EQUITY RESEARCH

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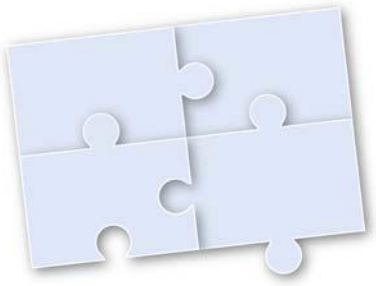
RBC Telecom Scenario Report

Fibre-to-the-home: Playing the long game



Introduction

In this report, we: (i) discuss why fibre-to-the-home (FTTH) matters for investors; (ii) identify the key factors that impact returns on FTTH; (iii) calculate the discounted payback period on FTTH; (iv) estimate the "blue-sky" cost of future FTTH for the telcos; and (v) show the valuation and ROIC sensitivity to various FTTH scenarios.

Key takeaways

- **FTTH is a delta that will impact returns for investors.** Over the next decade, we believe FTTH will play an increasingly important role in determining returns for investors given: (i) FTTH is a "leap-frog" technology; (ii) the Internet is changing the "own-the-home" game; (iii) the positive IPTV flow-through impact for the telcos will wane; (iv) a 2017-2019 OTT inflection period and Telecom Big Bang could pressure telco FTTN; (v) accelerated FTTH deployment will have meaningful financial and strategic implications for all operators; and (vi) these implications could be a potential catalyst for sector consolidation.
- **A long payback period under most scenarios.** We calculate a discounted payback period (DPP) of 11 years on an aerial build. Under our better and bad cases, the payback period extends from 8 to 18 years. Taking our better case and assuming a 100% buried build, the DPP increases from 8 years to 13 years highlighting the need for operators to expand the aerial footprint where possible.
- **"Blue-sky" cost of FTTH is not insignificant.** Factoring in basic assumptions on FTTH coverage (75% of total footprint), subscriber penetration (50% of FTTH footprint) and the percentage of aerial versus buried deployment in each footprint, we estimate the "blue-sky" future cost of FTTH deployment and loading could be $9B for BCE, $5B for TELUS and $500MM Manitoba Telecom.
- **Manageable valuation risk provided capex intensity remains stable.** Under our stable capex intensity scenario, the valuation upside under our favourable revenue and margin outcome is reasonably balanced versus the downside under our unfavourable outcome (+19% versus -9% on average). Under our elevated capex intensity scenario, the downside under our unfavourable outcome heavily outweighs the upside under our favourable outcome (-27% versus +2% on average).
- **For the moment, FTTH is neutral to our sector investment thesis.** Given manageable valuation risk under our stable capex intensity scenario, FTTH is neutral to our sector investment thesis. This view is predicated on BCE and TELUS maintaining stable capex intensity. While the most likely scenario in the near-term, over the medium-term, we see an increased risk of elevated capex intensity, particularly should our OTT inflection period and Telecom Big Bang play out. Should the telcos enter a phase of elevated capex intensity, we will have to weigh the incremental growth opportunity but negative FCF impact against the lower capex risk profile and what should be competitive all-IP platforms of the cablecos.

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Fibre-to-the-home: Playing the long game

The purpose of the RBC Telecom Scenario Report series is to examine potential scenarios within the Canadian telecom sector that could have implications for investors. As scenarios consider a range of outcomes with uncertain probabilities, our primary objective is to provide additional qualitative and quantitative analysis that can bring incremental perspective to investors.

In this report, we: (i) discuss why fibre-to-the-home (FTTH) matters for investors; (ii) identify the key factors that impact returns on FTTH; (iii) calculate the discounted payback period on FTTH; (iv) estimate the "blue-sky" cost of future FTTH for the telcos; and (v) show the valuation and ROIC sensitivity to various FTTH scenarios.

Key takeaways

FTTH is a delta that will impact returns for investors. Over the next decade, we believe FTTH will play an increasingly important role in determining returns for investors in the Canadian telecom sector given: (i) FTTH is a "leap-frog" technology and potentially one of the last in Canadian telecom; (ii) the Internet is increasingly changing the "own-the-home" game; (iii) the positive IPTV flow-through impact for the telcos will wane, potentially putting telco FTTN at a disadvantage to the cablecos; (iv) a 2017-2019 OTT inflection period and Telecom Big Bang could pressure telco FTTN; (v) accelerated FTTH deployment will have meaningful financial and strategic implications for all operators; and (vi) these implications could be a potential catalyst for sector consolidation.

Onus is on the operators to find the most "economically optimal path forward". We believe the deployment of FTTH is the only realistic option for BCE and TELUS given the role each operator plays in ensuring Canada has a modern telecom infrastructure and given current telecom policy in Canada, which leans heavily on having more than one competitive facilities-based operator in any one market. With the discussion moving beyond "if" to "how", we believe the onus is on each operator to find the most "economically optimal path forward" in order to maximize returns for investors.

A long payback period under most scenarios. Using the Bell Aliant cost experience (base case), we calculate a discounted payback period (DPP) of 11 years on an aerial build. Under our better and bad cases, the payback period extends from 8 to 18 years. Taking our better case and assuming a 100% buried build, the DPP increases from 8 years to 13 years highlighting the need for operators to expand the aerial footprint where possible.

Revenue uncertainty is the key return risk on FTTH, in our view. While near-term churn and ARPU benefits along with the potential for substantial longer-term cost savings are supportive of FTTH returns, we believe revenue uncertainty with respect to telephony and television substitution, wireline Internet substitution and Internet pricing power, is the key return risk.

"Blue-sky" cost of FTTH is not insignificant. Factoring in basic assumptions on FTTH coverage (75% of total footprint), subscriber penetration (50% of FTTH footprint) and the percentage of aerial versus buried deployment in each footprint, we estimate the "blue-sky" future cost of FTTH deployment and loading could be $9B for BCE, $5B for TELUS and $500MM Manitoba Telecom. These "blue-sky" estimates factor in average aerial and buried deployment costs of $600/premise and $1,750/premise, respectively, and an average cost per load of $900/premise.

Manageable valuation risk provided capex intensity remains stable. To understand how FTTH could impact the telco stocks, we examined the valuation and ROIC impact to various FTTH scenarios for each telco. Given the many approaches that can be taken to assess the FTTH impact, our approach is intended to address two important questions for investors: (i) if the telcos are successful in deploying FTTH at current capex intensity levels, what is the valuation and ROIC sensitivity to both favourable and unfavourable revenue and margin outcomes? (ii) if the telcos are not successful in deploying FTTH at current capex intensity levels but rather require an increase in capex intensity, what is the valuation sensitivity under this capex scenario to both favourable and unfavourable revenue and margin outcomes?

Under the stable capex intensity scenario: (i) the valuation upside under the favourable revenue and margin outcome is reasonably balanced compared to the downside under the unfavourable outcome (+19% versus -9% on average); and (ii) the differential in average ROIC between favourable and unfavourable outcomes is approximately 200bps-300bps. Under the elevated capex intensity scenario: (i) the downside under the unfavourable revenue and margin outcome heavily outweighs the upside under the favourable outcome (-27% versus +2% on average); and (ii) the differential in average ROIC between favourable and unfavourable outcomes is approximately 200bps-300bps. The differential in average ROIC between the stable capex intensity and elevated capex intensity scenarios is approximately 100bps.

Cost savings will be key to mitigating revenue weakness. We believe the outlook for traditional wireline revenue for the industry will increasingly be challenged. Wireline revenue weakness should have a manageable valuation impact provided wireline margins hold, if not improve, due to network efficiencies and mix. Should operators be able to generate substantial cost savings from FTTH (i.e., operating cost efficiencies, copper de-commissioning, economics of scope), the valuation and ROIC impact of wireline revenue weakness on FTTH returns should also be manageable. However, should the public market have a bias towards revenue growth as a key valuation driver of wireline multiples, and/or should a mismatch in the timing of wireline revenue pressure and cost savings result in temporary wireline margin pressure, valuation risk will increase.

For the moment, FTTH is neutral to our sector investment thesis

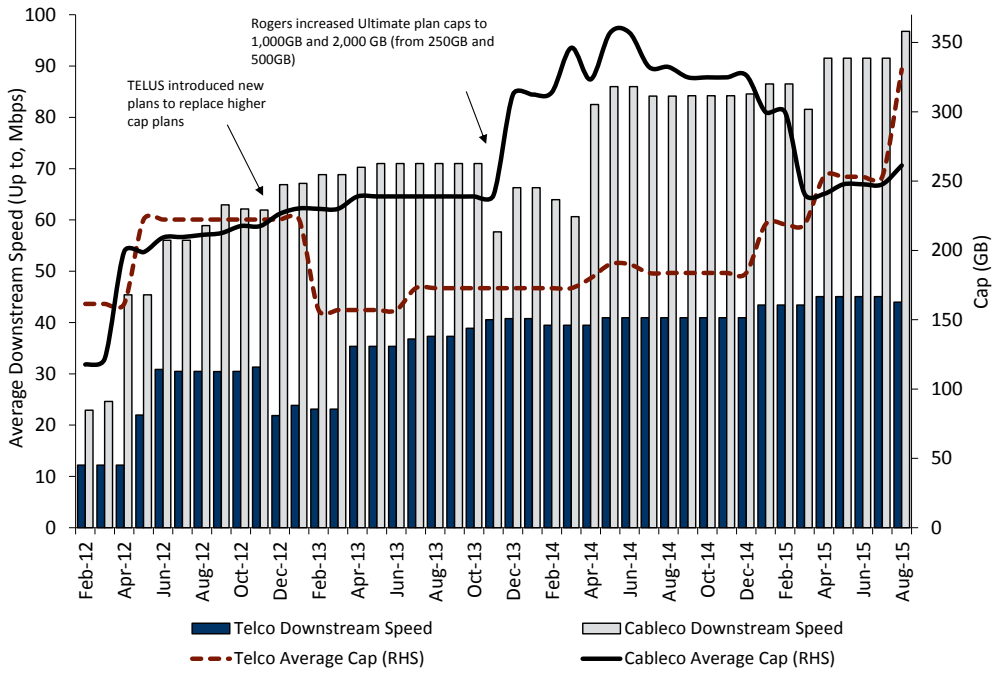
Given manageable valuation risk under our stable capex intensity scenario, accelerated FTTH deployment by BCE and TELUS is neutral to our sector investment thesis. This view is predicated on the ability for BCE and TELUS to maintain stable capex intensity. While largely consistent with current guidance from each company, we do believe stable capex intensity is the most likely scenario in the near-term. Over the medium-term, however, we see an increased risk of elevated capex intensity, particularly should our OTT inflection period and Telecom Big Bang play out. Should the telcos enter a phase of elevated capex intensity, we will have to weigh the incremental growth opportunity but negative FCF impact against the lower capex risk profile and what should be competitive all-IP platforms of the cablecos.

Big picture: Why FTTH matters now

FTTH has been on the radar screens of telecom investors since Verizon's FTTH deployment beginning in 2004 and Bell Aliant's accelerated FTTH deployment from 2009 through 2014. For investors, we believe FTTH opens up both investment opportunities and risks. Over the next decade, we believe FTTH will play an increasingly important role in determining returns for investors in the Canadian telecom sector, for the following reasons:

- **FTTH is the next (and potentially last) "leap-frog" technology in Canadian telecom.** The 1990s were characterized by minimal service overlap between low-growth telco monopolies and higher-growth cablecos against the backdrop of an emerging wireless sector. The 2000s and 2010s can be characterized by intense competition between the telcos and cablecos driven by new services (i.e., Internet) and new technologies (i.e., cable telephony and IPTV) against the backdrop of an explosion in wireless. During this period of competition, "asynchronous innovation", or the technological leap-frogging between the telcos and cablecos in network innovation, has enabled the Canadian operators to: (i) differentiate the network; (ii) establish temporary competitive advantages in the marketplace; (iii) yield market share gains; and (iv) generate returns on the capital deployed. With a growing Internet speed and capacity advantage for the cablecos and with IPTV penetration gains by the telcos entering the later innings, we see FTTH as the next "leap-frog" technology in Canadian telecom. To be clear, both the telcos and cablecos are deploying FTTH. However, the more limited Internet capability of telco FTTN against the backdrop of rising household data demand suggest the incentive for the telcos to more rapidly deploy FTTH is increasing.
  Exhibit 1 shows the cableco current speed advantage versus telco FTTN.

