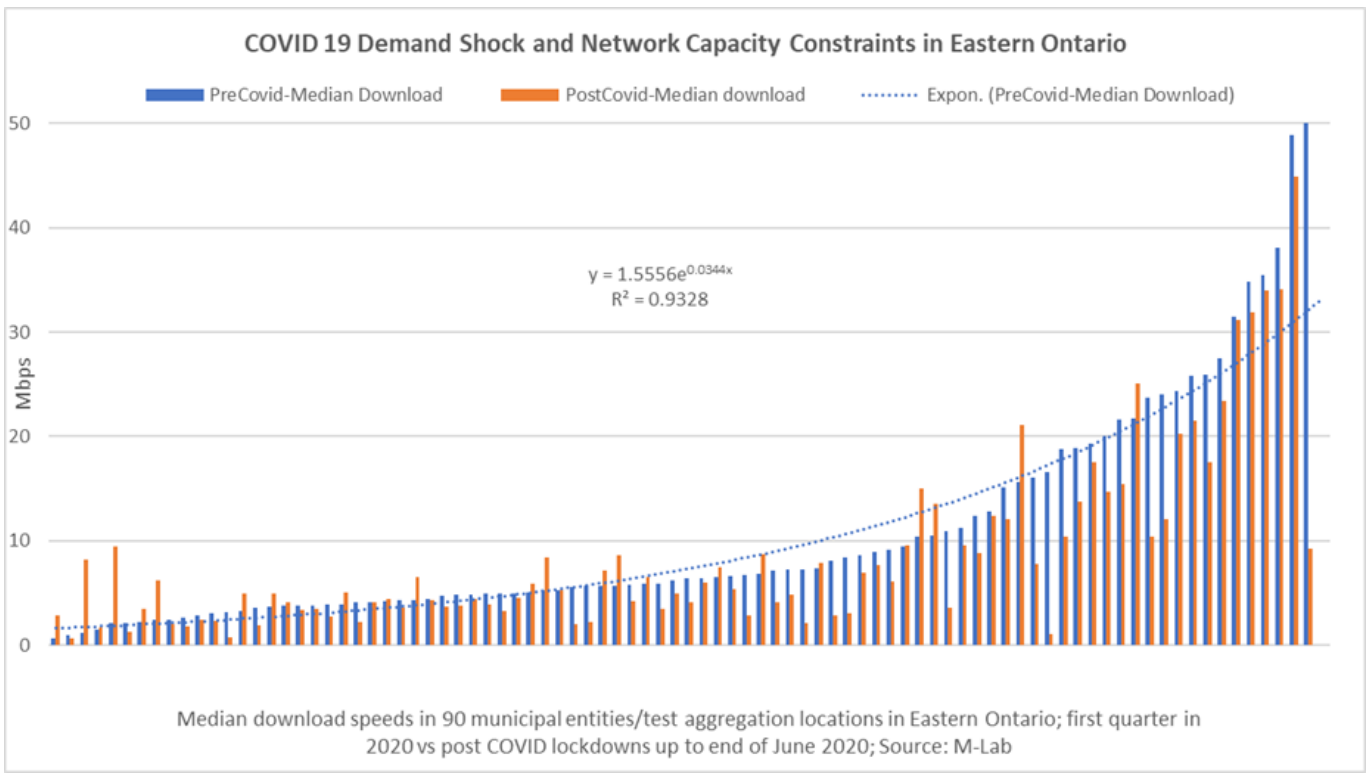
Economic Benefits of Investing in Basic vs. Gigabit Broadband Infrastructure in Rural Eastern Ontario

Summary of Policy Brief

Context: As part of their response to the COVID-19 pandemic, the Eastern Ontario Wardens' Caucus (EOWC) and the Eastern Ontario Leadership Council (EOLC) have prioritized improving the quality and affordability broadband Internet connectivity in the Region. To achieve this objective, the Eastern Ontario Regional Network (EORN) has developed two high-level technical strategies that aim to enhance broadband infrastructure capacity and service quality in underserved areas of the Region (i.e. those areas where services that meet the basic service speed targets defined by the Canadian Radio-television and Telecommunication Commission (CRTC) are not available). Having costed the options, EOWC/EORN aim to better understand how the two models differ in their potential economic benefits in order to assess against their fixed capital cost requirements. This report analyzes a subset of the potential benefits associated with the two strategies for improving Internet connectivity in rural eastern Ontario.



