

# 5G Resource Guide



**EORN**

EASTERN ONTARIO  
REGIONAL NETWORK

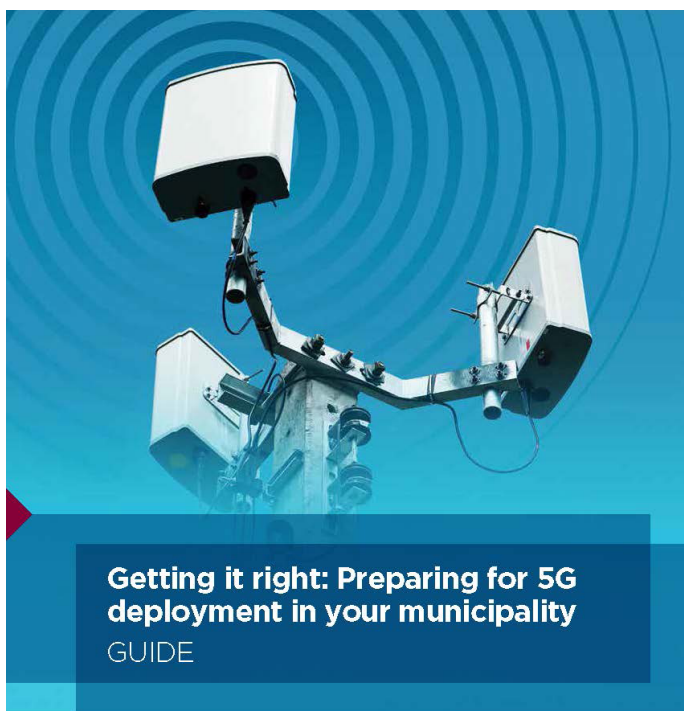
## Table of Contents

5G resource highlights.....	3
Introduction.....	4
EORN’s position.....	5
Resources.....	6
Federation of Canadian Municipalities (FCM).....	6
Getting it right: preparing for 5G deployment in your municipality.....	6
Telecommunications and rights-of-way: a handbook for municipalities.....	7
The Government of Canadian.....	7
Safety Code 6: Health Canada’s Radiofrequency Exposure Guidelines.....	7
Innovation, Science and Economic Development Canada (ISED): Radiofrequency Energy and Safety.....	8
Consumer and Clinical Radiation Protection Bureau.....	8
World Health Organization (WHO).....	9
The International Commission on Non-Ionizing Radiation Protection (ICNIRP).....	10
The Institute of Electrical and Electronics Engineers (IEEE), through the International Committee on Electromagnetic Safety (ICES).....	11
American Cancer Society.....	11
Canadian Wireless Telecommunications Association (CWTA).....	12
5G Canada Council (5GCC).....	12
International perspectives.....	13
New Zealand.....	13
United Kingdom.....	13
Frequently asked questions.....	14
Appendix A - Summary of links.....	16

# 5G resource highlights

Health Canada ensures that 5G installations comply with all existing safety regulations, including Safety Code 6

Large safety margins have been incorporated into Safety Code 6 limits to provide a significant level of protection for the general public and personnel working near radio frequency sources.



Resources such as the Federation of Canadian Municipalities' *Getting it right: Preparing for 5G deployment in your municipality* can help you prepare for questions about emerging telecommunications technology.



**International perspective - New Zealand Ministry of Health** "5G is just another application of radio technology. There is nothing unique to 5G that would make it interact differently with the body than other radiofrequency fields (radio signals). For this reason all the previous research on radiofrequency (RF) fields and health also tells us about the effects and safe levels of 5G"

# Introduction

The Eastern Ontario Regional Network (EORN) is committed to making eastern Ontario one of the best connected regions in the world. We understand that connectivity plays a critical role in ensuring a community's development and prosperity.

EORN has secured funding for a project designed to improve cell phone coverage and capacity in the region (the Cell Gap Project). Construction associated with the Cell Gap Project will begin in 2021. Part of the project will include construction of cell phone towers and antennas by telecommunications service providers (TSPs) .

TSPs make their investments with an eye on the future. TSPs don't want their technology to be outdated in only a few years or to be left behind in the race for the fastest and best network. All new equipment that is installed across the region (such as antennas, radios and routing electronics) is designed to support the transition to 5G.

5G (or fifth generation) refers to the next generation of mobile wireless standards and technologies. 5G will provide significant improvements over the current 4G. 5G is about much more than boosting speeds on your mobile phone. It is ultimately about enabling faster internet connectivity everywhere and for everyone.