Exhibit 1: Cablecos maintain a speed advantage versus the telco FTTN

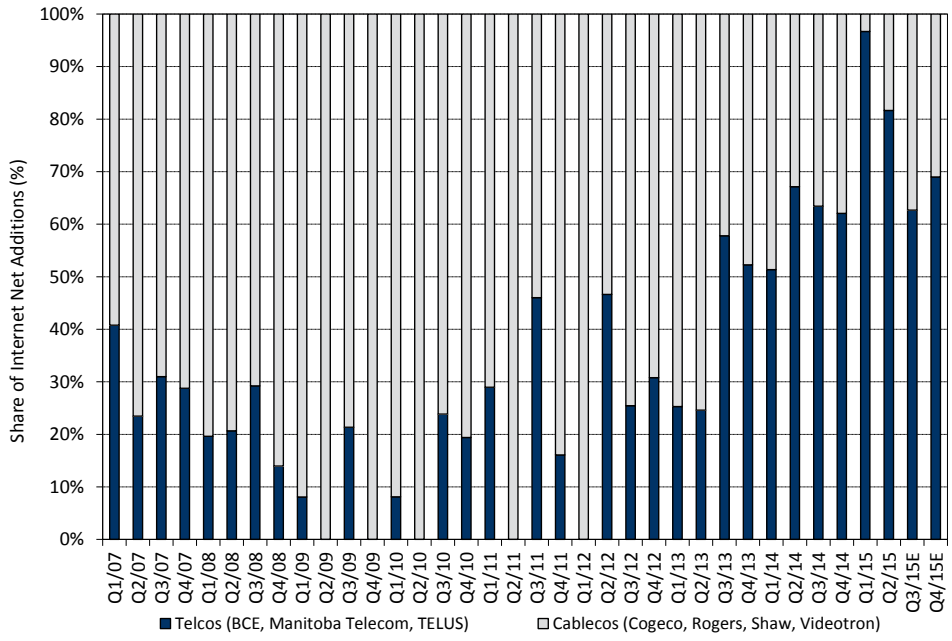


Source: Company websites

- **Internet is changing the "own the home" game.** Since network innovation has enabled both telcos and cablecos to offer voice, video and data services, the primary goal for all telecom operators has been to own the home by bundling telephony, television and Internet. Although the cablecos took an early lead in offering the triple play, the telcos are successfully clawing back share by leveraging a superior IPTV product to gain new Internet toeholds. While owning the home remains a strategic priority for both telcos and cablecos, we believe the game to own the home is changing in three ways: (i) the Internet now carries disproportionately greater importance within the bundle as telephony and television substitution accelerate; (ii) new IP-based in-home services are emerging, such as home security and smart home monitoring; and (iii) household demand for seamless in-home/out-of-home IP connectivity is increasing. As a result, a competitive Internet offering will be critical to maintaining residential market share, anchoring new growth opportunities and achieving seamless in-home/out-of-home IP connectivity.
- **Positive IPTV flow-through impact for the telcos will wane.** The rolling out of IPTV by the telcos has had a positive flow-through impact for Internet (and telephony) with a high proportion of households subscribing to double or triple-play offerings (BCE does not offer IPTV without the household taking Internet). Currently, this positive flow-through impact is enabling the telcos to re-capture Internet share. Once IPTV penetration reaches saturation, however, this positive flow-through impact on Internet will wane, putting telco Internet market share at risk given the Internet speed and capacity advantage for the cablecos. By the end of 2015E, we forecast IPTV penetration (% of FTTN/FTTH footprint) for BCE and TELUS of approximately 17% and 35%, respectively.

Exhibit 2 shows the the share of Internet subscriber net additions between the telcos and the cablecos for the companies in our coverage universe.

Exhibit 2: Positive IPTV flow-through impact for the telcos will wane



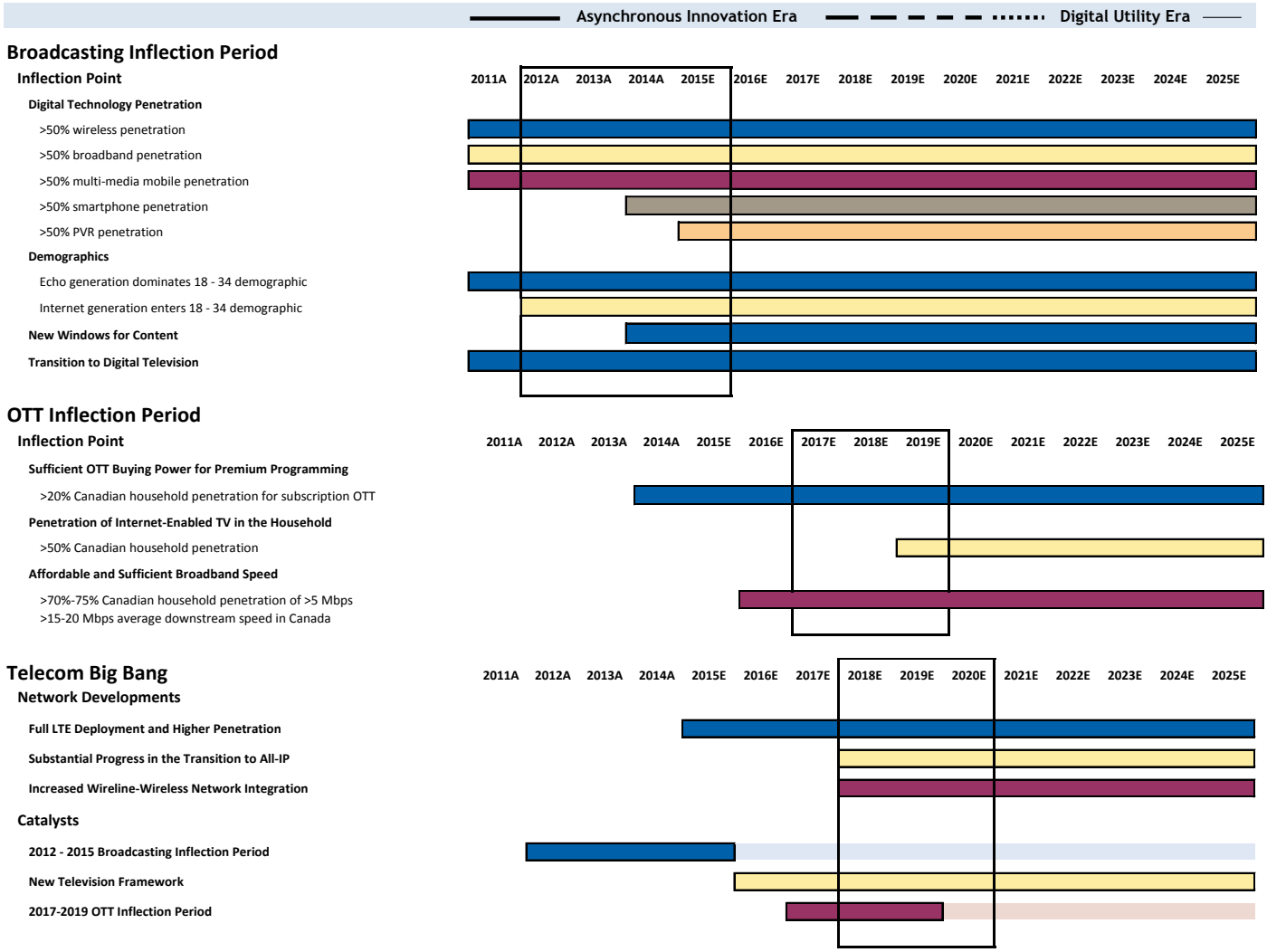
Note: Rogers Q4/14 Internet net additions exclude Source Cable Internet subscribers of 16k
Sources: Company reports, RBC Capital Markets estimates

- **An OTT inflection period and Telecom Big Bang could pressure telco FTTN.** In 2006, we identified a potential 2012-2015 broadcasting inflection period whereby the broadcasting business model in Canada would come under greater pressure. This inflection period is playing out. In 2011, we identified a potential 2017–2019 OTT inflection period whereby OTT services could become a more viable substitute for the current television system in Canada. This inflection period represents the collision of three important inflection points: (i) sufficient OTT buying power for premium television programming; (ii) a critical mass of Internet-enabled television households; and (iii) affordable and sufficient broadband speed to support OTT video consumption. In our view, the outcome of this inflection period will be accelerated OTT adoption and thus accelerated television substitution via cord-shaving or cord-cutting.

  Interestingly, our 2017-2019 OTT inflection period will coincide with full LTE deployment and high LTE penetration, the transition to all-IP for the cablecos, increased wireline-wireless network integration and a new unbundled television framework in Canada. Furthermore, Gartner forecasts that over 30% of all TVs manufactured in 2018 will be 4k with 4k streaming requiring a minimum download speed of 20 Mbps. Although these developments do not change the timing of our OTT inflection period, the likelihood that the rate at which video is unlocked from the current television ecosystem resembles more of a “big bang”, rather than an evolution, is rising. A big bang in OTT video would undoubtedly test the capacity of last-mile wireline networks in Canada. While higher Internet prices could help restore major supply-demand imbalances, the cableco speed advantage versus telco FTTN would likely be exploited putting the telcos at a structural disadvantage in the absence of FTTH.

  Exhibit 3 shows how our 2012-2015 broadcasting inflection period and our 2017–2019 OTT inflection period line up with our Telecom Big Bang.

Exhibit 3: Our 2012-2015 broadcasting inflection period, 2017–2019 OTT inflection period and Telecom Big Bang



Source: RBC Capital Markets

For detail on our 2012-2015 broadcasting inflection period, please see our August 23, 2006 Canadian Broadcasting report, *The Inflection Points Ahead*.

For detail on our potential 2017-2019 OTT inflection period, please see our April 15, 2011 RBC Media Spotlight report, *Pricing in a Potential OTT Inflection Period*.

For detail on how the current bundled television model may evolve in an era of cord-cutting and cord-shaving, please see our December 13, 2011 report, *Shelter from the Storm*.

For detail on a potential "big bang" of wireless and OTT video, please see our September 3, 2014 Telecom Scenario Report, *Rogers Communications: Big Bang Theory and the Five-Year Bull Case*.

- **Accelerated FTTH deployment will have meaningful financial and strategic implications for all operators.** Up until 2015, FTTH deployment in Canada was largely limited to multi-dwelling units (i.e., condos, apartments), new housing developments and select overbuild locations on a tactical/experimental basis, with two exceptions: (i) Bell's deployment of FTTH in Quebec City, which was completed in 2013; and (ii) Bell Aliant's accelerated FTTH deployment in Atlantic Canada and rural Ontario between 2009 and 2014. In early 2015, BCE formally announced a shift from FTTN to FTTH deployment with "virtually all" incremental fibre investment being FTTH. While not as publicly committed to FTTH as BCE is at the moment, TELUS too acknowledged that the scale of the company's FTTH deployment is increasing as was evidenced by the June announcement to commit to invest $1B in Edmonton over the next six years to cover 90% of homes and businesses with fibre.

  Accelerated FTTH deployment will have meaningful financial and strategic implications for all operators. Financially, the upfront cost of rolling out FTTH and subscriber loading is significant by almost any measure, and any unforeseen increase in capex and commensurate decrease in FCF, would likely depress telecom valuations. Strategically, the playing field could tilt in favour of FTTH where deployed, raising the risk of competitive imbalances in the market and irrational competitive responses, not unlike the initial $99/month competitive response to FTTH from Rogers in Newfoundland and New Brunswick in 2013. In addition, a too rapid a share shift to FTTH could trigger accelerated FTTH deployment (and/or DOCSIS 3.1 deployment) by the cablecos, raising the overall capital intensity for the industry and depressing telecom valuations. On the other side of the spectrum, delaying FTTH too long increases the risk of the telcos being caught off-guard by rising household data demand, or could open up the door for overbuilds by deeper-pocketed new entrants, such as Google.

  Given these financial and strategic implications, the ability for BCE and TELUS to deploy FTTH at a measured pace will be critical to minimizing any financial or strategic disruption.
- **A potential catalyst for sector consolidation.** The deployment of FTTH in Canada will require significant investment over the next decade. Equally important, generating adequate returns on the capital deployed will require the combination of new revenue streams and continuous cost-efficiencies. In our view, this FTTH roadmap will favour scale operators with the financial capability to absorb the significant investment required. Against this backdrop: (i) sub-scale regional operators, such as Cogeco Cable, Manitoba Telecom and Quebecor could come under increased financial pressure potentially succumbing to the larger consolidators; and (ii) substantial cost savings under a Rogers – Shaw or BCE – TELUS wireline combination could be increasingly seen as an effective way to increase scale, generate cost savings to finance FTTH deployment and/or preserve wireline economics should wireline revenue pressure accelerate.

