Broadband Connectivity in Rural Canada

Brief to the House of Commons Committee

Submitted by: Blue Sky Economic Growth Corporation

What was said in the Federal Budget 2017 (Chapter2)?

"Charting a Better Future for Rural and Northern Communities"

Investments in rural and northern infrastructure will help grow local economies, build stronger, more inclusive communities, and help safeguard the environment and the health of Canadians.

Because rural and northern communities have unique infrastructure needs that require a more targeted approach, the Government will invest $2.0 billion over 11 years to support a broad range of infrastructure projects, to be allocated to provinces and territories on a base plus per capita allocation basis.

Projects could include improving road access or expanding Internet connectivity—building on progress already underway thanks to a $500 million investment in rural broadband included in Budget 2016.

A further $5 million over five years will be made available to Statistics Canada and the private sector to conduct "surveys on the impact of digital technology in Canada."

Reality Check

The increase in Canadian fibre broadband subscriptions slowed in 2016, slipping to ninth in growth among 35 Organization for Co-operation and Economic Development (OECD) countries.

According to December 2016 numbers recently released, broadband fibre connections — which includes fibre-to-the-home (FTTH), fibre-to-the-premises (FTTP), and fibre-to-the-building (FTTB) — grew 38.2 per cent between 2015 and 2016 in Canada. Comparatively, by the end of 2015, Canada was ranked seventh for growth in fibre connections, increasing nearly 64 per cent from 2014.

Australia edged out the 2015 growth leader, New Zealand, with a nearly 122-per-cent increase in fibre subscriptions.

Overall, 10 per cent of Canada's broadband connections are fibre, the OECD figures said, well below the OECD average of 21.3 per cent, and the 74.9 per cent of total connections in Japan.

Canada also ranks 12th out of OECD nations for the highest number of fixed broadband subscriptions per 100 inhabitants, with 36.8, but remains among the bottom of the pack — 28th — in mobile penetration, with 68.8 subscriptions per 100 inhabitants, down a spot from the previous year.[1]

How do we fix this?

- We need a plan-the CRTC cannot declare in December 2016 " that internet access is a basic service" without a National Broadband Strategy in place to understand how we will get there.
- There are too many different opinions about the fact that Canadians are well served...for example

[2]**Table 1 – Availability of Broadband Services by Canadian households, Selected Download Speeds, 2014**

Download Speed Range	Availability (Percentage of Households)	
	Large Population Areas	Rural Areas
1.5 to 4.9 Mbps	100%	98%
5.0 to 9.9 Mbps	100%	86%
30.0 to 49.9 Mbps	99%	28%
100+ Mbps	96%	25%

This table clearly shows excellent coverage in urban Canada and is unfortunately what is used to determine need for government assistance. If the suggestion is that 100% of Canadians in large populations have access to high speed internet that is above 9.9 Mbps, but, only 86 % of rural areas, then, that still means that nearly 5Million Canadians who live in rural areas cannot get what our government currently states is the target level of service and only 28% of rural Canadians can receive service that is still below the CRTC "basic service" threshold. Clearly we are in need of a strategy to:

- Understand with absolute clarity what is needed that includes rural Canada, and;
- Determine how to get to the point where all Canadians could receive greater than 50Mbps service and beyond.

[1] https://thewirereport.ca/2017/07/07/canadian-fibre-connections-grow-to-10-per-cent-oecd/

[2] Source: Table prepared by the author using data from the Canadian Radio-television and Telecommunications Commission, *Communications Monitoring Report 2015.*

HoC Standing Committee Questions:

1. What constitutes acceptable High Speed Service?

It is has been a universal understanding for some time that access to high speed internet is essential for advancing our economy, quality of life and the sustainability of our communities. So why are there areas in rural and Northern Ontario where high speed internet is not yet available to all?

In spite of the recognition of the need for better internet access, and the efforts of the private sector, public stakeholders like Blue Sky Net and provincial and federal funding programs, some areas remain un-served while others do not have the bandwidth capacity essential to serve the community needs. Due to low population densities, a lack of "anchor users" and environmental and geographic factors, private sector service providers have difficulty justifying the large investment necessary to extend basic service and increase the bandwidth capacity of their existing networks. Across the country, underserved areas tend to have these factors in common;

Population Density

Areas that currently have a lack of internet access and capacity tend to have lower population densities. There seems to be no "magic number" in terms of households or population counts per square kms that would indicate an area to have inadequate access. Often-times underserved areas tend to have a *relative* low population density as compared to a nearby urban community.