Canadian TSPs are actively advertising their 5G networks. And while most of those networks are not fully developed and presently only available in densely populated areas, their commitment to a fully integrated 5G network is obvious. EORN is committed to ensuring that all municipalities in eastern Ontario benefit from the roll out of 5G. No family should be left behind because they choose to live in a suburb or a rural setting.

As a result, local municipalities and elected officials are receiving questions about 5G. In an effort to assist municipalities, elected officials and staff in preparing for questions about 5G, EORN has developed this resource. It is an overview of what the government and some other respected organizations such as the Federation of Canadian Municipalities (FCM), the American Cancer Society (ACS) and the World Health Organization (WHO) are saying about 5G.

Note that website links to resources are embedded in the written text throughout the document and then repeated in Appendix A for easy copying and pasting.



# EORN's position

5G is a new technology and we understand that some people will have questions and concerns, in particular about health and safety. All Canadian telecom service providers must build their mobile networks based on established industry standards and safety guidelines set out by Health Canada. This applies to all generations of equipment including emerging technologies such as 5G.

According to Health Canada and the WHO, cell phone towers are not a health risk and exposure to radiofrequency (RF) is well below Health Canada limits.

Current Canadian health and safety limits also cover the frequency ranges that would be used by 5G devices and installations.

**A connected community is a prosperous and competitive community and at EORN we aim to work with TSPs to have the best and safest cell network in accordance with the rules set by the appropriate authorities.**



# Resources

While EORN doesn't conduct its own research on health and safety concerns, we do keep up with rules and regulations. Below is a list of resources we reference. For each, we have highlighted some documents and links that might be particularly useful for municipalities in eastern Ontario as you prepare for expansion of telecommunications networks and the arrival of additional cell towers.

## **Federation of Canadian Municipalities (FCM)**

FCM is a national voice of municipal government. Its membership includes more than 2,000 municipalities of all sizes, from Canada's cities and rural communities, to northern communities and 20 provincial and territorial municipal associations. Part of the FCM mandate is to conduct research on behalf of Canadian municipalities and publish its findings.

### **Getting it right: preparing for 5G deployment in your municipality**

[This FCM document](#)<sup>1</sup> is written specifically for municipalities. It describes technology related to 5G and how it works in layman's terms. It also addresses the current legislative backdrop and explains the differences between the Telecommunications Act, the Radio Communication Act and the Broadcasting Act. And it includes case studies.

Quotes from the FCM document:

“Health Canada ensures that 5G installations comply with all existing safety regulations, including [Safety Code 6 \(SC6\)](#)<sup>2</sup>, which determines exposure limits for wireless devices and their associated infrastructure. Canada's limits are consistent with the science-based standards used in other countries. Large safety margins have been incorporated into these limits to provide a significant level of protection for the general public and personnel working near radio frequency sources.

Innovation, Science and Economic Development Canada (ISED) requires that all wireless equipment sold in Canada, including consumer devices such as cell phones, tablets and Wi-Fi routers comply with SC6. Carriers are obligated to comply with these regulations.”



# Resources

## Telecommunications and rights-of-way: a handbook for municipalities

Another useful FCM document while preparing for 5G and additional cell towers is:

[Telecommunications and rights-of-way. A handbook for municipalities](#)<sup>3</sup>. Amongst other things, the document includes a model Municipal Access Agreement (MAA), which was the result of a collaboration between the municipal sector and the telecommunications industry and was sponsored by the Canadian Radio-television and Telecommunications Commission (CRTC).

Quotes from the FCM document:

“Depending on your municipality’s circumstances, you might decide to deal with the occasional request from a carrier through ad hoc or individual permits. Alternatively, if you receive a number of requests, you might decide to negotiate long-term, MAAs with carriers.”

“If a municipality has not yet put in place any process by which carriers must first obtain approval before undertaking work within the municipality, experience has repeatedly demonstrated that every time a carrier breaks open a right-of-way, it invariably transfers costs to municipal taxpayers.”

## The Government of Canada

### Safety Code 6: Health Canada’s Radiofrequency Exposure Guidelines

The Canadian government is committed to protecting the health and safety of Canadians from environmental risks, including those posed by exposure to radiofrequency (RF) electromagnetic fields - the kind of energy given off by various electronic devices such as cell phones and Wi-Fi, as well as broadcasting antennae and cell phone towers.

