plans will not increase in the future and thereby negatively impact earnings and/or cash flow. Defined benefit funding risks may arise if total pension liabilities exceed the total value of the respective plan assets in trust funds. Unfunded differences may arise from lower than expected investment returns, changes to mortality and other assumptions, reductions in the discount rate used to value pension liabilities, changes to statutory funding requirements and actuarial losses. While employee defined benefit pension plan re-measurements will cause fluctuations in other comprehensive income, these re-measurements will never be subsequently reclassified to income.

Risk mitigation: We seek to mitigate this risk through the application of policies and procedures designed to control investment risk and through ongoing monitoring of our funding position. Our best estimate of cash contributions to our defined benefit pension plans is $50 million in 2018 ($66 million in 2017).