Under a Northern Ontario perspective, the general trend seems to be as follows- Population centres of 20,000 people plus get access to "next generation" services (I.e. LTE, FTTH) 18 months-2 years behind the services are rolled out in major Canadian centres like Toronto, Vancouver, Montreal, etc. Next urban communities[3] with 2,5000 people plus, especially those on highway corridors are next to have services rolled out. Within this group it is not a guarantee they will see it at all, but are likely to see some service improvement. For example; Urban community of 20,000 gets FTTH, the next year small urban community of 2,500 may get Fibre to the Neighborhood by the same ISP with improved service but not equivalent to the larger urban neighbor.

It is difficult to try to assess any logic to broadband improvement schedules to areas smaller or more dispersed than the above outside of when public funding is made available.

[3] "Urban Community" has no strict definition in this context. Simply meant as a community with an identifiable cluster of population which is higher than surrounds it.

Anchor Users

Simply put, these are the large commercial and industrial users that likely need specialized or custom service delivered to their location. Often, neighborhoods reap the benefits of these telecom requirements as nearby backhaul components are upgraded to meet the demands for the anchor tenant thereby also potentially upgrading the capacity to nearby non-commercial users. In small semi and non-urban areas there are less anchor tenants to spur these improvements.

Environmental/Geographic Challenges

Separate and apart from low population density and dispersed households is the potential for difficult geography in these unserved areas. Again, from a Northern Ontario perspective, some of the desirable elements that come with "country living" also can create obstacles for providing advanced telecommunication services.

Water- residents who live by the water are often at some of the lowest elevation points nearby increasing the likelihood of being obstructed from consumer telecom services as it "floats overhead."

Foliage- Dense foliage, especially from coniferous tress can offer a dense barrier where wireless signals cannot penetrate. This foliage, especially located near a customer's home or business called "foreground obstruction" makes securing wireless signals exceptionally difficult.

Topography- More often than not and especially in Northern Ontario, underserved areas have considerable relief in the geography. Sharp and jagged cliffs of the Canadian Shield also obstruct wireless signals to a greater degree than rolling or undulating landscapes. In these situations, more towers and/or taller towers are often needed to "backfill" dead zones.

Also, this landscape populated with trees, lakes, rivers and granite makes installing new wireline infrastructure difficult as well.

Service Targets, Scalability

Currently, the CRTC's vision of providing the majority of Canadians a 50Mbps download and 10 Mbps upload connection seems reasonable, but is it achievable?

Blue Sky Net's position is that incremental improvements may be a better approach in some areas rather than a hard and fast "one size fits all" solution. While BSN recognizes that trends point to average consumers needing better and faster connections where yesterday's standards don't meet the needs of today's requirements, it also recognizes that meeting those needs in certain areas may not be economically feasible.

As described above, the population may be too sparse, or terrain too rugged, or a combination of these factors that make operating a 50Mbps network not sustainable in the long term even with substantial capital subsidies for infrastructure costs. This is not to say that the area does not need some sort of service improvement or government intervention though.

One approach to these areas might be to adjust the speed and quality of service targets to an appropriate level where there is marked service improvements and also becomes viable for the provider. Further requirements could be applied to contribution agreements where the service operator may have to incrementally improve service levels or backhaul capacity, etc.

Acceptable High Speed Service

Again adopting a one size fits all speed target might be problematic because of economic barriers of operating networks in low density markets. Robust networks must be built in underserved areas, but the focus must be "tailored" to the area where service is being built out. Market forces tend to exist in urban areas that require very little outside investment. Urban areas have a high concentration of service subscribers and data usage. On the opposite end of the spectrum in more rural areas there becomes a "chicken-before-the-egg" scenario. Broadband services are more expensive, there are fewer options (low competition) and service tends to be of poorer quality. These factors can contribute to a lower customer subscription level on a per capita basis, meaning the small market subscribes even less than the larger urban market. A further paradox exists because rural communities are the ones that could take most advantage of advanced telecommunication services to overcome challenges of physical distance. A simple example being access to correspondence courses online to a community where the nearest community college/post secondary school is 200kms away.