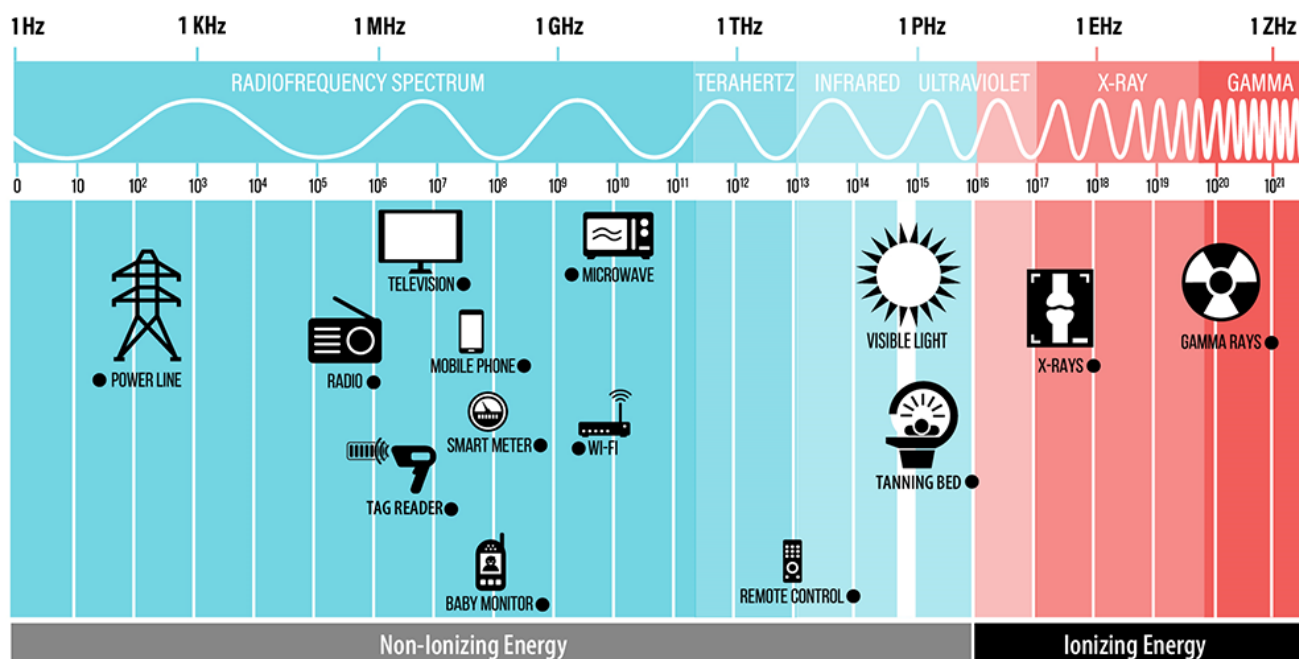
The purpose of [Safety Code 6 \(SC6\)](#)<sup>2</sup> is to establish safety limits for human exposure to RF fields in the frequency range from 3 kHz to 300 GHz. The safety limits in this code apply to all individuals working at, or visiting, federally regulated sites. The limits established in Safety Code 6 incorporate large safety margins to provide a significant level of protection for all Canadians, including those working near RF sources.



# Resources

## Innovation, Science and Economic Development Canada (ISED): Radiofrequency Energy and Safety

This [ISED website](#)<sup>4</sup> contains a lot of information about radiofrequency, non-ionizing and ionizing energy and the limits for wireless devices and antenna installations. This graph is from the ISED website and shows that cell phones operate in the RF range comparable to baby monitors, smart hydro meters, microwaves and Wi-Fi.



Examples of natural and human-made sources of electromagnetic energy. Source: [Government of Canada website on RF energy and safety](#)<sup>4</sup>

## Consumer and Clinical Radiation Protection Bureau

The Consumer and Clinical Radiation Protection Bureau (CCRPB) is responsible for the administration of the Radiation Emitting Devices Act, which addresses radiation safety issues for X-ray and non-ionizing radiation devices. The Act covers devices used in consumer and industrial applications, as well as medical devices.

CCRPB assesses, monitors and assists in the reduction of the health and safety risks associated with radiation exposure from devices, undertakes research into the biological effects of ionizing and non-ionizing radiation, develops guidelines, standards and safety codes, provides radiation safety inspections of federally-regulated facilities containing radiation-emitting devices, and provides advice on potential health impacts of sources of environmental noise.