The challenge: EORN has previously mapped gaps in service speeds on offer in the Region using data provided by service providers to CRTC and Innovation, Science and Economic Development Canada (ISED. According to EOWC/EORN's estimates based on data on maximum advertised speed on offer as compiled by ISED, approximately 50% (285,000 of dwellings/pseudo-households) in eastern Ontario currently cannot access services that meet the 50/10 Mbps CRTC established back in 2016. This translates to nearly half of eastern Ontario's population outside of Ottawa (approximately 600,000). This level of service may have been adequate for basic Internet applications that were essential before the pandemic (e.g. email, web browsing, downloading media content). However, they are not sufficient for enabling reliable use of multimedia and cloud-based applications requiring reliable, more symmetric speeds, and low-latency connectivity. It is precisely these applications that have now become vital to the ability of people to work from home, continue with their education, receive healthcare, and communicate with their friends and loved ones.

Proposed solutions: Future state scenarios EOWC/EORN have outlined range from a lower cost option designed to improve regional network capacity to deliver speeds that satisfy "basic service" aspirational speed targets of 50/10 Mbps (with a combination of wireless and wired/fibre access technologies), as well as more ambitious proposals that would expand access to ultra-high capacity/low latency fibre-to-the-premises (FTTP) networks to 95% of premises in underserved areas of the Region (266,000 dwellings/premises). The basic service model requires around $700 million in fixed capital expenditures to expand access to 50/10 Mbps service offers, while the Gig model is estimated to require around $1.6 billion in capital expenditures. EOWC/EORN estimate that a public subsidy between 60 to 80 percent of the total fixed capital expenditures will be required to bring up the expected rate of return facing private providers sufficiently to attract complementary private investments. Relative to the basic service model, the Gig model would require $600 to $800 million more in public subsidies to implement.

Summary of findings: In broad terms, the Gig model would be more efficient from the perspective of people that live and work in areas that will have to rely on less reliable and capacity constrained large cell wire less technologies in the basic service model. The Gig model is also more equitable than the basic service model as it would expand access to fibre-based services that are now available in Canada's urban cores, as well as in larger cities in eastern Ontario. A key question for regional and upper-tier stakeholders at this stage of planning and exploration of funding options is if the economic benefits of the additional investment the Gig model in terms of efficiency and equity gains are worth the additional subsidies it requires compared to the cheaper wireless option for higher cost areas the plan aims to serve. To answer this question, this report analyses a number of key economic channels through which ultra-high speed/low latency fibre optic technologies generate economic value for consumers, service providers, and governments. We find that the projected economic benefits of the EORN Gig project clearly outweigh its costs in terms of public fixed costs subsidies that its implementation will require, while lower operational costs of fibre optic access networks will enhance the technical and financial sustainability of this strategy. In addition to lower speeds and hard to resolve reliability issues (i.e. in the spring when leaves grow), the large wireless component in the basic service model will require recurring investments in wireless equipment with a short lifespan. This will threaten the quality of service available to people as demand grows on congestion prone and hard to scale wireless technologies, as well as the financial viability the EORN basic service model without additional public subsidies in the future. Combining short to long term estimates of the impact of the EORN Gig model on employment and GDP, we find that full upper-tier tax recovery for the Gig project will be feasible 10 to 15 years post deployment. The following table summarizes some of the key findings and mid-range estimates derived in the report.