Blue Sky Net's recommendation is that each community/area be examined individually before assessing speed/performance targets. Population density, current service availability, incumbent providers, backhaul capacity, distance to backhaul are all factors that must be considered first. Advanced analysis tools like Blue Sky Net's broadband analysis GIS exist and should be used to carefully analyse gaps in service first.

2. The financial challenges of implementing high-speed services.

Challenge 1: Unrealistic planning of deployment timeframes, budget and reliance on poor data:

In our work as a non-profit technology development corporation, we have observed many examples of network deployment planning which has been based on little more than intuition. Using the current Hexagon mapping system currently favoured by ISED, it is not granular enough to provide the reality of need, which can only be obtained by using mapping systems that provide parcel fabric property level views. When good proactive planning has not been done, the project rollout financial estimates are jeopardised because decisions are made

based upon poor data. The resulting plans do not properly consider the network architecture requirements or customer requirements and in some cases the serious challenge of land acquisition is overlooked.

Countries across the globe have defined long-term strategic plans that aim to increase the contribution of ICT to the overall GDP of the country. The Australian government launched their strategy in October 2012[4] and are now clear leaders in technology implementation and adoption.

A National Rural Broadband strategy although challenging, is one key initiative that has the goal of providing accessible and affordable broadband connectivity to everyone. This supports increased use of ICT technologies and provides digital inclusion for non-connected communities. As a consequence, the vision for deployment (the "why") needs to be clear before any planning decision (the "how") made. This strategy will also need to be adjusted if, for example, the environment changes in order to maintain alignment with on-going technology developments or there are changes made by incumbent ISP's.

The integrity of a rollout plan lies in the reliability of the data used to generate that plan. Obtaining accurate data is fundamental to planning. When planning a National Broadband Strategy (NBS), data on population and housing density can often be unreliable or out of date. Data that describes the parcel fabric, population, housing density and civil infrastructure can form the foundation of the NBS business plan and thereby determines the architecture of the network and the project budget for the network builds. The project budget is fundamental to all subsequent business planning, including the scale of the NBS rollout and the time required in building the projects. Therefore, if the base data is unreliable the entire plan becomes unstable and costs will be overrun, milestones will be missed and schedules will not be kept.

The amount of effort to validate data sets is not great when compared to the effort of managing a national broadband rollout based on bad data, yet our experience shows that the quality of base data is often not given enough serious consideration at the outset of national government Broadband project planning. Gathering, cross-checking and validating data should be one of the highest priorities before network planning begins.

The key to a successful NBS is neither a glitzy technology nor the speed of deployment. The key to success lies in proper planning. Putting effort up-front might feel like a delay, especially when everyone is eager to get started and to show progress, but proper planning will produce better outcomes faster and cheaper than rushing to deploy. While this may sound like a motherhood statement, it bears highlighting due to the number of communities in the most recent Broadband funding program, Connect to Innovate, that were deemed to be ineligible, when in fact many were proven to be well below the required 5Mbps download threshold.

[4] https://www.finance.gov.au/archive/policy-guides-procurement/ict_strategy_2012_2015/

Proposed Solution

The government of Canada, and the CRTC currently depend on a system referred to as the "hexagon maps", to determine where service is available. By their own admission, in depicting where areas are "served or underserved" it is described in the following manner.....

"For the purpose of these maps, the entire hexagon is classified as "served" by the given technology if at least one household has access to these target speeds in that hexagon. The actual speeds and coverage may vary depending on the technology. For example, wireless signals may be affected by distance from the tower, terrain and weather; similarly cable and digital subscriber line (DSL) technologies may be affected by distance and other factors. Actual availability may therefore vary within a specific hexagon".[5]