# Resources

## World Health Organization (WHO)

WHO describes its primary role as directing and coordinating international health within the United Nations system. Its main areas of work are health systems, health through the life-course, noncommunicable and communicable diseases, preparedness, surveillance and response, and corporate services. WHO established the International Electromagnetic Fields Project in 1996. The project investigates the health impact of exposure to electric and magnetic fields in the frequency range 0-300 GHz and advises national authorities on electromagnetic field (EMF) radiation protection. WHO advocates for further research into the possible long-term health impacts of all aspects of mobile-telecommunications. The organization identifies and promotes related research priorities. It also develops public information materials and promotes dialogue among scientists, governments, and the public to increase understanding around health and mobile communications.

This is some of the information published by WHO on EMFs and 5G:

- [Electromagnetic fields and public health](#)<sup>5</sup>
- [5G mobile networks and health](#)<sup>6</sup>

Quotes from WHO:

“A common concern about base station and local wireless network antennas relates to the possible long-term health effects that whole-body exposure to the RF signals may have. To date, the only health effect from RF fields identified in scientific reviews has been related to an increase in body temperature (> 1 °C) from exposure at very high field intensity found only in certain industrial facilities, such as RF heaters. The levels of RF exposure from base stations and wireless networks are so low that the temperature increases are insignificant and do not affect human health.”

“Some people perceive risks from RF exposure as likely and even possibly severe. Several reasons for public fear include media announcements of new and unconfirmed scientific studies, leading to a feeling of uncertainty and a perception that there may be unknown or undiscovered hazards. Other factors are aesthetic concerns and a feeling of a lack of control or input to the process of determining the location of new base stations. Experience shows that education programmes as well as effective communications and involvement of the public and other stakeholders at appropriate stages of the decision process before installing RF sources can enhance public confidence and acceptability.”

# Resources

“Considering the very low exposure levels and research results collected to date, there is no convincing scientific evidence that the weak RF signals from base stations and wireless networks cause adverse health effects.”

WHO also writes that two international bodies produce exposure guidelines on electromagnetic fields. These guidelines are not technology-specific. They cover radiofrequencies up to 300 GHz, including the frequencies under discussion for 5G. Many countries currently adhere to the guidelines recommended by:

## **The International Commission on Non-Ionizing Radiation Protection (ICNIRP)**

ICNIRP issued [newly updated RF EMF guidelines](#)<sup>7</sup> in 2020 and wrote: the new guidelines protect against all potential adverse health effects relating to exposure to RF electromagnetic fields from 5G technologies.

Quote from ICNIRP:

“Another general characteristic of RF EMFs is that the higher the frequency, the lower the depth of penetration of the EMFs into the body. As 5G technologies can utilise higher EMF frequencies (>24 GHz) in addition to those currently used (<4 GHz), power from those higher frequencies will be primarily absorbed more superficially than that from previous mobile telecommunications technologies. However, although the proportion of power that is absorbed superficially (as opposed to deeper in the body) is larger for the higher frequencies, the ICNIRP (2020) restrictions have been set to ensure that the resultant peak spatial power will remain far lower than that required to adversely affect health. Accordingly, 5G exposures will not cause any harm providing that they adhere to the ICNIRP (2020) guidelines.”



# Resources

## **The Institute of Electrical and Electronics Engineers (IEEE), through the International Committee on Electromagnetic Safety (ICES)**

The International Committee on Electromagnetic Safety (ICES) operates under the rules and oversight of the IEEE Standards Association Standards Board and is responsible for development of standards for the safe use of electromagnetic energy in the range of 0 Hz to 300 GHz relative to:

1. The potential hazards of exposure of humans, volatile materials, and explosive devices to such energy
2. Standards for products that emit electromagnetic energy by design or as a by-product of their operation
3. Standards for environmental limits

## **American Cancer Society**

The American Cancer Society (ACS) is on a mission to free the world from cancer. It is funding and conducting research, sharing expert information, supporting patients, and spreading the word about prevention. While the American Cancer Society does not have any official position or statement on whether or not radiofrequency radiation from cell phones, cell phone towers, or other sources is a cause of cancer, it does have extensive and current resources on its website.

- [ACS on cell phone towers](#)<sup>8</sup>
- [ACS on cell phones](#)<sup>9</sup>

Quotes from the American Cancer Society:

“Cell phones communicate with nearby cell towers mainly through RF waves, a form of energy in the electromagnetic spectrum between FM radio waves and microwaves. Like FM radio waves, microwaves, visible light, and heat, they are forms of non-ionizing radiation. This means they do not directly damage the DNA inside cells, which is how stronger (ionizing) types of radiation such as x-rays, gamma rays, and ultraviolet (UV) rays are thought to be able to cause cancer.”