Prepared for the Eastern Ontario Wardens' Caucus (EOWC)/Eastern Ontario Regional Network (EORN)
By Reza Rajabiun, PhD, LLM

Economic Benefits of Investing in Basic vs. Gigabit Broadband Infrastructure in Rural Eastern Ontario

Summary Table: Findings and Economic Benefit Estimates

Element	Findings/Estimates Note: Mid-range estimates	Comment/Explanation
Efficiency	Gig model vastly superior in translating investment into network improvements	~2 times CAPEX in Gig model will translate into 20x more capacity downstream and 100x more capacity upstream compared to basic service model
Equity	Gig model vastly superior as extends ultra-high speed, low latency fibre access to 95%	Basic service model aims to achieve a minimum standard that may not be adequate anymore, while the Gig model designed to deliver services that are comparable in quality to those available in large urban centres
Current vs. future investment requirements	Over 4 to 6 equipment refresh cycles, the costs of the Gig vs. basic service models will be comparable	CAPEX in Gig model mainly in fibre with a very long lifespan vs. basic service model where a large portion of CAPEX in wireless equipment that needs to be replaced every 3 to 7 years (we assume 5 years for the analysis here)
Affordability	Capacity constraints under the basic service model will lead to higher quality adjusted prices. Gig model cheap to scale as demand grows in the future	Data caps, overage fees, and/or throttling of speeds remain common in the mobile and fixed wireless broadband markets, while FTTP deployments will enable unlimited data services with little service quality degradation
Quality of Service (QoS)/reliability	The fibre portions of both plans have the capacity to deliver high availability/quality services	Fibre more reliable than copper and wireless, particularly in the spring when the trees turn green. It is not clear if the wireless portion of the basic service model will enable delivery of broadband services that will meet CRTC latency and other minimum QoS standards
Synergies with 5G	The basic service model does not expand "deep fibre" very much into rural areas	Gig model can help reduce the costs of deploying "small cell"/5G networks facing wireless service providers, municipalities, and small underserved communities.
Investment incentives	Subsidizing low capital intensity wireless will reduce take up rates for high-quality technologies later	Adopting the wireless portion of the basic service model will undermine the long-term case for deploying fibre access networks and decommission decades old copper telephone plants
Complementarities in fixed/wireless service quality	Accelerating fibre deployments will improve wireless service quality in the Region	Expanding access to ultra high speed/low latency fibre networks allows high demand users to switch to the higher quality network, reducing the load on congestion prone wireless broadband networks on the rural edges of the network
Complementarities with EORN cell gap project	Macro cell design in basic service model may help mitigate cellular coverage and capacity gaps	EORN's cellular project is already working to address coverage and capacity gaps in 4G/LTE macro cell infrastructure, the marginal value added from the 50/10 basic service design limited relative to the Gig design that would enable microcell/5G network diffusion in small towns/hamlets remains unclear
Copper decommissioning	Gig model would allow for extensive copper decommissioning and cost reduction for incumbent telecom provider in the long run	Universal service obligations on telephone and low speed data access require incumbents to maintain decades old and expensive to maintain copper plants. Unless they have first deployed fibre access networks in a particular area, CRTC is unlikely to allow incumbents to decommission copper plants
Consumer welfare	$1.3 billion over 10 years post deployment with Gig model	Mid range consumer surplus gains from access to ultra-high speed/low latency/symmetric fibre vs. legacy DSL/cable: $1000 per year per subscriber; at 50% FTTP take up in region at current market prices for Gig services in urban
Consumer savings from price commitments	Additional $650 million over 10 yeas post deployment with Gig model	Assuming EORN can obtain Gig pricing discount commitments of $40 per month relative to current market prices of $120 for Gig services (where available) from its service provider partners in exchange for public capital expenditure subsidies
Operational cost reductions from fibre vs. copper	$13 million per year at 50% take-up ramping up to a total of $200 million over 10 years	Extrapolating from Bell Aliant cost reductions from transitioning customers from copper to FTTP at ~ $100 per year per subscriber