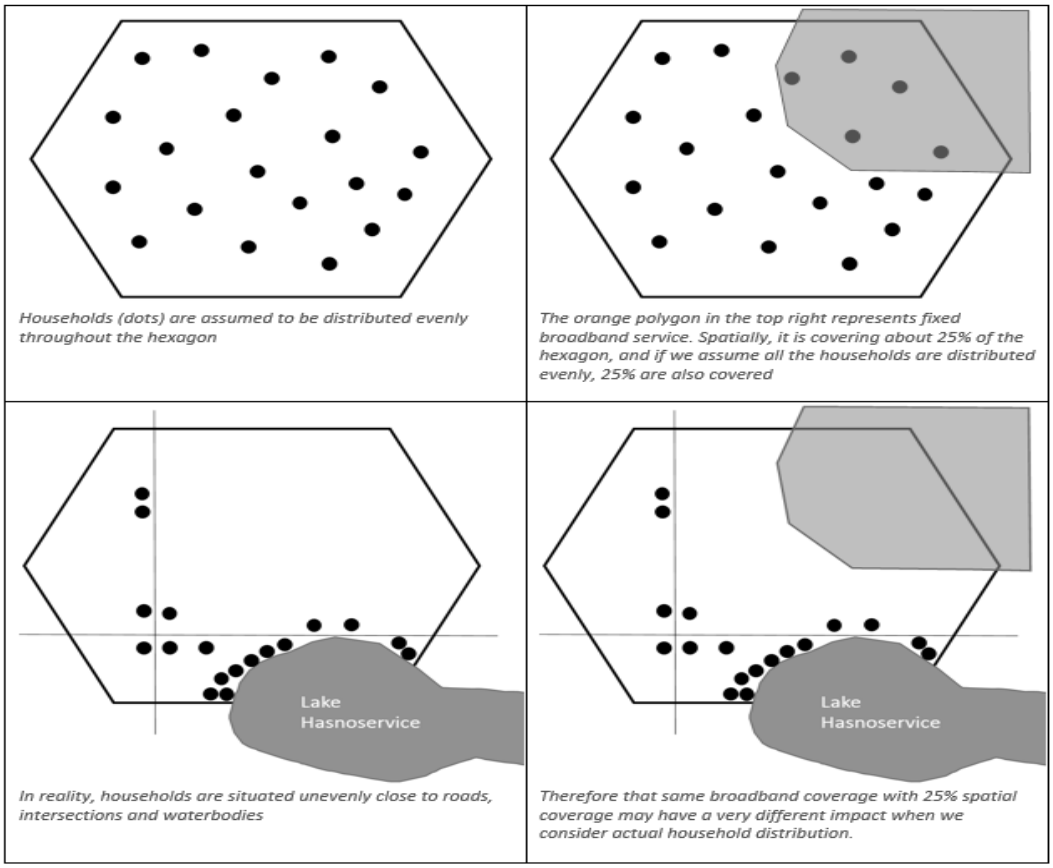
During the recent Federal Broadband funding program (Connect to Innovate) and the past Connecting Canadians program, these hexagon maps were used to determine eligibility of communities. Many communities were left off of the eligibility list because they were in hexagons that were deemed by ISED to be "served".

In the current Hexagon maps, each Hexagon is given an estimated household and population count. It must be assumed then, that these single points of population and houses have been distributed evenly throughout the entire 25 square km area of the hexagon in the absence of more granular information. In reality, this is not the case. Homes are situated unevenly throughout the hexagons clustered around roads, intersections, lakes and schools or other institutions.

Given this fact, even if we mapped that broadband service was available to 25% of the hexagon's area, given the current model, we are forced to assume therefore that 25% of households are covered. Given the reality of the unequal distribution of households for the reasons listed above, we know this estimate is going to be inaccurate.

See example below.

[5] http://www.crtc.gc.ca/eng/internet/internetcanada.htm



Serving small gaps, but preventing overbuilds

From experience we've seen that it's pretty typical in suburban environments that multiple networks exist, each of which partially serves the broadband needs of the area. Within one single hexagon there may be 2-3 unique networks still not serving 100% of the area. It is unlikely that these networks are capable of delivering the new expectation of 50/10Mbps.

The main issue with the Hexagon maps in situations where there is multiple networks partially serving a hexagon is two-fold;

a) We cannot properly quantify the gap or inequity of coverage because we do not actually know where the households are in the hexagon and

b) Even if subsidies could be accessed in these situations to improve coverage there is no mechanism to monitor the potential for overbuild, without more granular information.