“The US Food and Drug Administration (FDA) issued a technical report based on studies published between 2008 and 2018, as well as national trends in cancer rates. The report concluded: “Based on the studies that are described in detail in this report, there is insufficient evidence to support a causal association between radiofrequency radiation (RFR) exposure and [tumor formation].”

# Resources

## Canadian Wireless Telecommunications Association (CWTA)

CWTA represents companies that provide services and products across the wireless sector and promotes the industry with the goal of ensuring continued growth of the wireless sector in Canada.

In April of 2020, CWTA published a 5G short summary document labelled “[Setting the record straight on 5G wireless and radio frequency safety](#)<sup>10</sup>”. It has useful links to additional resources on the last page.

At times, the CWTA collaborates with a consulting firm called Accenture Strategy. They have published several documents on 5G including:

- [Accelerating 5G in Canada. Benefits for cities and rural communities](#)<sup>11</sup>
- [Fuel for innovation. Canada’s path in the race to 5G](#)<sup>12</sup>

The following is an excerpt from the CWTA document “Accelerating 5G in Canada. Benefits for cities and rural communities”:

The advanced connectivity features of 5G, such as ultra-low latency (time to connect to a network), high bandwidth and massive machine-to-machine communication, can play a significant role in enabling a wide range of applications, including:

- Transportation: traffic management, autonomous vehicles, rail/transit maintenance
- Healthcare: connected ambulance, remote care, wearables
- Agriculture: crop and soil management, autonomous vehicles
- Energy management: smart grid, smart street lighting
- Water and waste management: smart metering
- Municipal services: smart parking meters, garbage collection, snow removal
- Public safety: smart policing, disaster management
- Rural connectivity: fixed wireless access

## 5G Canada Council (5GCC)

Mandated and governed by the CWTA board of directors, the 5G Canada Council is operated by CWTA senior staff. Their website offers an [extensive resource section](#)<sup>13</sup> as well as an opportunity to sign up for a regular newsletter. The resources section is divided in four parts: 5G explainers, 5G in Canada, Radiofrequency energy and safety, and 5G reports.

# International perspectives

5G is already deployed in various countries such as New Zealand and the United Kingdom. This is what these governments are saying about 5G deployment in their countries.

## New Zealand

The health department of the Government of New Zealand has a particularly [detailed 5G FAQ](#)<sup>14</sup>. Here is some advice from the New Zealand Ministry of Health on how to deal with confusing and conflicting information on the internet about 5G and health concerns:

“When looking at information on the internet or any other source, it is important to distinguish between advocacy and considered, impartial assessment of research. An impartial assessment starts with no preconceived conclusions, considers all the relevant research, assesses it for its strengths and weaknesses and draws conclusions based on that assessment. Advocacy, on the other hand, presents selected information to support a particular viewpoint and does not attempt to weigh up the merits of competing viewpoints.”

Here is a question and answer from the New Zealand Ministry of Health:

Question: What research has been done on the health effects of 5G?

Answer: 5G is just another application of radio technology. There is nothing unique to 5G that would make it interact differently with the body than other radiofrequency fields (radio signals). For this reason all the previous research on radiofrequency (RF) fields and health also tells us about the effects and safe levels of 5G.

## United Kingdom

The Government of the United Kingdom keeps the public informed about 5G on its website under the heading: [5G technologies: radio waves and health](#)<sup>15</sup>. The Public Health England website summarizes:

“It is possible that there may be a small increase in overall exposure to radio waves when 5G is added to an existing network or in a new area. However, the overall exposure is expected to remain low relative to guidelines and, as such, there should be no consequences for public health.”

# Frequently asked questions

This section of the EORN 5G Resources Overview is a quick reference to some of the most frequently asked questions surrounding 5G. The answers presented below are gathered directly from the resources mentioned in this document and presented to you as a summary.

## **What is 5G and how will it be used?**

5G stands for fifth generation. It refers to the next generation of mobile wireless standards and technologies. The advanced connectivity features of 5G, such as ultra-low latency (time to connect to a network), high bandwidth and massive machine-to-machine communication, can play a significant role in enabling a wide range of applications to make things such as transportation, healthcare and emergency services a lot more efficient.

