October 21, 2026

To: USA, Department of Human Health Services

From: Frank Clegg, Canadians for Safe Technology

Subject: Response to – Docket HHS-OASH-2026-0397 – Document citation: 91-FR 59792. Document number: 2026-19252 - Request for Information on Electromagnetic Fields (EMFs), Radiofrequency (RF) Radiation, and Wireless Radiation Exposure

Canadians for Safe Technology (C4ST)[1] is a national, non-profit, non-partisan, volunteer coalition of citizens and scientists, concerned about the health risks of wireless technology. C4ST was co-founded in 2012, by Frank Clegg, former President of Microsoft Canada. Over several months, Mr. Clegg met with experts from institutions such as Harvard, Yale, Columbia, McGill, the University of Toronto, an expert advisor for the World Health Organization and one of the lead scientific writers for Al Gore's team that won the Nobel Prize and became concerned about the effects of wireless radiation on humans, especially children. Mr. Clegg is supported by a volunteer Leadership Team. Frank Clegg is also on the board of the Environmental Health Trust.

C4ST collaborates with volunteer working groups and other non-governmental organizations, to raise awareness about health risks of exposures to wireless devices, to support communities who are concerned about proposed telecommunication tower applications that would negatively impact their community, and to meet with elected officials at all levels of government to share the state of the science and best practices from around the world.

Health Canada's human limits, as set out in Safety Code 6 (2015) are similar to the FCC's limits, although somewhat stricter at lower frequencies. The scientific evidence of harm from non-thermal effects has not been incorporated in setting the current limits in Canada nor in the USA. The reliance on thermal effects only is based on science first published in the 1920's.[2] Since most technology companies operating in Canada are USA based organizations, Canada typically follows FCC guidelines when setting Canadian safety standards for technology.

C4ST has been a leading voice for more protective limits for radiofrequency radiation in Canada and supported safer limits in the USA such as when delegating to New Hampshire's Science, Technology and Energy Committee[3] (Final report [4]) and the Michigan Energy Policy Committee [5](attached).

In Canada, we have been involved in more than 100 cell tower situations in Canada, making submissions and offering suggestions to those who contact us. Since its inception, C4ST has often been contacted by people in Canada, the USA and elsewhere, reporting adverse effects from cell towers and other wireless devices. In May, 2019 we were a participant in the wireless symposium held by Women's College Hospital[6], testified to Canada's Parliamentary Health Committee in 2015[7] as well as presented orally and in written form when Safety Code 6 was last revised in 2015. C4ST also has been active in achieving radiofrequency radiation threshold limits for adverse effects on non-human species as there are none currently in Canada. Frank Clegg is a lead author of the peer-reviewed publication: ***Building science and radiofrequency radiation: What makes smart and healthy buildings.***[8]

One of the goals of this submission is to inform some of the shortcomings of our experience in Canada[9] [10] so that the American process can avoid the same deficiencies.

C4ST's recommendations:

1. Convene a truly independent multidisciplinary panel with appropriate expertise to systematically review the scientific evidence of the effects of electromagnetic radiation. Rigorous scientific methods, transparency, full public consultation from initial scoping throughout the process, and health-protective precautionary interpretation of findings should be fundamental.
2. Establish binding standards to protect wildlife and the environment from electromagnetic radiation using a similar process.
3. Build on the regulation of chemicals, shift the burden of proof to the telecommunications and wireless technology industries, and require that they prove that their products are not harmful to Americans or the environment.
4. Ensure Americans' indoor and outdoor exposure to electromagnetic radiation from wireless technologies is kept as low as possible (ALARA or "as low as reasonably achievable") through proper regulation, monitoring, enforcement and ongoing public education and technical device management. One of many examples would be to require that all wireless devices and antennas not transmit (i.e., not emit radiation) when not in use.