FTTH economics 101

Moving beyond "if" to "how"

With a long payback on FTTH, many investors are questioning whether accelerating the deployment of fibre is the optimal use of excess capital for the telcos. Why not cede Internet victory to the cablecos in certain markets and ultimately exit residential wireline in these markets altogether? Arguably, FTTH will be the most costly "future proofing" of the telecom business in the history of the industry. Furthermore, where television and Internet market share and penetration gains helped finance and justify heavy investments in DSL/FTTN, what remains unclear is exactly what new services will help finance and justify the heavy investments in FTTH, particularly given rising telephony and television substitution.

Having said this, in our view, the deployment of FTTH is the only realistic option for BCE and TELUS given: (i) the size of BCE and TELUS and the role each company plays in ensuring Canada has a modern telecom infrastructure; and (ii) telecom policy, which leans heavily on having more than one competitive facilities-based operator in any one market. Therefore, we believe the FTTH debate should move beyond "if" to "how". Importantly for investors, how can the returns on FTTH be maximized, and how could FTTH impact the stocks?

Factors that could impact returns on FTTH

There are a number of factors that could impact returns on FTTH. For incumbent operators proceeding with FTTH, we believe the onus is on each operator to find the most "economically optimal path forward" in order to maximize returns for investors. The optimal path is likely to be different for each operator based on several revenue, cost, timing, regulatory and other considerations. Fortunately, FTTH can be deployed on a modular basis providing incumbent operators with some flexibility to modify deployment plans as conditions dictate.

Revenue considerations

- **Multiple revenue streams.** The ability to amortize the cost of FTTH across multiple revenue streams will be a key determinant of the type of returns generated on FTTH. Multiple revenue streams can include traditional triple-play households (telephony, television, Internet), new services such as home monitoring and smart home applications, businesses within traditional residential footprints and new verticals such as healthcare and education.
- **Rate of customer up-sell.** With FTTH, operators will look to up-sell households to higher-tiered packages helping to boost household ARPU. Early experience with FTTH by Verizon and Bell Aliant suggests a promising up-sell from the majority of FTTH customers. Adding to the appeal of FTTH is the symmetrical speed offered for both upload and download.
- **Lower customer churn.** Improved customer satisfaction among FTTH households can significantly lower churn, helping to improve the returns generated on FTTH. Early experience with FTTH by Verizon and Bell Aliant point to a notable churn reduction.
- **Rate of telephony and television substitution.** Among traditional triple-play households, steady telephony substitution and an expected increase in television substitution will reduce attach rates and could put downward pressure on traditional residential revenue. Offsetting this potential revenue drag for under-penetrated telcos should be continued IPTV market share gains.

- **Wireline Internet substitution.** Potential wireline Internet substitution with 5G wireless networks that are capable of delivering theoretical speeds of 1 Gbps could negatively impact FTTH returns. Despite this eventual risk, the commercial deployment of 5G wireless networks are not expected to begin until 2020 at the earliest, suggesting the rate of wireline Internet substitution will remain relatively benign over the next decade.
- **Internet pricing power.** A key determinant of the type of returns generated on FTTH will be the ability for telecom operators to increase Internet revenue by deploying a "more for more" Internet pricing strategy to offset telephony and television substitution. Internet pricing power will in part depend on the extent to which the tariffs around mandated wholesale Internet access to FTTH remain balanced.
- **Competitive response.** A key determinant of the type of returns generated on FTTH will also be the competitive response by the cablecos, including: (i) the timing around the upgrade to DOCSIS 3.1 which too can deliver 1 Gbps speeds (Comcast is expected to be the first major North American U.S. cableco to deploy DOCSIS 3.1 in late 2015/early 2016 with field testing now underway); (ii) the all-IP transition; (iii) the rate/nature of cableco FTTH builds; and (iv) the pricing environment. While the initial $99/month competitive response to FTTH from Rogers in Newfoundland and New Brunswick is disconcerting, we would expect both BCE and TELUS to remain relatively disciplined on FTTH pricing with the cablecos largely following suit in the majority of footprints.

Cost considerations

- **Aerial versus buried FTTH.** The ability to deploy FTTH using aerial infrastructure will be a key determinant of the type of returns generated on FTTH. Aerial FTTH can be up to 80% cheaper to deploy than buried FTTH (i.e., approximately $400-$700/premise for aerial FTTH deployment versus approximately $1,500-$2,000/premise for buried). In some instances, aerial footprints have some buried components which will increase the cost. To minimize the cost of FTTH, we expect each operator to aggressively explore all available infrastructure and installation options in order to maximize aerial deployment within the targeted total FTTH footprint. In addition to stringing fibre along traditional telephone and utility poles, innovative infrastructure options include sewer, water and gas pipes. Innovative installation options include the use of duct sharing, fibre blowers, bendable fibre, push-able fibre, new splicing techniques, cable de-coring, field boundaries and self-connection. From a topographical standpoint, FTTH deployment is often more complicated to deploy in hilly or mountainous terrain increasing the cost.
- **Realizing economies of scope on FTTH.** Over the next decade, we expect wireline and wireless networks to become increasingly integrated driven by: (i) rising demand for data-heavy, seamless in-home and out-of-home services; and (ii) a potentially greater reliance by operators on network efficiency to maintain profitability/EBITDA should wireline revenue come under pressure. From a consumer perspective, a more homogenous wireline-wireless network infrastructure would be capable of delivering unified communications of new converged voice, data, and video services, such as advanced TV Everywhere and other video offerings, WiFi-carrier integration and location-agnostic content and services.

  From an operator perspective, a FTTH network can: (i) can support multiple services as well as new services; (ii) provide better support for wireless backhaul, which will be an increasingly important component of the wireless network, particularly as wireless data speeds increase with LTE Advanced/5G; (iii) facilitate the integration of a small-cell network (i.e., micro, pico, WiFi, indoor) with a traditional macro network, which can lower the effective cost of FTTH by allocating a portion of the deployment cost to

wireless; (iii) serve both the consumer and business markets; and (iv) meet the demand as major verticals transition to digital, such as healthcare and education. More broadly, wireline-wireless network integration can realize cost savings from a uniform network operating centre, uniform network management, more efficient network expansion and densification, and the creation of a single content depository.

- **Leveraging the existing FTTN network.** The Canadian telcos have invested significantly in FTTN in recent years. Some of this investment can be used to support FTTH helping to lower the cost of FTTH deployment. In terms of overall economics, however, the incremental reduction in cost arising from a FTTH overbuild in a FTTN territory must be weighed against the revenue impact of cannibalizing existing FTTN subscribers (versus gaining entirely new subscribers with FTTH in non-FTTN territories).
- **Population density.** Population density by neighbourhood will be a key determinant of the type of returns generated on FTTH. The ability to amortize the relatively fixed cost of FTTH deployment in any given area over a higher number of premises naturally lowers the cost per premise and should improve returns (all else being equal). For less dense rural areas, FTTH is unlikely to payout and thus telecom operators are better off deploying wireless technologies, such as satellite, fixed-wireless and/or LTE/5G wireless in these areas of the total footprint.
- **FTTH-driven operating cost efficiencies.** The improved reliability of FTTH versus copper significantly reduces operating costs driven by: (i) a reduction in the volume of incoming customer calls and truck rolls, which represents the majority of variable costs for an operator (most fiber issues can be rectified at the central office); and (ii) lower network maintenance, in effect lowering or replacing the high cost of copper grooming. Currently, the average annual maintenance cost savings of FTTH is up to $100/home (US$110/home for Verizon). In addition, FTTH significantly reduces the cost per bit between the premise and network driven by new technologies, such as XGPON and WDM PON. In addition, the cost per bit is not linear in that as speed increases, the cost savings on a per bit basis increase at a higher rate.
- **Copper de-commissioning.** Copper de-commissioning represents a considerable cost-savings opportunity for the telcos as the network duplication resulting from the FTTH overbuild is eliminated. Copper de-commissioning is unlikely to occur until FTTH has penetrated approximately 80% of the central office footprint (+/- 10%), at which time the remaining residential, business and wholesale customers can be economically migrated. Until this threshold is reached, migrating existing telephony customers that are not also Internet and/or television customers is too cost prohibitive. In the U.S., Verizon commenced copper de-commissioning in 2011 with the goal of reducing costs, up-selling customers and improving customer satisfaction. The targeted territories for FTTH migration and subsequent copper de-commissioning have included “chronic” copper areas (i.e., requiring two or more truck rolls every six months), municipalities with very old copper (i.e., >60 years) and damaged areas (i.e., New York City following Hurricane Sandy).

Timing considerations

- **Market share imbalances.** Within our coverage universe, the Canadian telcos have an approximate 45% share of the residential and SMB Internet market while the Canadian cablecos have a 55% share. Given the track record in Canada of price discipline in a largely duopolistic market structure, we believe the long-term Internet market share expectation for each operator is 50%. With the cablecos currently offering approximately two times the Internet speed of that of the telcos, the telcos risk losing

Internet market share as household data demand rises, particularly post the peak of IPTV footprint expansion/penetration when the positive flow-through impact on Internet will wane. Given the importance of the Internet in owing the home, any material loss of Internet market share to the cablecos would likely trigger more rapid FTTH deployment by the telcos.

- **Household data demand.** The proliferation in OTT video is driving household data demand. According to the CRTC, the average household in 2013 downloaded 45 GB per month (up 58% YoY) with 31% of households subscribing to Internet speeds >16 Mbps in 2013 versus 27% in 2012 and 10% in 2011. While the percentage of households subscribing to Internet speeds > 50 Mbps was only 5% in 2013 (versus 4% in 2012 and less than 1% in 2011), this percentage is only going to increase. At the moment, the large cablecos can largely offer Internet speeds of up to 250 Mbps over 95% of the footprint, which currently compares to 50 Mbps within a typical telco FTTN footprint (although Internet speeds of 100 Mbps are available in some territories). Excluding FTTH, the rollout of DOCSIS 3.1 will further boost speeds for the cablecos, while additional FTTN overlays could further boost speeds for the telcos. Although telco FTTN for the moment is "good enough" to meet most household demand and thus remain competitive, any meaningful step-up in household data demand (i.e., driven by our 2017-2019 OTT inflection period and Telecom Big Bang) could result in a major cableco advantage in the absence of FTTH.
- **High attach rates.** The ability to amortize FTTH investment across multiple revenue streams is a key determinant of the type of returns generated on FTTH. Multiple revenue streams for traditional triple-play households naturally require high attach rates on telephony and television. Postponing FTTH deployment into the future risks realizing much lower attach rates as telephony and television substitution accelerate, which could impact the returns generated on FTTH. While monetizing the growth in data demand may help mitigate substitution effects, the desire to maximize revenue while triple-play demand is still meaningful could be justification for FTTH deployment sooner rather than later.
- **Municipal permitting and/or partnerships.** Deploying FTTH requires obtaining municipal permits, the timing of which can vary considerably by municipality. In some instances, municipal permitting can be a gating factor for FTTH deployment. On a positive note, we expect forward-looking municipalities to take more of a partnership approach with the telecom industry whereby significant upfront FTTH deployment commitments are made in exchange for municipal access.
- **The FTTH cost curve.** Over time, new technology has the potential to lower the FTTH cost curve with respect to both FTTH deployment (i.e., network and construction technique) and subscriber loading. For example, wireless technology in the home can reduce installation times for low-coaxed households, as well as lower the volume of service calls (by up to 25% for BCE). In addition, an increase in global FTTH deployments are lowering CPE costs.
- **Competition from new entrants.** In Canada, there are a number of small operators that have deployed fibre in some capacity, such as Beanfield, CityWest, FibreMedia, Novus, Vianet and Wightman Telecom (to name a few). While new entrant FTTH overbuilds will remain a competitive threat to incumbent telecom operators, we believe the threat is greatest from large U.S. companies such as Google. In the U.S., Google has or is deploying FTTH in three cities (Kansas City was completed in 2013 with FTTH being rolled out in Austin and Provo). Following a 2014 announcement that Google would work with 34 cities in 9 metropolitans to explore future FTTH expansion, Google has since

confirmed that FTTH will be deployed in Nashville, Charlotte, Raleigh/Durham, Atlanta and Salt Lake City, with Phoenix, Portland, San Antonio and San Jose under future consideration.