Funded by FedNor, we have developed a GIS and database for Northern Ontario whose model can be applied to the rest of Canada. The GIS is called BAIMAP (Broadband and Associated Infrastructure Mapping and Analysis Project) and can, if needed, link broadband availability to every property in Northern Ontario.

In 2013, and again in 2015 we reached out to any ISP that owned and operated broadband networks in Northern Ontario. We asked them to provide coverage boundaries as well the platform, location of key infrastructure and performance measures for their services.

At the time, both the CRTC and the Federal Government were targeting 5Mbps down and 1Mbps uploads as a target for every Canadian to have access. We then grouped all the coverage files into three classifications:

1) Areas that cannot receive fixed broadband service and were likely to only access broadband through Satellite and/or cellular/Mobile broadband.

2) Areas that could receive broadband service but based on the performance measures provided by the submitting ISPs would likely experience a service that consistently delivered below the 5/1 service threshold, and

3) Areas that were covered by fixed broadband networks and constantly delivered 5/1 service. We then had an accurate depiction of three levels of spatial broadband coverage.

To analyze the impact of this coverage, we overlaid the spatial coverage on a number of base maps including the hexagon maps and Statistics Canada's Dissemination Blocks. However, the most accurate analysis comes from cross referencing our spatial coverage with digital parcel maps.

In Ontario, the Municipal Property Assessment Corporation (MPAC) maintains active records for every assessed property in Ontario of ownership, assessed value, street address, property type and classification. Along with their strategic data management partner Teranet, this assessment data is linked to a digital parcel boundary map for each and every assessed property, linking the two files with a common (usually) 15 digit roll number.

We then spatially matched the coverage files for all of Northern Ontario, with the physical property files to determine service availability for each property. Now, we have a database and GIS layers of over 530,000 unique properties all linked to service availability and corresponding gaps.

This GIS data can then be rolled up and customized for visual or tabular reports by community, district, or customizable units. We have also used the hexagon maps as a giant "cookie cutter" to link each hexagon in Northern Ontario with our property level analysis results. Therefore, we have the ability to maintain the benefits of the consistent size of the hexagons but have the confidence that the analysis behind the results is as granular as possible.

We have contacted several provincial level organizations across the nation, to determine the availability of parcel level data. During these preliminary discussions it appears that some level of parcel data is available across the country.

BAIMAP could be replicated across the country as the vehicle to properly assess the "actual need" across the country. In the most recent national program, 4.4 Billion dollars was requested

and the fund was 500 Million in Connect to Innovate. There needs to be a strategy to more accurately determine the required budget.

Blue Sky Economic Growth Corporation (Blue Sky Net) is a not-for-profit corporation, incorporated in 2002. Our mission is to act as a regional economic development facilitator in the Districts of Nipissing, that part of the District of Parry Sound east of Dun Church, the south part of the District of Temiskaming including Temagami, West Nipissing, Sudbury East and Manitoulin Island as defined by our articles of incorporation.

In terms of delivery of ICT services, our regional service delivery area has been defined by FedNor as Nipissing, Sudbury East, Manitoulin Island and points in between. Blue Sky Net is the ICT division of the organization.

We believe that technology development is important in our service delivery area because rural Canada is important to the country. Rural areas are the sites of food production, resource extraction, energy generation, clean water and air, and future carbon sequestration. In other words, rural Canada is a site of significant economic activity, job creation, environmental stewardship, and social/cultural production. All of these activities need access to affordable, reliable, dependable Broadband coverage.

We strongly believe that authentic engagement must take place at the local and regional level. We continue to encourage a "place-based" policy whereby policy is created that allows communities to respond to economic opportunities and challenges by capitalizing on local and regional assets. Throughout the last three years of our current operating contract, Blue Sky Net has actively supported and engaged local resources and we understand technology needs and development in the North.

Blue Sky Net believes in a collaborative approach and that strategic investments must be made among and by the federal, provincial, regional and municipal governments which will go a long way to ensuring a vibrant rural Northern Ontario, a place where people will want to live, gain livelihoods and invest. Our mission is to improve access to technology for those businesses and residential consumers. Technology is empowerment to everyone who uses it, but we live in an age of mass distraction and now more than ever is a time when focus is needed. We look to help weed through the distraction, where focus is needed.