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1. Scientific evidence omitted by Health Canada and the flawed World Health Organization's commissioned reviews

1.1 Health Canada

During the latest revision of Safety Code 6, Health Canada contracted the Royal Society of Canada to convene a panel to review the literature on RF radiation and make recommendations. Although the panel claimed to have conducted a comprehensive examination, it, as well as the "authoritative sources", omitted at least 140 studies in its analyses including those submitted by Dr. Lennart Hardell and Dr. Devra Davis. Health Canada disregarded this information (provided in C4ST's report) when it reaffirmed the older limits with little adjustments. The literature omitted is summarized in the poster (attached). *Scientific Review to Support Public Policy Regarding Exposure to Radiation from Wireless Communications Devices (e.g. cell phones).* At least 140 relevant studies indicating potentially significant or harmful effects were identified as absent from the Canadian review.

1.2. World Health Organization

More recently, the World Health Organization commissioned a series of systematic reviews of evidence of RF radiation exposures and human health. This had been preceded with a call for health outcomes to examine. One factor put forward was the thermal effects (heat-related) outcomes. This review on thermal effects of Rf radiation was not conducted – an important knowledge gap.

The process used for the systematic reviews has been criticized for how studies were selected, the use of inappropriate meta-analyses and other important factors.

Details of some of these shortcomings have been described by Frank et al. (2024)[11] and Frank et al. (2025).[12]

2. Environment

The environmental impacts need to be considered, not only because effects on non-human species affects the integrity of the planet's ecosystems but also the demonstrated effects support adverse effects seen in humans.

C4ST partnered with Prevent Cancer Now in a comprehensive examination of effects in a white paper[13] prepared when advocating that RF radiation should be included in Canada's premier environmental law, the ***Canadian Environmental Protection Act 1999.***

Of note, Environment and Climate Change Canada, in a report, states: *"The potential of increasing exposures as a contributing factor to adverse effects in wildlife, in conjunction with recognized environment stressors, should be considered."*

However, to the best of our knowledge, no staff or funds have been allocated to this field by ECCC.

Thus is a significant knowledge gap and should be given the highest priority.

Peer-reviewed publications that should be considered:

1. Balmori, Alfonso. (2021). **Electromagnetic radiation as an emerging driver factor for the decline of insects**. *Science of The Total Environment*, *767*, 144913. https://doi.org/10.1016/j.scitotenv.2020.144913
2. Levitt, B. B., Lai, H. C., & Manville, A. M. (2021a). **Effects of non-ionizing electromagnetic fields on flora and fauna,**

Part 1. Rising ambient EMF levels in the environment. *Reviews on Environmental Health*. https://doi.org/10.1515/reveh-2021-0026
3. Levitt, B. B., Lai, H. C., & Manville, A. M. (2021b). **Effects of non-ionizing electromagnetic fields on flora and fauna, Part 2 impacts: how species interact with natural and man-made EMF**. *Reviews on Environmental Health*. https://doi.org/10.1515/reveh-2021-0050
4. Levitt, B. B., Lai, H. C., & Manville, A. M. (2021c). **Effects of non-ionizing electromagnetic fields on flora and fauna, Part 3. Exposure standards, public policy, laws, and future directions**. *Reviews on Environmental Health*. https://doi.org/10.1515/reveh-2021-0083
5. Levitt, B. B., Lai, H. C., & Manville, A. M. (2022). **Low-level EMF effects on wildlife and plants: What research tells us about an ecosystem approach**. *Frontiers in Public Health*, *10*. Retrieved from https://www.frontiersin.org/articles/10.3389/fpubh.2022.1000840

Regulation should consider air space as habitat to be regulated as land and water.

3. Microwave catalysis: accelerated chemical reactions with low level microwave radiation at ambient temperatures

Microwave effects: faster biochemical reactions with low level microwave radiation, especially with more lipids in the mix; in medical testing, higher reaction rate with athermal (non-thermal) microwaves for IgG ELISA test (minutes vs. hours), and testing for LDH; faster protein unfolding with athermal microwaves; changed specificity of enzymatic reactions; and increased microbial rates of biosynthesis.