Regulatory and other considerations

- **Mandated access to FTTH.** On July 22, 2015, the CRTC released its decision following a review of wholesale wireline services. The wholesale services framework determines the rates, terms and conditions under which incumbent operators are required to provide network access to competitors. Surprisingly, the CRTC determined that mandated wholesale high-speed access (HSA) services will now apply to FTTH networks in addition to traditional DSL/copper/FTTN and DOCSIS/cable networks. Although mandated access to FTTH was ultimately expected, we did not expect the CRTC to mandate access at this juncture given the very early stages of FTTH deployment in Canada. While mandated access to FTTH could act as a dis-incentive for FTTH deployment, we expect the incumbents to largely proceed with current FTTH plans as the impact of this decision should be manageable for three reasons: (i) the use of Phase II costing, which should prevent an "unfair" tariff regime from being implemented; (ii) the requirement under the disaggregated wholesale HSA services model for competitors to invest in interconnection (which requires scale and is consistent with facilities-based competition); and (iii) the ability for incumbents to more aggressively push the quad-play as well as other services in the bundle should Internet re-sellers gain greater traction over time.
- **Government programs and tax incentives.** Government-sponsored broadband programs can lower the net cost of FTTH deployment for private operators. For example, the federal government committed $305MM to "extend and enhance broadband internet service for Canadians in rural and Northern communities" in the 2014/2015 budget. In addition, tax incentives such as accelerated capital cost allowance may further incentivize FTTH investment.
- **Cost of capital.** By any historical standard, the cost of capital for telecom operators is currently very low, which can incentivize investment and boost returns generated on FTTH (all else being equal).

The Bell Aliant FTTH experience

Accelerated FTTH deployment by Bell Aliant from 2009 through 2014 offers one of the best insights for telecom investors into the economics of FTTH. Bell Aliant proceeded with an accelerated FTTH build primarily for two reasons: (i) approximately 80%-85% of the company's footprint was aerial; and (ii) long loop lengths meant that the cost of deploying FTTH would have been largely similar to deploying FTTN. We aggregated all quantitative and qualitative data points that were disclosed over this accelerated build period, the primary sources of which included financial reports, all quarterly conference calls and our meetings with management.

The subscriber and (illustrative) revenue experience

Bell Aliant indicated that all internal targets were being met or exceeded after a very short nine months into the FTTH build. By the end of 2014, the penetration of FibreOp Internet and television subscribers (% of FTTH footprint) were 25% and 22%, respectively. Key subscriber data points included: (i) FibreOP subscriber penetration (% of FTTH footprint) tracked ahead of the penetration curve for Verizon, which experienced >50% penetration in more mature markets after six years; (ii) FibreOP television and triple play attach rates of 90%-95% were higher than expected with a 30% improvement in RGU performance experienced in mature FTTH footprints; (iii) subscriber churn was lower than expected boosted by the high television attach rate; (iv) FibreOp subscribers consistently migrated to higher tiers with the vast majority of television subscribers (85%) taking PVR and HD options as well as more actively using VOD; (v) demand consistently outstripped Bell Aliant's installation capacity; (vi) the revenue lift in a FTTH footprint typically exceeded the revenue drag in a non-FTTH footprint; and (vii) revenue growth turned positive in Atlantic Canada within two years of deploying FTTH, just prior to reaching 50% coverage of the total footprint.

Exhibit 4 summarizes the Bell Aliant FTTH subscriber experience. For illustrative purposes only, we show theoretical FTTH-related revenue assumptions with respect to Internet, television and telephony ARPU and telephony attach rates (i.e., Bell Aliant did not disclose specific FTTH revenue). Based on our assumptions, FibreOp revenue would have accounted for approximately 15% of Bell Aliant's total wireline revenue by the end of 2014.

Exhibit 4: The Bell Aliant FTTH subscriber and (illustrative) revenue experience

	Q2/09	Q3/09	Q4/09	Q1/10	Q2/10	Q3/10	Q4/10	Q1/11	Q2/11	Q3/11	Q4/11	Q1/12	Q2/12	Q3/12	Q4/12	Q1/13	Q2/13	Q3/13	Q4/13	Q1/14	Q2/14	Q3/14	Q4/14
Revenue Analysis																							
FTTH deployment																							
FTTH premises passed	0	11,000	25,000	35,000	74,000	106,000	138,000	178,000	294,000	398,000	458,000	516,000	574,000	621,000	656,000	679,000	725,000	770,000	806,000	827,000	879,000	961,000	1,017,000
Competitive footprint	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000
Total footprint	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
Key FTTH markets	Saint John and Fredericton							Halifax				Sudbury						Sault St. Marie					
FTTH footprint penetration																							
% of competitive footprint	0%	1%	1%	2%	4%	6%	8%	10%	16%	22%	25%	29%	32%	35%	36%	38%	40%	43%	45%	46%	49%	53%	57%
% of total footprint	0%	0%	1%	1%	3%	4%	6%	7%	12%	17%	19%	22%	24%	26%	27%	28%	30%	32%	34%	34%	37%	40%	42%
FTTH loading																							
Television																							
FibreOP TV subscribers (000s)								13	20	30	42	52	65	79	97	112	126	142	158	171	186	200	219
Fibre OP TV net additions (000s)									6	11	11	11	13	14	17	16	13	16	16	13	14	14	19
FibreOP TV penetration																							
% of FTTH footprint								7%	7%	8%	9%	10%	11%	13%	15%	17%	17%	18%	20%	21%	21%	21%	22%
% of competitive footprint								1%	1%	2%	2%	3%	4%	4%	5%	6%	7%	8%	9%	10%	10%	11%	12%
% of total footprint								1%	1%	1%	2%	2%	3%	3%	4%	5%	5%	6%	7%	7%	8%	8%	9%
High-Speed Internet																							
FibreOP Internet subscribers (000s)								14	22	34	47	60	75	92	112	130	147	166	184	200	217	235	255
Fibre OP Internet net additions(000s)									8	12	13	13	15	17	20	18	17	19	18	16	17	18	20
FibreOP Internet penetration																							
% of FTTH footprint								8%	8%	9%	10%	12%	13%	15%	17%	19%	20%	22%	23%	24%	25%	24%	25%
% of competitive footprint								1%	1%	2%	3%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%
% of total footprint								1%	1%	1%	2%	3%	3%	4%	5%	5%	6%	7%	8%	8%	9%	10%	11%
FibreOP penetration in mature markets																							
% of FTTH footprint									20%-25%	20%-25%	25%-30%	25%-30%	25%-30%	30%-35%	30%-35%	35%-40%	35%-40%	35%-40%	40%-45%	45%-55%			
TV attach rate					90%		90%	90%		90%					90%	90%			95%				
Illustrative FibreOp revenue																							
Television																							
FibreOP TV ARPU (net)								$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00
FibreOP TV average subscribers								10	16	25	36	47	59	72	88	105	119	134	150	165	179	193	210
FibreOP TV revenue ($000s)								1,786	2,960	4,505	6,479	8,445	10,574	13,026	15,867	18,836	21,441	24,105	27,009	29,653	32,136	34,707	37,710
Annualized TV revenue ($000s)								7,143	11,840	18,020	25,917	33,779	42,295	52,102	63,469	75,343	85,765	96,421	108,035	118,611	128,545	138,830	150,840
Internet																							
FibreOP Internet ARPU (net)								$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00
FibreOP Internet average subscribers								11	18	28	41	54	68	84	102	121	138	156	175	192	209	226	245
FibreOP Internet revenue ($000s)								1,942	3,293	5,093	7,368	9,699	12,218	15,076	18,381	21,804	24,908	28,143	31,498	34,555	37,532	40,685	44,100
Annualized Internet revenue ($000s)								7,767	13,172	20,373	29,474	38,794	48,872	60,303	73,523	87,216	99,633	112,573	125,992	138,219	150,130	162,741	176,400
Telephony																							
Telephony ARPU (net)								$30.00	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00	$30.00
Assumed attach rate								90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
FibreOP telephony revenue ($000s)								874	1,482	2,292	3,316	4,364	5,498	6,784	8,271	9,812	11,209	12,664	14,174	15,550	16,890	18,308	19,845
Annualized Internet revenue ($000s)								3,495	5,927	9,168	13,263	17,457	21,992	27,136	33,085	39,247	44,835	50,658	56,697	62,198	67,558	73,233	79,380
Total FibreOp revenue ($000s)																							
Estimated revenue								4,601	7,735	11,890	17,164	22,508	28,290	34,885	42,519	50,451	57,558	64,913	72,681	79,757	86,558	93,701	101,655
YoY growth												389%	266%	193%	148%	124%	103%	86%	71%	58%	50%	44%	40%
Annualized revenue								18,406	30,940	47,560	68,655	90,031	113,160	139,541	170,077	201,805	230,233	259,652	290,724	319,028	346,233	374,803	406,620
Total wireline revenue ($MM)								658	669	674	676	655	660	669	666	656	664	666	660	648	654	669	671
% FibreOp								1%	1%	2%	3%	3%	4%	5%	6%	8%	9%	10%	11%	12%	13%	14%	15%

Source: RBC Capital Markets

The cost experience

We have constructed what we believe is a reasonably accurate model that reflects Bell Aliant's cost of FTTH deployment and subscriber loading. We note that our model excludes undisclosed FTTH-related development and marketing costs. Key cost data points included: (i) an average cost per premise of approximately $500 over the accelerated build period with the cost ranging from $400 per premise in the dense/aerial footprints like Halifax to just under $600 per premise in less dense/aerial footprints; and (ii) a cost per load in the $900-$1,000 range. Based on these costs, from 2009 through 2014, Bell Aliant invested approximately $530MM to deploy FTTH to 1MM premises in Atlantic Canada and Ontario, and invested approximately $280MM to load 219k and 255k net FibreOp television and Internet subscribers, respectively, for a total cost of approximately $800MM. Other important data points included: (i) the average annual maintenance cost savings of FTTH was up to $100/home; (ii) after two years, installation times were averaging 5 hours, down from 7 hours six-to-nine months earlier; and (iii) wireless set-top boxes reduced installation times by about an hour, equating to about $100/home in savings net of equipment cost differentials.

Exhibit 5 summarizes what we believe is a reasonably accurate model that reflects Bell Aliant's cost of FTTH deployment and subscriber loading.