Equipment refresh	$550 million more required over 20 years/4 equipment refresh cycles for basic vs. Gig model ($3700 per household)	Mainly due to the high proportion of wireless equipment in the basic service model, which needs to be replaced every 3 to 7 years. Long term capital cost requirements of both model broadly comparable over a 20 to 30 year time horizon/expected life of fibre optic assets
Emissions	Gig model significantly less power consumption/pollution	Controlling for data consumption levels, wireless broadband generally has 10 time the power consumption of wired; fibre has about 1/5 of power consumption of legacy DSL and 1/10 of coaxial cable. Particularly relevant differentiator given rapid growth in data demand at home caused by COVID
Property values	3% growth in median property values, or $7500 per home	Per home benefits in terms of property values higher than EORN's estimated costs of FTTP deployment per home (between $4000-$6000 depending on the model). With COVID, it will be very hard to sell houses with sub-par connectivity and people will value homes with reliable connectivity relatively more. The FTTP premium on property values might be substantially higher than our mid range estimates. Our high end estimate of an increase of $17,500 per home might be more realistic at this point than the mid range estimates
Municipal property taxes	$20 million per year/$200 in 10 years	Assuming a property value tax rate of 1%. Note that there some variation around this rate at the local level. Can materialize post deployment and once the FTTP premium is incorporated in taxable property value assessments. Amount not sufficient to cover/finance deployment costs locally. Explains why upper-tier financial support required from broader tax revenue streams
Telecommuting: Private benefits	$400 million annual cost avoidance for rural telecommuters in the region	At 20% telecommuting rate post COVID and cost avoidance of ~$8,000 per year per rural telecommuter, based on estimates from Southwestern Ontario and Halton Region. The potential private benefit higher than EORN's estimated costs of fibre deployment per household ($4000-$6000)
Telecommuting: Public benefits	200 kg reduction in per capita CO_2 emissions	
Home-based healthcare	$170 million (4%) reduction in the costs of healthcare delivery in the Region	Based on estimates from case studies on FTTP and advanced healthcare application deployments in rural Sweden. This does not include benefits in terms of potential benefits from quality improvement and other benefits associated with remote healthcare deliver in the time of COVID
Employment and taxes: Deployment phase (first 3 to 5 years)	12,000 jobs sustained/created with Gig model; 3000 in region $500 million in upper tier tax recover for construction spending	Deployment phase employment and tax recovery from basic service model lower proportionally to the lower level of investment and fibre construction in relatively high cost areas. Based on industry specific and generic infrastructure multiplier estimates. Note that fiscal multipliers tent to be higher in times of recession/depression where there is substantive slack.
Employment and taxes: Long term (5-10 years post deployment)	4000 additional local jobs from Gig project; reduction of unemployment by 3.5%; $27 million annually in additional taxes	Based on previous estimates from Bell Aliant FTTP deployments and diffusion of FTTP in French municipalities, scaled to the size of the labour force in target area
GDP growth and tax recovery	Short to medium term: -GDP impact: $1.4 billion -Tax revenue: $450 million Medium to long term: -GDP impact: $2.4 billion -Tax impact: $800 million	Using generic Ontario public infrastructure spending multiplier estimates from previous studies compiled for the Ontario Government to assess previous programs and as baselines for the development of the Ontario's Long Term Infrastructure Plan (LTIP, 2017).
Medium to long term GDP growth and total tax recovery (5 to 10 years post deployment)	$300 million increase in GDP level in rural eastern Ontario; $100 million annual increase in tax revenue from the region.	Based on literature review of estimated elasticities of ultra-high speed/fibre broadband diffusion around the world, scaled to regional characteristics. Impacts to materialize post deployment, take up, and productivity growth phase. Post deployment and ramp up in take up. 10 year total GDP impact up to $3 billion; tax revenue impact up to $1 billion