For more information see ***Current Microwave Chemistry:*** *an international peer-reviewed journal that publishes important contributions describing advances in the use of the microwave in the fields of chemistry, biology, medicine, biomedical science, and engineering. The journal covers microwave-assisted synthesis of novel organic, organometallic and inorganic molecules or complexes, kinetics and mechanistic studies of microwave-induced chemical reactions and potential use of microwave irradiation in the fields of drug discovery, green chemistry, catalysis and industrial process development. It is the premier source of microwave related information for chemists, biologists, pharmacologists and engineers in both industry and academia.: ISSN: 2213-3364 (Online):*
https://www.benthamdirect.com/content/journals/cmic

4. 5G technologies human exposure limits increased: Lack of evidence is not proof of safety

Health Canada added a "complement" to Safety Code 6 which increased the recommended limits by two times or more for 5G technologies held close to the body.[14] To support these loosening of the limits Health Canada conducted a major literature review. This review did not find any 5G mmWave studies on humans except temperature. Page 32: Extract: *"No human studies were identified that assessed endpoints such as cancer, ocular effects, reproductive system effects, cognitive effects, impacts on the immune system, non-specific symptoms or any other adverse health outcomes in response to exposure to RFEMF in the 6-300 GHz frequency range."*

The evidence upon which the loosened limits for 5G technologies are based on 10 studies, are all of short duration and are on temperature and pain sensation (Appendix 1). This falls far short of basing increased limits on sound scientific evidence.

5. Health related statements made by telecommunications companies in their Annual Reports

One has to question what the major telecommunications know that is not acknowledged by guideline/standard setting authorities. Telecommunications companies mention health and the possibility of litigation in Annual Reports. See

Appendix 2 to read some of the statements made by Bell-BCE Inc., Quebecor, Rogers Communications and TELUS relating to health and other concerns.

Appendix 1. Modified from Table 4.1 in the health Canada Report: . “Analysis of Recommended Localized Human Exposure Limits for Radiofrequency Fields in the Frequency Range, 6 GHz to 300 GHz. Notations in red have been added by C4ST. (see next page).

First and last columns added and exposure times in boxes (in red) Modified from Table 4.1: Human study characteristics. P 34 & 35.

In: Health Canada Report. *"Analysis of Recommended Localized Human Exposure Limits for Radiofrequency Fields in the Frequency Range, 6 GHz to 300 GHz."* Consumer & Clinical Radiation Protection Bureau (CCRPB).