Exhibit 5: The Bell Aliant FTTH cost experience

	Q2/09	Q3/09	Q4/09	Q1/10	Q2/10	Q3/10	Q4/10	Q1/11	Q2/11	Q3/11	Q4/11	Q1/12	Q2/12	Q3/12	Q4/12	Q1/13	Q2/13	Q3/13	Q4/13	Q1/14	Q2/14	Q3/14	Q4/14
Cost Analysis																							
FTTH deployment																							
FTTH premises passed	0	11,000	25,000	35,000	74,000	106,000	138,000	178,000	294,000	398,000	458,000	516,000	574,000	621,000	656,000	679,000	725,000	770,000	806,000	827,000	879,000	961,000	1,017,000
Key FTTH markets			Saint John and Fredericton						Halifax				Sudbury							Sault St. Marie			
FTTH footprint penetration																							
% of competitive footprint	0%	1%	1%	2%	4%	6%	8%	10%	16%	22%	25%	29%	32%	35%	36%	38%	40%	43%	45%	46%	49%	53%	57%
% of total footprint	0%	0%	1%	1%	3%	4%	6%	7%	12%	17%	19%	22%	24%	26%	27%	28%	30%	32%	34%	34%	37%	40%	42%
FTTH additional premises passed		11,000	14,000	10,000	39,000	32,000	32,000	40,000	116,000	104,000	60,000	58,000	58,000	47,000	35,000	23,000	46,000	45,000	36,000	21,000	52,000	82,000	56,000
TTM additional premises passed				35,000	74,000	95,000	113,000	143,000	220,000	292,000	320,000	338,000	280,000	223,000	198,000	163,000	151,000	149,000	150,000	148,000	154,000	191,000	211,000
Cost of FTTH deployment																							
Cost per premise	$600	$600	$600	$570	$570	$570	$570	$400	$400	$400	$400	$570	$570	$570	$570	$575	$575	$575	$575	$575	$575	$575	$575
Cost (MM)	$0	$7	$8	$6	$22	$18	$18	$16	$46	$42	$24	$33	$33	$27	$20	$13	$26	$26	$21	$12	$30	$47	$32
Cummulative (MM)	$0	$7	$15	$21	$43	$61	$79	$95	$142	$183	$207	$240	$274	$300	$320	$333	$360	$386	$407	$419	$448	$496	$528
Average cost per premise (MM)																							$519
FTTH loading																							
Television																							
FibreOP TV subscribers (000s)								13	20	30	42	52	65	79	97	112	126	142	158	171	186	200	219
Fibre OP TV net additions (000s)									6	11	11	11	13	14	17	16	13	16	16	13	14	14	19
FibreOP TV penetration																							
% of FTTH footprint								7%	7%	8%	9%	10%	11%	13%	15%	17%	17%	18%	20%	21%	21%	21%	22%
% of competitive footprint								1%	1%	2%	2%	3%	4%	4%	5%	6%	7%	8%	9%	10%	10%	11%	12%
% of total footprint								1%	1%	1%	2%	2%	3%	3%	4%	5%	5%	6%	7%	7%	8%	8%	9%
High-Speed Internet																							
FibreOP Internet subscribers (000s)								14	22	34	47	60	75	92	112	130	147	166	184	200	217	235	255
Fibre OP Internet net additions (000s)									8	12	13	13	15	17	20	18	17	19	18	16	17	18	20
FibreOP Internet penetration																							
% of FTTH footprint								8%	8%	9%	10%	12%	13%	15%	17%	19%	20%	22%	23%	24%	25%	24%	25%
% of competitive footprint								1%	1%	2%	3%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%
% of total footprint								1%	1%	1%	2%	3%	3%	4%	5%	5%	6%	7%	8%	8%	9%	10%	11%
Cost of FTTH loading																							
Cost per load								$1,000	$1,000	$975	$975	$950	$950	$950	$950	$950	$950	$950	$950	$900	$900	$900	$900
Number of net loads (000s)								14	8	12	13	13	15	17	20	18	17	19	18	16	17	18	20
Monthly churn								0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%
Number of gross loads (000s)								15	8	13	14	14	17	18	22	20	20	23	22	20	22	23	25
Cost (MM)								$15	$8	$12	$14	$13	$16	$17	$21	$19	$19	$21	$21	$18	$19	$21	$23
Cummulative (MM)								$15	$23	$35	$49	$62	$78	$95	$116	$135	$154	$176	$196	$214	$234	$254	$277
Total Cost																							
Cost of FTTH deployment (MM)	$0	$7	$8	$6	$22	$18	$18	$16	$46	$42	$24	$33	$33	$27	$20	$13	$26	$26	$21	$12	$30	$47	$32
Cost of FTTH loading (MM)								$14	$8	$12	$14	$13	$16	$17	$21	$19	$19	$21	$21	$18	$19	$21	$23
Total cost of FTTH (MM)	$0	$7	$8	$6	$22	$18	$18	$30	$55	$54	$38	$46	$49	$44	$41	$33	$45	$47	$41	$30	$49	$68	$55
Cummulative (MM)		$7	$15	$21	$43	$61	$79	$110	$164	$218	$256	$302	$351	$395	$436	$469	$514	$561	$602	$633	$682	$750	$805

Source: RBC Capital Markets

Aerial FTTH discounted payback period

A base case

To better understand the potential returns on FTTH, we calculate a discounted payback period (DPP) for a theoretical "base case" aerial FTTH build that covers 1MM premises over 10-years on a straight-line basis using the cost per premise and cost per load as experienced by Bell Aliant. Under this scenario, the aerial FTTH build would payout in approximately 11 years. This calculation is generally consistent with Bell Aliant's stated 7-8 year payback on its initial 600k premises passed and 10-year payback on the subsequent 400k premises passed.

The major assumptions underpinning our discounted payback period calculation include: (i) penetration rates for Internet, television, telephony that are consistent with that for Bell Aliant and Verizon, as well as penetration rates that factor in television and telephony substitution; (ii) a penetration rate for "other services" that directionally reflects current and future new telecom services, such as home monitoring and smart home applications; (iii) average monthly churn of 0.9%; (iv) ARPU growth/declines for Internet, television and telephony that reflect the shift in pricing power from television and telephony to Internet; (v) a steady increase in EBITDA margins reflecting an improving mix of growing higher-margin Internet and declining lower-margin television, as well as reflecting operating cost efficiencies generated from FTTH; (vi) a -1% annual decline in the average cost per premise passed beginning at $500 in year 1; (vii) a -3% annual decline in the average cost per load beginning at $900 in year 1; and (viii) a decline in maintenance capex intensity to low double-digits longer-term.

Our discounted payback period calculation factors in a year 1 EBITDA margin of 43%, which implicitly assumes an incumbent operator is able to leverage existing overhead. We believe this assumption is the most practical approach when analyzing FTTH returns for incumbent operators. In addition, our approach does not factor in the incremental benefits of FTTH versus the alternative of doing nothing. For example, in the absence of FTTH, we would expect the rate of telephony substitution to be higher and the share of the residential and SMB Internet market to be lower over time. While avoiding this more negative outcome of doing nothing may be justification for proceeding with FTTH, particularly for the Canadian telcos that do not want to cede the Internet market to the cablecos, our approach does not explicitly factor in the incremental "delta" versus the status quo.

For the purposes of simplicity, our discounted payback period analysis excludes the full economic benefit arising from economies of scope, such as supporting wireless and better servicing the business market as well as certain verticals, such as healthcare and education. While capturing the full economic benefit from economies of scope would directly improve the DPP, we would expect a still relatively long payback regardless.

Exhibit 6 summarizes our calculated aerial FTTH discounted payback period using the Bell Aliant cost experience.

Exhibit 6: Aerial FTTH discounted payback period – A base case

Discounted Payback Period																Considerations
Stand-alone aerial build	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**	**Year 11**	**Year 12**	**Year 13**	**Year 14**	**Year 15**	
FTTH premises passed																
Additional premises passed	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	2,000	2,000	2,000	2,000	2,000	
FTTH premises passed	100,000	200,000	300,000	400,000	500,000	600,000	700,000	800,000	900,000	1,000,000	1,002,000	1,004,000	1,006,000	1,008,000	1,010,000	
Penetration (% of FTTH footprint)																
Internet	10%	20%	25%	30%	35%	40%	45%	50%	50%	50%	50%	50%	50%	50%	50%	**Substitution**
Television	9%	17%	21%	26%	30%	28%	32%	35%	35%	35%	35%	35%	35%	35%	35%	**Attach rates**
Telephony	7%	14%	18%	22%	25%	20%	23%	25%	25%	25%	25%	25%	25%	25%	25%	**Wholesale competition**
Other services	1%	3%	5%	7%	9%	12%	14%	16%	18%	20%	22%	24%	26%	28%	30%	
Net additions																
Internet	10,000	30,000	35,000	45,000	55,000	65,000	75,000	85,000	50,000	50,000	1,000	1,000	1,000	1,000	1,000	
Television	8,500	25,500	29,750	38,250	46,750	19,250	52,500	59,500	35,000	35,000	700	700	700	700	700	**Competitive response**
Telephony	7,225	21,675	25,288	32,513	39,738	-6,437	37,500	42,500	25,000	25,000	500	500	500	500	500	
Other services	1,000	5,200	9,400	13,600	17,800	22,000	26,200	30,400	34,600	38,800	21,440	21,524	21,608	21,692	21,776	
	26,725	82,375	99,438	129,363	159,288	99,813	191,200	217,400	144,600	148,800	23,640	23,724	23,808	23,892	23,976	
RGUs																
Internet	10,000	40,000	75,000	120,000	175,000	240,000	315,000	400,000	450,000	500,000	501,000	502,000	503,000	504,000	505,000	
Television	8,500	34,000	63,750	102,000	148,750	168,000	220,500	280,000	315,000	350,000	350,700	351,400	352,100	352,800	353,500	
Telephony	7,225	28,900	54,188	86,700	126,438	120,000	157,500	200,000	225,000	250,000	250,500	251,000	251,500	252,000	252,500	
Other services	1,000	6,200	15,600	29,200	47,000	69,000	95,200	125,600	160,200	199,000	220,440	241,964	263,572	285,264	307,040	
	26,725	109,100	208,538	337,900	497,188	597,000	788,200	1,005,600	1,150,200	1,299,000	1,322,640	1,346,364	1,370,172	1,394,064	1,418,040	
Monthly ARPU (net)																
Internet	$60	$62	$64	$66	$68	$70	$72	$74	$76	$78	$81	$83	$86	$88	$91	
YoY		3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	**Up-sell**
Television	$60	$58	$56	$55	$53	$52	$50	$48	$47	$46	$44	$43	$42	$40	$39	**Internet pricing power**
YoY		-3%	-3%	-3%	-3%	-3%	-3%	-3%	-3%	-3%	-3%	-3%	-3%	-3%	-3%	**Competitive response**
Telephony	$30	$29	$28	$27	$27	$26	$25	$24	$24	$23	$22	$21	$21	$20	$20	**Wholesale competition**
YoY		-3%	-3%	-3%	-3%	-3%	-3%	-3%	-3%	-3%	-3%	-3%	-3%	-3%	-3%	
Other services	$20	$21	$22	$23	$24	$26	$27	$28	$30	$31	$33	$34	$36	$38	$40	
YoY		5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	
Total	$170	$170	$170	$171	$172	$172	$173	$175	$176	$178	$180	$182	$184	$186	$189	
YoY		0%	0%	0%	0%	0%	1%	1%	1%	1%	1%	1%	1%	1%	1%	
Revenue ($MM)																
Internet	4	19	44	77	120	173	239	317	388	446	484	500	516	532	549	
Television	3	15	33	54	80	98	116	146	168	182	186	181	176	171	166	
Telephony	1	6	14	23	34	38	42	52	60	65	66	65	63	61	59	
Other services	0	1	3	6	11	18	26	37	51	67	82	95	109	124	141	
	8	41	94	161	245	327	423	551	666	760	819	840	863	888	915	
EBITDA margins																
Internet	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	
Television	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	
Telephony	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	
Other services	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	
Operating costs	5	23	53	89	134	176	223	288	345	390	417	424	433	442	453	
EBITDA																
Internet	2	11	26	46	72	104	143	190	233	268	291	300	310	319	330	
Television	1	3	7	11	16	20	23	29	34	36	37	36	35	34	33	
Telephony	1	3	7	12	17	19	21	26	30	32	33	32	31	30	30	
Other	0	0	1	3	6	9	13	19	25	33	41	47	54	62	70	
	3	18	41	72	110	151	200	264	321	370	402	416	430	446	463	
																Operating cost-efficiencies
EBITDA margin	43%	44%	44%	45%	45%	46%	47%	48%	48%	49%	49%	49%	50%	50%	51%	**Mix change**
Capex																
Cost of FTTH network expansion																
Cost per premise passed	$500	$495	$490	$485	$480	$475	$471	$466	$461	$457	$452	$448	$443	$439	$434	**Aerial versus buried**
YoY savings		-1.0%	-1.0%	-1.0%	-1.0%	-1.0%	-1.0%	-1.0%	-1.0%	-1.0%	-1.0%	-1.0%	-1.0%	-1.0%	-1.0%	**Economies of scope**
Cost of network expansion ($MM)	50	50	49	49	48	48	47	47	46	46	1	1	1	1	1	**Population density**
																Copper de-commissioning
Cost of FTTH loading																**Technological innovation**
Cost per load	$900	$873	$847	$821	$797	$773	$750	$727	$705	$684	$664	$644	$624	$606	$588	
YoY savings		-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	-3.0%	
Cost of loading ($MM)	9	27	34	45	56	68	80	92	73	75	1	1	1	1	1	
Total	59	77	83	94	104	116	127	139	119	121	2	2	2	1	1	
Maintenance capex	10	20	30	40	50	60	70	80	90	100	100	100	101	101	101	
Capex intensity % of revenue	124%	49%	32%	25%	20%	18%	17%	15%	14%	13%	12%	12%	12%	11%	11%	
Total capex	69	97	113	134	154	176	197	219	209	221	102	102	102	102	102	
Net cash flow	-66	-79	-72	-62	-44	-24	3	45	113	150	300	314	328	344	360	
Cumulative net cash flow	-66	-145	-216	-278	-323	-347	-343	-298	-186	-36	264	578	906	1,250	1,611	
Discounted payback period																
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Discount rate	8.0%															**Cost of capital**
Present value factor	0.9259	0.8573	0.7938	0.7350	0.6806	0.6302	0.5835	0.5403	0.5002	0.4632	0.4289	0.3971	0.3677	0.3405	0.3152	
Discounted net cash flow	-61	-68	-57	-46	-30	-15	2	24	56	69	129	125	121	117	114	
Cumulative discounted net cash flow	**-61**	**-129**	**-185**	**-231**	**-261**	**-276**	**-274**	**-250**	**-194**	**-124**	**4**	**129**	**250**	**367**	**481**	

Source: RBC Capital Markets

Better and bad cases

To illustrate the sensitivity of our "base case" discounted payback period to our assumptions, we have created both a "better case" and "bad case" as shown in Exhibit 7. With this "stretching out" of assumptions in either direction both positive and negative on an accumulated basis (i.e., consistently changing all major assumptions for each case either positively or negatively), the payback period extends from 8 to 18 years. For additional perspective, taking our "better case" but rather than assume 100% aerial deployment at an average cost of $500 per premise, we assume 100% buried deployment at an average cost of $1,750 per premise (leaving all other assumptions unchanged). Under these assumptions, 100% buried deployment would significantly push back the discounted payback period from 8 years to 13 years highlighting the need for operators to expand the aerial footprint where possible.