## **How does the Government of Canada ensure your safety?**

Canada's approach to RF safety is among the most stringent in the world. Health Canada has established guidelines for safe exposure to RF energy, known as Safety Code 6, which utilizes very conservative limits set at least 50 times below the threshold of any potential adverse health effects. Innovation, Science and Economic Development Canada (ISED) uses Safety Code 6 in setting its standards and regulations for RF exposure limits for wireless devices and associated infrastructure, such as antennas. All wireless devices must meet ISED's requirements and be certified before being sold in Canada. Antenna installations must also meet ISED's requirements at all times as a condition of a carrier's license.

## **What is radiofrequency (RF) energy?**

RF energy, also referred to as "RF emission," "RF wave" or "RF field," is one form of electromagnetic energy that is part of the electromagnetic spectrum. There are both natural and human-made sources of electromagnetic energy. An example of natural electromagnetic energy is lightning. An example of human-made electromagnetic energy is AM/FM radio signals.

## **What is electromagnetic spectrum?**

Electromagnetic spectrum is the range of frequencies produced by all sources of electromagnetic energy. The diagram on page 7 of this document illustrates where common equipment operates in a specific frequency range starting from a powerline, moving through radiofrequency spectrum to phones and ending with X-rays and gamma rays.

# Frequently asked questions

## **What is the difference between non-ionizing energy and ionizing energy?**

Non-ionizing energy is electromagnetic energy that does not break down the bonds between atoms and molecules, which means it does not break down chemical bonds within cells and tissues. Examples of non-ionizing energy include visible light and RF energy used in wireless communication.

Ionizing energy is electromagnetic energy that may have enough energy to break down the bonds between atoms and molecules. Examples of ionizing energy include X-rays and gamma rays, which are both used in some medical treatments under medical supervision.

# Appendix A - Summary of links

1. FCM - Getting it right: Preparing for 5G deployment in your municipality  
<https://fcm.ca/en/resources/preparing-5g-deployment-in-your-community>
2. Health Canada - Safety Code 6 (SC6)  
<https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/radiation/safety-code-6-health-canada-radiofrequency-exposure-guidelines-environmental-workplace-health-health-canada.html>
3. FCM - Telecommunications and rights-of-way. A handbook for municipalities  
<https://fcm.ca/en/resources/telecommunications-and-rights-way-handbook>
4. ISED - Radiofrequency Energy and Safety  
<http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf11467.html>
5. WHO - Electromagnetic fields and public health  
<https://www.who.int/peh-emf/publications/facts/fs304/en/>
6. WHO - 5G mobile networks and health  
<https://www.who.int/westernpacific/news/q-a-detail/5g-mobile-networks-and-health>
7. ICNIRP - RF EMF guidelines 2020  
<https://www.icnirp.org/en/publications/article/rf-guidelines-2020.html>
8. American Cancer Society - Cell Phone Towers  
<https://www.cancer.org/cancer/cancer-causes/radiation-exposure/cellular-phone-towers.html>
9. American Cancer Society - Cell Phones  
<https://www.cancer.org/cancer/cancer-causes/radiation-exposure/cellular-phones.html>
10. CWTA - Setting the record straight on 5G wireless and radio frequency safety  
<https://www.5gcc.ca/wp-content/uploads/2020/04/Setting-the-Record-Straight-on-5G-Wireless-RF-Safety-April-28-2020.pdf>
11. CWTA - Accelerating 5G in Canada. Benefits for cities and rural communities  
[https://www.accenture.com/\\_acnmedia/PDF-112/Accenture-Accelerating-5G-in-Canada-PoV-2019.pdf](https://www.accenture.com/_acnmedia/PDF-112/Accenture-Accelerating-5G-in-Canada-PoV-2019.pdf)
12. CWTA - Fuel for innovation. Canada's path in the race to 5G  
[https://www.5gcc.ca/wp-content/uploads/2018/06/CWTA-Accenture-Whitepaper-5G-Economic-Impact\\_Updates\\_WEB\\_06-19-2018.pdf](https://www.5gcc.ca/wp-content/uploads/2018/06/CWTA-Accenture-Whitepaper-5G-Economic-Impact_Updates_WEB_06-19-2018.pdf)
13. 5GCC – Canada Council (5GCC) resources  
[www.5gcc.ca/resources/](http://www.5gcc.ca/resources/)
14. New Zealand Ministry of Health - 5G questions and answers  
<https://www.health.govt.nz/your-health/healthy-living/environmental-health/radiation-environment/cellsites-and-5g/5g-questions-and-answers>
15. Public Health England - 5G technologies: radio waves and health  
<https://www.gov.uk/government/publications/5g-technologies-radio-waves-and-health>







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