Exhibit 7: Aerial FTTH discounted payback period - Better and bad cases

Better Case	
Payout	**Year 8**
Assumptions	
Penetration	
Maximum 50% Internet penetration	Year 5
Attach rates	
TV - Years 1-5	90%
TV - Years 6-10	80%
Telephony - Years 1-5	90%
Telephony - Years 6-10	70%
Other service penetration - Year 10	30%
Average monthly churn	0.70%
Total monthly ARPU - Year 10	$191
EBITDA margin - Year 10	53%
Capex	
FTTH deployment - cost per premise	$500
% decline in cost per premise	-2%
FTTH loading - cost per load	$900
% decline in cost per load	-5%
Discount rate	7%

Base Case	
Payout	**Year 11**
Assumptions	
Penetration	
Maximum 50% Internet penetration	Year 8
Attach rates	
TV - Years 1-5	85%
TV - Years 6-10	70%
Telephony - Years 1-5	85%
Telephony - Years 6-10	50%
Other service penetration - Year 10	20%
Average monthly churn	0.90%
Total monthly ARPU - Year 10	$178
EBITDA margin - Year 10	49%
Capex	
FTTH deployment - cost per premise	$500
% decline in cost per premise	-1%
FTTH loading - cost per load	$900
% decline in cost per load	-3%
Discount rate	8%

Bad Case	
Payout	**Year 18**
Assumptions	
Penetration	
Maximum 40% Internet penetration	Year 8
Attach rates	
TV - Years 1-5	80%
TV - Years 6-10	60%
Telephony - Years 1-5	80%
Telephony - Years 6-10	30%
Other service penetration - Year 10	10%
Average monthly churn	1.00%
Total monthly ARPU - Year 10	$172
EBITDA margin - Year 10	44%
Capex	
FTTH deployment - cost per premise	$500
% decline in cost per premise	0%
FTTH loading - cost per load	$900
% decline in cost per load	-1%
Discount rate	9%

Source: RBC Capital Markets

The FTTH footprint in Canada

2015 is the inflection point for accelerated FTTH deployment

FTTH deployment in Canada is in the early innings. While both telcos and cablecos have deployed FTTH in greenfield developments for years, brownfield FTTH deployment (i.e., FTTH overbuilds in existing neighbourhoods) has been relatively limited with the level of commitment to deploy FTTH varying among the incumbents. To-date, the deployment of DOCSIS 3.0 by the cablecos and FTTN by the telcos have provided enough Internet capacity to meet household data demand. However, with the increase in household data demand showing no signs of slowing, FTTH is now coming into focus. Among the telcos under coverage, we estimate FTTH represents only 17% of the total footprint with FTTN/FTTH representing a broader 77% of the total footprint.

FTTH deployment roadmaps vary by telco

- **BCE is the furthest along the FTTH deployment path** – BCE is furthest along the FTTH build among the Canadian telcos due in part to the acquisition of 100% of Bell Aliant in 2014 that added 1MM FTTH premises (42% of the Bell Aliant total footprint). In April, BCE announced a commitment to invest $20B in broadband investment (including wireless) by the end of 2020 with the company targeting approximately 8.5MM FTTH premises over what we estimate will be 7-10 years (eventually covering approximately 75% of the total footprint). FTTH represents approximately 22% of the total footprint of 10MM premises for BCE with FTTN/FTTH representing a much broader 78% of the total footprint. In June, BCE announced a commitment to cover 1.1MM premises in Toronto with fibre comprising 500k single-family homes, 450k MDUs and 150k businesses. The bulk of Toronto FTTH deployment will be completed by 2017. By the end of 2015, BCE expects FTTH to represent "30% of total customer locations".
- **TELUS too is now accelerating FTTH deployment –** For TELUS, details around FTTH deployment plans are less known. In February, TELUS confirmed an increased focus on FTTH deployment with the company taking a modular approach with the goal of maximizing economies of scope. At the moment, we estimate FTTH represents 7% of the total footprint of 3.8MM premises with FTTN/FTTH representing a much broader 74% of the total footprint (management indicated that 25% of the FTTx footprint is "fibre enabled" as of Q2/15). Management expects the bulk of FTTH deployment to be completed over the next 5-7 years. In June, the company announced a commitment to invest $1B in FTTH to cover 90% of premises in Edmonton.
- **Manitoba Telecom reaching the end of a largely unfinished 5-year plan –** In 2010, Manitoba Telecom announced that by the end of 2015, the company intended to deploy FTTH to 120,000 premises in 20 communities. By the end of 2014, FTTH had reached 35k premises, increasing to 42k by Q2/15. At the moment, we estimate FTTH represents 8% of the total footprint of 500k premises for MTS with FTTN/FTTH representing a broader 70% of the total footprint.

The U.S. telco experience

- **Verizon –** Verizon commenced FTTH deployment in 2005. Verizon has indicated that the average cost per premise under a blanket build is approximately US$1,000 with an average cost per load of approximately US$650-$700 and installation taking roughly 4-5 hours. Verizon's FTTH deployment currently covers approximately 18MM premises, which represents just under 70% of the total consumer wireline footprint. By 2009 (i.e.,

five years after FTTH deployment began), FiOS television and Internet subscriber penetration was 28% and 25% of the FTTH footprint, respectively. By early 2015 (i.e., eleven years after FTTH deployment began), these penetration rates had increased to 36% and 42%, respectively. In most markets, penetration rates are approximately 40% with penetration reaching 50% in the more mature and less competitive markets. Other data points include: (i) the loading mix comprises Internet (39%), television (33%) and telephony (28%); and (ii) FiOS revenue per connection has declined from US$243 in 2010 to US$195 in 2015.

- **AT&T** – In addition to steady greenfield deployment and "Project VIP", which will cover 1MM businesses with fibre and is substantially complete, AT&T commenced its "GigaPower" FTTH deployment project in 2013 in Austin with the longer-term goal of bringing FTTH to 25 regions covering 100 cities. As of Q2/15, GigaPower was in 11 markets. As part of the DirectTV acquisition, the company has committed to deploy a 1Gbps service to 12MM premises, above its original target of 2MM premises.

The "blue-sky" cost of future FTTH

Estimating the total future cost of FTTH deployment and loading by operator over the long-term is a challenge reflecting limited visibility around: (i) the extent to which aerial footprints can be expanded by leveraging existing infrastructure and new technology; (ii) the extent to which new technology and economies of scope can drive down the deployment and loading cost curves; (iii) extent to which changes in the competitive environment impact loading/subscriber penetration; (iv) the extent to which cheaper substitute technologies emerge to reduce the overall FTTH footprint, such as 5G wireless, fixed-wireless, satellite and FTTN overlays; and (v) the size of government-sponsored broadband programs, which can lower the net cost of FTTH deployment for private operators (i.e., such as the $305MM allocated in the 2014/2015 federal budget to "extend and enhance broadband internet service for Canadians in rural and Northern communities").

Factoring in basic assumptions on FTTH coverage (75% of total footprint), subscriber penetration (50% of FTTH footprint) and the percentage of aerial versus buried deployment in each footprint, we estimate the "blue-sky" future cost of FTTH deployment and loading could be $9B for BCE, $5B for TELUS and $500MM Manitoba Telecom. These "blue-sky" estimates factor in average aerial and buried deployment costs of $600/premise and $1,750/premise, respectively, and an average cost per load of $900/premise.

Exhibit 8 provides a summary of estimated FTTH footprints, deployment roadmaps and the "blue-sky" cost of future FTTH for BCE, TELUS and Manitoba Telecom.

Exhibit 8: FTTH footprints, deployment roadmaps and the "blue-sky" cost of future FTTH for the telcos

	BCE	TELUS	MTS
Footprint			
Total	10.0MM premises	3.8MM premises	0.5MM premises
FTTN/FTTH	7.8MM premises	2.8MM premises	0.35MM premises
%	78%	74%	70%
FTTH	2.2MM premises	0.25MM	0.04MM premises
%	22%	7%	8%
% aerial	60%	47%	75%
% buried	40%	53%	25%
Deployment roadmap	- Beginning in 2015, all new network deployment will be FTTH with FTTH to represent "30% of total customer locations" by the end of 2015 - Committed to broadband investments (including wireless) of $20B from 2015 through 2020 - Broadly targeting 8.5MM FTTH premises over a 10-year timeframe (75% of forecast footprint) - Quebec City FTTH investment of $225M covering 100k premises was completed in 2013 - 1.1MM premises (500k single-family, 450k MDUs, 150k businesses) in Toronto will be covered with FTTH for $1.1B beginning with 50k premises in the summer 2015 (the bulk of the build completed by 2017). Approximately 70% is aerial and 30% buried given agreement with Toronto Hydro. - Bell Aliant covers 1MM premises in Atlantic Canada and rural Ontario	- In 2015, the pace of FTTH deployment will accelerate with the company taking a modular approach with the goal of maximizing economies of scope - FTTH currently deployed in 19 communities in B.C. and 19 communities in Alberta (mainly rural) with 25% of the 2.8MM FTTx footprint "fibre enabled" Expects the "bulk" of FTTH deployment over a 5-7 year period - Committed to invest $1B to cover 90% of premises in Edmonton with FTTH	- In 2010, announced plans to invest $125MM on FTTH over 5 years with a target to cover 120k premises in 20 communities - Under the 5-year FTTH plan, 16 communities were covered with FTTH as of early 2015 with 42k premises passed as of Q2/15
"Blue-sky" cost of FTTH			
Penetration			
% of total footprint	75%	75%	75%
Premises left to cover (MM)	6.1	2.9	0.4
Deployment			
Aerial cost per premise	$600	$600	$600
Buried cost per premise	$1,750	$1,750	$1,750
% aerial	60%	47%	75%
% buried	40%	53%	25%
Average cost per premise	$1,060	$1,212	$888
Total deployment cost (MM)	$6,450	$3,513	$332
Loading			
Cost per load	$900	$900	$900
Penetration of FTTH footprint	50%	50%	50%
Premises to load (MM)	3.0	1.4	0.2
Total loading cost (MM)	$2,738	$1,304	$168
Total "blue-sky" cost of FTTH (MM)	$9,188	$4,817	$501

Source: RBC Capital Markets

Valuation and ROIC sensitivity to FTTH scenarios

Our scenario approach

To understand how FTTH could impact the telco stocks, we examined the valuation and ROIC impact to various FTTH scenarios for each telco. Given the many approaches that can be taken to assess the FTTH impact, our approach for the purposes of this report is intended to address two important questions for investors: (i) if the telcos are successful in deploying FTTH at current capex intensity levels, what is the valuation and ROIC sensitivity to both favourable and unfavourable revenue and margin outcomes? (ii) if the telcos are not successful in deploying FTTH at current capex intensity levels but rather require an increase in capex intensity, what is the valuation sensitivity under this capex scenario to both favourable and unfavourable revenue and margin outcomes? Given the multiple factors that can impact returns generated on FTTH (i.e., revenue, cost, timing, regulatory, other), for each capex scenario, our revenue and margin assumptions are intended to directionally capture what we believe is a reasonable range of outcomes.

A reasonable range of outcomes

Our favourable outcomes are intended to simplistically capture the key positive revenue and margin benefits of FTTH. Our unfavourable outcomes are largely symmetrical to our favourable outcomes. For revenue, we increase and decrease our current annual wireline data revenue growth estimates for 2016E-2025E by +100bps and -100bps for the favourable and unfavourable outcomes, respectively. We believe this increase broadly captures the revenue impact from an increase in Internet market share to an eventual 50% share for each operator. For margins, we increase and decrease the average wireline EBITDA margin for 2016E-2025E by +200bps-250bps and -200bps-250bps for the favourable and unfavourable outcomes, respectively. We believe the increase broadly captures the operating cost efficiencies of FTTH. For capex, our “stable capex intensity” scenario assumes current capex intensity levels are maintained for 2016E-2025E. Our “elevated capex intensity” scenario assumes a +400bps increase in wireline capex intensity for 2016E-2025E. This increase is intended to broadly capture the risk of the telcos having to unexpectedly incur higher capex through the build and translates to an approximate 35%-50% increase in the cost of FTTH versus our “blue-sky” estimates.

For the purposes of simplicity, we do not: (i) change WACC and terminal growth rate assumptions under the two scenarios or favourable and unfavourable outcomes; (ii) account for a potential permanent “step-down” in capex post the FTTH deployment phase; (iii) ease the rate of deployment under unfavourable outcomes; (iv) make adjustments for market share and margin differentials between retail and wholesale subscribers; and (v) change dividend growth assumptions.

Manageable valuation risk provided capex intensity remains stable

Under the stable capex intensity scenario: (i) the valuation upside under the favourable revenue and margin outcome is reasonably balanced compared to the downside under the unfavourable outcome (+19% versus -9% on average); and (ii) the differential in average ROIC between favourable and unfavourable outcomes is approximately 200bps-300bps. Under the elevated capex intensity scenario: (i) the downside under the unfavourable revenue and margin outcome heavily outweighs the upside under the favourable outcome (-27% versus

+2% on average); and (ii) the differential in average ROIC between favourable and unfavourable outcomes is approximately 200bps-300bps. The differential in average ROIC between the stable capex intensity and elevated capex intensity scenarios is approximately 100bps.

Exhibit 9 summarizes the valuation and ROIC sensitivity to our FTTH scenarios.

Exhibit 9: Valuation and ROIC sensitivity to our FTTH scenarios

	Stable Capex Intensity						Elevated Capex Intensity					
	BCE		TELUS		MTS		BCE		TELUS		MTS	
DCF and ROIC Impact under FTTH Scenarios	Favourable	Unfavourable	Favourable	Unfavourable	Favourable	Unfavourable	Favourable	Unfavourable	Favourable	Unfavourable	Favourable	Unfavourable
2016 DCF-based Value per Share	**$65**	**$50**	**$52**	**$42**	**$35**	**$25**	**$55**	**$41**	**$45**	**$35**	**$30**	**$19**
Upside / downside to current share price	20%	-7%	17%	-6%	20%	-14%	2%	-24%	1%	-21%	3%	-35%
2016 - 2025 Average ROIC	**14.0%**	**11.8%**	**13.4%**	**11.6%**	**10.9%**	**8.3%**	**12.7%**	**11.0%**	**12.5%**	**10.9%**	**9.9%**	**7.4%**
2016 - 2025 Wireline Assumptions:												
Revenue												
Average data revenue growth	4.5%	2.5%	6.3%	4.3%	5.9%	3.9%	4.5%	2.5%	6.3%	4.3%	5.9%	3.9%
Average wireline revenue growth	1.8%	0.4%	3.8%	2.2%	0.9%	0.3%	1.8%	0.4%	3.8%	2.2%	0.9%	0.3%
Margins												
Average wireline EBITDA margins	43.1%	38.8%	34.1%	28.6%	45.1%	41.0%	43.1%	38.8%	34.1%	28.6%	45.1%	41.0%
Capex intensity												
Average wireline capex intensity	22.5%	22.5%	27.5%	27.5%	23.5%	23.5%	26.5%	26.5%	31.5%	31.5%	27.5%	27.5%
Average consolidated capex intensity	16.5%	16.5%	17.5%	17.5%	16.7%	16.7%	18.7%	18.7%	19.0%	19.0%	18.3%	18.3%

Source: RBC Capital Markets

Cost efficiencies will be key to mitigating revenue weakness

We believe revenue uncertainty is the key return risk on FTTH. We believe the outlook for traditional wireline revenue for the industry will increasingly be challenged reflecting: (i) continued telephony substitution; (ii) accelerating television cord-cutting and cord-shaving; (iii) market share gains by Internet re-sellers; and (iv) a steady re-pricing within the business market. While there are pockets of wireline revenue growth (i.e., residential Internet, data hosting, verticalization, home monitoring/smart home), in the absence of the emergence of entirely new wireline services, wireline revenue growth could turn negative over the medium-term as substitution effects and deterioration in telephony and television pricing power outweigh data monetization.

Wireline revenue weakness should have a manageable valuation impact provided wireline margins hold, if not improve, due to network efficiencies and mix. Should operators be able to generate substantial cost savings from FTTH (i.e., operating cost efficiencies, copper de-commissioning, economics of scope), the valuation and ROIC impact of wireline revenue weakness on FTTH returns should also be manageable. However, should the public market have a bias towards revenue growth as a key valuation driver of wireline multiples, and/or should a mismatch in the timing of wireline revenue pressure and cost savings result in temporary wireline margin pressure, valuation risk will increase.

Exhibit 10 summarizes the valuation and ROIC sensitivity to our stable and elevated capex intensity scenarios assuming an unfavourable revenue outcome but a favourable margin outcome for each (i.e. mixed).

Exhibit 10: Valuation and ROIC sensitivity under an unfavourable revenue outcome but favourable margin outcome

	Stable Capex Intensity			Elevated Capex Intensity		
	BCE	TELUS	MTS	BCE	TELUS	MTS
DCF and ROIC Impact under FTTH Scenarios	Mixed	Mixed	Mixed	Mixed	Mixed	Mixed
2016 DCF-based Value per Share	**$62**	**$51**	**$34**	**$53**	**$46**	**$29**
Upside / downside to current share price	15%	15%	17%	-2%	3%	0%
2016 - 2025 Average ROIC	**13.1%**	**13.0%**	**10.4%**	**12.2%**	**11.6%**	**9.5%**
2016 - 2025 Wireline Assumptions:						
Unfavourable revenue						
Average data revenue growth	2.5%	4.3%	3.9%	2.5%	4.3%	3.9%
Average wireline revenue growth	0.4%	2.2%	0.3%	0.4%	2.2%	0.3%
Favourable margins						
Average wireline EBITDA margins	43.1%	34.1%	45.1%	43.1%	34.1%	45.1%
Capex intensity						
Average wireline capex intensity	22.5%	27.5%	23.5%	26.5%	31.5%	27.5%
Average consolidated capex intensity	16.5%	17.5%	16.7%	18.7%	19.0%	18.3%

Source: RBC Capital Markets

Summary of key operating and financial metrics

Exhibit 11: Summary of key operating and financial metrics

		2010	2011	2012	2013	2014	2015E	2016E	2017E	2018E
WIRELESS	**Blended ARPU ($)**									
	BCE	$53.23	$54.34	$56.39	$57.25	$59.92	$63.02	$64.28	$65.57	$66.55
	Rogers	$62.62	$60.20	$59.79	$59.58	$59.41	$60.03	$61.34	$62.73	$63.88
	TELUS	$57.63	$59.10	$60.39	$61.38	$63.13	$63.80	$64.76	$65.73	$66.72
	Network Revenue Growth (YoY)									
	BCE	9.2%	6.4%	6.5%	5.5%	6.4%	6.4%	5.0%	4.7%	4.1%
	Rogers	5.2%	0.5%	1.8%	0.4%	-0.1%	2.6%	3.3%	2.8%	2.6%
	TELUS	5.0%	8.5%	7.3%	5.1%	6.5%	6.4%	6.2%	4.8%	4.5%
	Network EBITDA Margins (%)									
	BCE	38%	38%	42%	44%	45%	46%	48%	48%	49%
	Rogers	48%	46%	46%	47%	48%	47%	48%	49%	50%
	TELUS	44%	44%	46%	46%	45%	45%	48%	49%	50%
	Capex Intensity (%)									
	BCE	9.8%	11.8%	11.4%	10.9%	10.9%	10.6%	11.0%	11.0%	11.0%
	Rogers	13.4%	16.7%	15.4%	11.9%	13.4%	12.4%	12.1%	11.7%	11.4%
	TELUS	9.2%	9.2%	12.1%	11.5%	12.5%	13.0%	11.3%	10.0%	9.6%
WIRELINE	**Revenue Growth (YoY)**									
	BCE	0.3%	-0.7%	-3.8%	-1.2%	-0.3%	0.0%	0.7%	1.1%	1.4%
	Cogeco Cable	11.5%	8.7%	5.4%	3.2%	2.4%	0.8%	0.8%	0.2%	0.0%
	Manitoba Telecom	-3.2%	2.2%	-0.2%	0.2%	3.4%	2.1%	0.4%	0.9%	1.3%
	Quebecor	10.0%	7.3%	6.5%	7.2%	1.4%	-1.5%	-0.2%	0.7%	0.8%
	Rogers	3.6%	3.9%	1.5%	3.5%	-0.2%	0.0%	0.0%	0.4%	0.5%
	Shaw	11.3%	5.7%	3.2%	2.3%	3.0%	0.8%	1.8%	2.4%	3.0%
	TELUS	-2.2%	3.6%	2.9%	3.8%	2.7%	2.2%	3.4%	3.5%	3.4%
	EBITDA Margins (%)									
	BCE	38.7%	39.1%	38.4%	37.6%	40.1%	40.6%	41.1%	41.5%	41.7%
	Cogeco Cable	44.5%	46.9%	48.3%	49.8%	51.1%	51.5%	51.7%	51.6%	51.6%
	Manitoba Telecom	51.8%	50.2%	50.5%	47.9%	47.1%	46.0%	45.5%	44.8%	44.2%
	Quebecor	48.8%	49.9%	50.9%	48.8%	50.4%	51.9%	52.3%	51.9%	51.6%
	Rogers	44.7%	46.8%	47.8%	49.4%	48.0%	47.3%	47.3%	47.8%	48.3%
	Shaw	47.5%	46.9%	44.1%	47.2%	49.2%	45.5%	45.5%	46.3%	47.2%
	TELUS	32.8%	31.2%	28.7%	26.0%	26.6%	26.3%	28.3%	30.0%	31.4%
	Capex Intensity (%)									
	BCE	18.5%	18.6%	21.5%	22.3%	23.5%	22.6%	22.5%	22.5%	22.5%
	Cogeco Cable	29.8%	29.8%	26.3%	18.8%	17.8%	17.8%	17.0%	17.2%	17.2%
	Manitoba Telecom	25.0%	18.9%	22.3%	19.8%	20.9%	17.7%	19.0%	19.0%	19.0%
	Quebecor	22.4%	25.3%	26.1%	16.6%	19.7%	20.8%	21.2%	22.2%	23.1%
	Rogers	19.2%	22.6%	24.8%	31.8%	30.4%	32.0%	31.4%	31.4%	31.3%
	Shaw	25.9%	22.9%	25.4%	26.5%	29.4%	30.3%	22.1%	21.4%	20.5%
	TELUS	25.6%	26.3%	24.2%	25.7%	27.3%	27.6%	27.6%	27.6%	26.7%
MEDIA	**Revenue Growth (%)**									
	BCE	n/a	n/a	41.6%	17.1%	14.9%	0.3%	2.1%	4.8%	3.0%
	Quebecor	1.0%	-0.9%	-3.3%	-8.3%	-2.9%	9.5%	4.3%	0.8%	0.6%
	Rogers	6.7%	7.3%	0.6%	5.2%	7.2%	10.4%	1.0%	1.0%	1.0%
	Shaw	-5.7%	0.2%	18.2%	5.0%	-0.9%	-1.3%	1.0%	0.5%	0.0%

		2010	2011	2012	2013	2014	2015E	2016E	2017E	2018E
	Total Wireless Subcribers (000s)									
	BCE	7,242	7,427	7,681	7,778	8,119	8,300	8,527	8,751	8,965
	Rogers	8,977	9,335	9,437	9,503	9,450	9,671	9,706	9,766	9,848
	TELUS	6,971	7,340	7,670	7,807	8,281	8,588	8,876	9,151	9,414
	Postpaid Wireless Subcribers (000s)									
	BCE	5,541	5,975	6,425	6,678	7,110	7,409	7,710	7,981	8,226
	Rogers	7,325	7,574	7,846	8,074	8,073	8,167	8,236	8,330	8,447
	TELUS	5,705	6,130	6,543	6,751	7,108	7,428	7,737	8,035	8,324
	Postpaid Net Additions (000s)									
	BCE	500	434	457	378	312	299	301	271	246
	Rogers	319	269	268	228	(1)	2	69	94	117
	TELUS	415	425	414	378	357	320	309	298	289
	Postpaid Churn (%)									
	BCE	1.33%	1.47%	1.28%	1.26%	1.22%	1.22%	1.20%	1.20%	1.20%
	Rogers	1.18%	1.32%	1.29%	1.24%	1.27%	1.30%	1.25%	1.24%	1.23%
	TELUS	1.13%	1.31%	1.09%	1.03%	0.93%	0.86%	0.88%	0.88%	0.88%
	Television Net Additions (000s)									
	BCE	71	68	69	122	153	111	106	101	96
	Cogeco Cable	10	3	(15)	(28)	(38)	(30)	(32)	(33)	(30)
	Manitoba Telecom	3	6	2	8	3	(1)	(1)	(1)	(1)
	Quebecor	35	50	(7)	(30)	(43)	(45)	(41)	(37)	(33)
	Rogers	4	(14)	(83)	(127)	(103)	(133)	(93)	(74)	(59)
	Shaw	7	(48)	(70)	(116)	(106)	(127)	(83)	(69)	(58)
	TELUS	144	196	170	137	101	84	67	54	43
	Telephony Net Additions (000s)									
	BCE	(386)	(374)	(457)	(402)	(465)	(404)	(364)	(328)	(295)
	Cogeco Cable	76	61	53	13	(15)	(10)	(8)	(8)	(8)
	Manitoba Telecom	(27)	(20)	(27)	(20)	(16)	(20)	(19)	(19)	(18)
	Quebecor	100	91	60	21	(7)	(11)	(12)	(14)	(15)
	Rogers	(12)	(1)	23	42	(3)	(51)	(32)	(32)	(32)
	Shaw	237	137	131	53	15	(51)	(11)	(11)	(11)
	TELUS	(227)	(146)	(188)	(151)	(85)	(93)	(86)	(79)	(72)
	Internet Net Additions (000s)									
	BCE	6	(17)	1	29	160	151	144	137	130
	Cogeco Cable	44	42	33	16	18	24	22	21	20
	Manitoba Telecom	(2)	(1)	1	12	8	2	4	4	3
	Quebecor	82	80	55	31	18	20	18	16	15
	Rogers	64	83	73	63	50	24	35	32	28
	Shaw	110	54	35	28	40	29	33	31	30
	TELUS	14	57	74	61	74	82	69	59	50
	EBITDA Margins (%)									
	BCE	n/a	21.7%	25.7%	26.7%	25.0%	24.4%	24.5%	25.0%	24.8%
	Quebecor	18.6%	13.9%	10.8%	11.4%	6.7%	5.1%	8.0%	8.5%	8.5%
	Rogers	9.8%	11.2%	11.7%	9.4%	7.2%	8.7%	8.7%	8.7%	8.7%
	Shaw	29.6%	28.2%	31.5%	31.9%	32.2%	31.0%	31.0%	31.0%	31.0%

Notes (i) Manitoba Telecom for MTS only. Margin and capex intensity include wireless; (ii) Cogeco data for Canadian Cable Services only; (iii) Shaw wireline capex excludes satellite; (iv) Segmented capex intensity excludes spectrum and is calculated as a percentage of total segmented revenue; and (v) BCE 2014 figures restated to include Bell Aliant in Bell segmented results and operating metrics.

Sources: Company reports, RBC Capital Markets estimates

Comparable valuations

Exhibit 12: Summary of comparable valuations

Cable and Telecom	Ticker	Share Price	Market Cap. (MM)	P/E				EV/EBITDA[3]				FCF Yield				Net Debt/ EBITDA	Dividend Yield	Dividend as % 2015E	
				2014	2015E	2016E	FTM	2014	2015E	2016E	FTM	2014	2015E	2016E	FTM			EPS[4]	FCF[5]
Canadian Telcos																			
BCE Inc.	BCE	C$53.97	C$45,798	17.0x	16.3x	14.9x	15.4x	8.0x	7.8x	7.4x	7.5x	4.7%	5.5%	7.1%	6.5%	2.3x	4.8%	78.5%	87.1%
Manitoba Telecom	MBT	C$29.05	C$2,280	17.1x	27.2x	18.6x	21.8x	6.2x	6.3x	6.0x	6.1x	5.8%	6.6%	8.8%	8.0%	2.1x	4.5%	121.6%	67.6%
TELUS Corporation	T	C$44.45	C$26,735	19.2x	17.9x	14.3x	15.6x	8.6x	8.6x	7.7x	8.0x	4.1%	4.6%	5.9%	5.4%	2.7x	3.8%	67.5%	82.8%
Average				**17.8x**	**20.4x**	**15.9x**	**17.6x**	**7.6x**	**7.6x**	**7.0x**	**7.2x**	**4.9%**	**5.6%**	**7.2%**	**6.6%**	**2.4x**	**4.4%**	**89.2%**	**79.2%**
Canadian Cablecos																			
Cogeco Cable Inc.	CCA	C$68.87	C$3,406	13.4x	13.2x	12.5x	12.5x	6.8x	6.5x	6.2x	6.2x	8.8%	8.1%	8.9%	8.9%	3.0x	2.0%	26.8%	25.0%
Quebecor Inc.[1]	QBR.B	C$29.81	C$3,664	23.6x	18.7x	17.8x	18.1x	6.8x	6.6x	5.9x	6.2x	4.0%	5.0%	6.6%	6.0%	3.3x	0.5%	8.8%	9.4%
Rogers Communications Inc.	RCI.B	C$45.31	C$23,323	15.3x	15.5x	14.4x	14.8x	7.0x	7.0x	6.7x	6.8x	5.4%	4.9%	6.1%	5.6%	3.1x	4.2%	65.7%	87.1%
Shaw Communications Inc.	SJR.B	C$26.76	C$12,631	14.2x	15.7x	14.9x	14.9x	7.7x	8.1x	7.7x	7.7x	3.4%	4.6%	5.9%	5.9%	2.3x	4.4%	69.7%	97.1%
Average				**16.6x**	**15.8x**	**14.9x**	**15.1x**	**7.1x**	**7.0x**	**6.6x**	**6.7x**	**5.4%**	**5.6%**	**6.9%**	**6.6%**	**3.0x**	**2.8%**	**42.8%**	**54.6%**
Cableco & Telco Average				**17.1x**	**17.8x**	**15.3x**	**16.2x**	**7.3x**	**7.3x**	**6.8x**	**6.9x**	**5.2%**	**5.6%**	**7.0%**	**6.6%**	**2.7x**	**3.5%**	**62.7%**	**65.2%**
US Telcos[2]																			
AT&T Inc	T	US$34.23	US$177,551	13.6x	13.6x	13.1x	13.3x	6.2x	6.4x	6.2x	6.3x	6.4%	7.5%	7.8%	7.7%	1.8x	5.5%	74.6%	73.2%
Verizon Communications Inc.	VZ	US$47.52	US$197,446	14.2x	12.4x	12.0x	12.1x	6.8x	6.6x	6.4x	6.5x	8.3%	7.5%	7.0%	7.2%	2.2x	4.6%	57.3%	61.5%
Average				**13.9x**	**13.0x**	**12.5x**	**12.7x**	**6.5x**	**6.5x**	**6.3x**	**6.4x**	**7.3%**	**7.5%**	**7.4%**	**7.5%**	**2.0x**	**5.1%**	**65.9%**	**67.3%**
US Cablecos[2]																			
Comcast Corp.	CMCSA	US$60.41	US$160,207	18.9x	18.3x	16.1x	16.9x	8.4x	8.3x	7.7x	8.0x	6.0%	5.7%	6.5%	6.2%	1.5x	1.7%	30.2%	29.2%
Time Warner Cable Inc.	TWC	US$190.31	US$52,887	25.2x	26.0x	22.2x	23.6x	9.2x	9.1x	8.4x	8.7x	3.9%	4.0%	4.7%	4.4%	2.9x	1.6%	40.9%	39.6%
Average				**22.0x**	**22.1x**	**19.1x**	**20.2x**	**8.8x**	**8.7x**	**8.1x**	**8.3x**	**5.0%**	**4.8%**	**5.6%**	**5.3%**	**2.2x**	**1.6%**	**35.6%**	**34.4%**
US Average				**18.0x**	**17.5x**	**15.8x**	**16.5x**	**7.7x**	**7.6x**	**7.2x**	**7.4x**	**6.1%**	**6.2%**	**6.5%**	**6.4%**	**2.1x**	**3.3%**	**50.8%**	**50.8%**

[1]Quebecor Media proportionately consolidated

[2]Estimates are Thomson One consensus. Verizon pro forma consolidation of Verizon Wireless ownership

[3]EV/EBITDA calculated using adjusted EBITDA, which includes pension expense, recurring restructuring costs and capitalized subsidies and excludes non-recurring items

[4]EPS defined as normalized earnings per share after preferred dividends

[5]Free cash flow defined as cash from operations before working capital - capex - preferred dividends

Source: Company reports, Thomson Financial, RBC Capital Markets estimates

Appendix A: Summary of select FTTH offerings

Exhibit 13: Current standalone Internet pricing

BCE - FibreOP

Download/Upload Speeds Mbps	Monthly Usage	Pricing per Month
100/30	Unlimited	$79.95
150/30	Unlimited	$94.95
300/30	Unlimited	$109.95
450/350	Unlimited	$249.95

BCE - Gigabit Fibe

Download/Upload Speeds Mbps	Monthly Usage	Pricing per Month
150/50	275GB	$85.95
300/100	400GB	$95.95
940/100	Unlimited	$149.95

Source: Company Websites

Exhibit 14: Current bundled pricing

FibreOP Bundle	Good	Better	Best
Internet (Download/Upload)	100/30 Mbps UL Usage	150/30 Mbps UL Usage	150/30 Mbps UL Usage
TV	165+ Channels	230+ Channels	255+ Channels
Phone	Nationwide	Nationwide	Nationwide
Promo Pricing	$109.95	$109.95	$109.95
After 3 months	$149.95	$169.95	$189.95
Upgrade to 150/30	$15.00	n/a	n/a
Upgrade to 300/30	$30.00	$15.00	$15.00

Gigabit Fibe Bundle	Good	Better	Best
Internet (Download/Upload)	940/100 Mbps 150GB/month	940/100 Mbps 150GB/month	940/100 Mbps 250GB/month
TV	Major networks like CTV, CBC and Global + specialty channels like CBC News and Much	Major networks and speciality channels +15 à la carte channels of your choice like AMC and Discovery	Major networks and specialty channels + 30 à la carte channels of your choice + TMN, TMN Encore, HBO Canada, Kids SuiteTM and CraveTV™.
Phone	UL Canada & US	UL Canada & US	UL Canada & US
Promo Pricing	N/A	$125.00	$157.00
After 3 months	$133.00	$151.00	$188.00

Source: Company Websites

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The purpose of this report series is to examine potential scenarios within the Canadian telecom sector that could have implications for investors. As scenarios consider a range of outcomes with uncertain probabilities, our primary objective is to provide additional qualitative and quantitative analysis that can bring incremental perspective to investors.

September 3, 2014 – Rogers Communications - Big Bang Theory and the Five-Year Bull Case

October 10, 2013 – Sizing Up a BCE-Bell Aliant Transaction

January 15, 2013 – Personal Information Exchange

August 7, 2012 – Manitoba Telecom: On a Path to an End Game?

Companies mentioned

BCE Inc. (TSX: BCE; $53.97; Outperform)

Cogeco Cable Inc. (TSX: CCA; $68.87; Outperform)

Manitoba Telecom Services Inc. (TSX: MBT; $29.05; Sector Perform)

Quebecor Inc. (TSX: QBR.B; $29.81, Outperform)

Rogers Communications Inc. (TSX: RCI.B; $45.31, Sector Perform)

Shaw Communications Inc. (TSX: SJR.B; $26.76; Sector Perform)

TELUS Corporation (TSX: T; $44.45; Outperform)

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