#	Source	Frequency of RFEMF	Exposure duration and intensity	Tissue exposed	Findings	# test subjects
1	Alekseev et al., 2003	42.25 GHz	0.3 to 55 s; 550-2080 W/m²	Forearm skin	Measured skin temperatures were similar to those modelled using 2-D PBHE. Increasing beam diameter led to higher peak temperature increase at the same incident power density. Beam diameter had no influence on temperature kinetics for exposures less than 3 s.	4 Assumed same as 2005 study
			Exposure, max: 55 seconds			
2	Alekseev et al., 2005	42.25 GHz	0 to 20 min; 550-2080 W/m²	Forearm and middle finger skin	Increasing blood perfusion was found to decrease maximum tissue temperature increase. Occlusion of blood perfusion resulted in similar temperature responses in tissues with differing basal blood flow.	4
			Exposure, max: 20 minutes			
3	Blick et al., 1997	7.5, 10, 35 and 94 GHz	10 s; 0-200 W/m²	Skin on back	Skin warmth perception thresholds (195 W/m² at 7.5 GHz; 45 W/m² at 94 GHz) were reported in terms of incident power density across a wide frequency spectrum.	15
			Exposure, max: 10 seconds			
4	Gustrau and Bahr, 2002	77 GHz	15 min; 10 or 100 W/m²	Forearm skin	Measured skin temperatures were similar to those modelled using PBHE (skin with fat layer). Exposure at 10 W/m² caused less than a 0.1°C temperature increase whereas exposure at 100 W/m² caused a 0.7°C peak skin temperature increase.	2
			Exposure, max: 15 minutes			
5	Hendler and Hardy, 1960	10 GHz, 2.5 kHz pulsed	140 s; 170 W/m²	Forehead skin	Threshold of warmth sensation was reported to be a 0.02°C temperature increase at a depth of 150-200 µm below the skin surface.	7
			Exposure, max: 140 seconds			
6	Nelson et al., 2003	94 GHz, 1 kHz pulsed	3 s or 3 min; 1750 or 10000 W/m²	Forearm skin	Measured skin temperature increases (~7°C) for high power density (10 kW/m² for 3s) RFEMF exposure were similar to those predicted using PBHE model with no blood flow. Low power density (1750 W/m²) RFEMF exposure caused an ~8°C temperature increase over 3 min that reached steady state, which was most similar to a moderate blood flow model (17mL/100g/min). The results suggested the PBHE model should adjust for variable blood flow during longer duration exposures.	4
			Exposure, max: 3 minutes			
7	Partyla et al., 2017	42.25 GHz	30 min; <172 W/m²	Chest	RFEMF exposure had no effect on pain tolerance, time to onset of cold pain or increasing pain threshold under double-blind conditions.	20 Healthy male adults
			Exposure, max: 30 minutes			
8	Radzievsky et al., 1999	42.25 GHz, continuous	30 min; 250 W/m²	Chest	RFEMF exposure caused a ~1.6°C temperature increase in chest skin after 5min, but subjects could not perceive this temperature increase. RFEMF exposure caused a delay in cold pain sensation in the hand and an increase in pain tolerance. No changes were noted in heart rate or blood pressure in response to RFEMF exposure.	12 Healthy male adults
			Exposure, max: 30 minutes			
9	Walters et al., 2000	94 GHz, 1 kHz pulsed	3 s; 9000 to 17500 W/m²	Mid-back	The average power density to evoke a threshold sensation of pain was 12500 W/m² for a 3 s exposure. This corresponds to a mean increase in surface temperature of 9.9°C from pre-exposure skin temperature (34.0°C) to a threshold temperature of 43.9°C at the end of 3 s.	10
			Exposure, max: 3 seconds			
10	Walters et al., 2004	94 GHz, 1 kHz pulsed	4 s or 3 min; 1750 or 10000 W/m²	Forearm skin	RFEMF exposure caused a bi-phasic temperature response, with the second phase resulting from local alterations in blood flow. Reduced blood flow resulted in increased peak tissue temperatures.	4
			Exposure, max: 3 minutes			

Appendix 2. Statements made relating to health and other concerns by telecommunication companies in their annual and other reports to shareholders.

1. BELL - BCE Inc.

BCE Inc. recognizes potential litigation relating to health issues in their annual report

BCE 2025 Integrated Annual Report https://www.bce.ca/cs-assets/2025-bce-integrated-annual-report.pdf-blt14a3fcac20d37443

Quote: ***"Caution regarding forward-looking statements.*** *…including climate change; the failure to develop and implement sufficient corporate governance practices; the inability to adequately manage social issues; health risks, including pandemics, epidemics and other health concerns, such as radio frequency emissions from wireless communications devices and equipment…*

"9 Business risks. Health risks, including pandemics, epidemics, and other health concerns, such as radiofrequency emissions from wireless communications devices and equipment, could have an adverse effect on our business

The following challenges, among others, could arise since our business is heavily dependent on radiofrequency technologies: we may face lawsuits relating to alleged adverse health effects on customers, as well as relating to our marketing and disclosure practices in connection therewith, and the likely outcome of such potential lawsuits is unpredictable and could change over time; changes in scientific evidence and/or public perceptions could lead to additional government regulations and costs for retrofitting infrastructure and handsets to achieve compliance; and public concerns could result in a slower deployment of, or in our inability to deploy, infrastructure necessary to maintain and/or expand our wireless network as required by market evolution. Any of these events could have an adverse effect on our business and financial performance."

2. QUEBECOR

Quebecor recognizes potential litigation relating to health issues in their annual report – Risk and Uncertainties

Quoting Quebecor Management and Discussion Analysis 2025 https://www.quebecor.com/en/investors/financial-documentation/quebecor-annual-documentation

"*Risks and Uncertainties. Concerns about alleged health risks relating to radiofrequency emissions.* *All the Corporation's cell sites comply with applicable laws and the Corporation relies on its suppliers to ensure that the network equipment and customer equipment supplied to it meets all applicable regulatory and safety requirements. Nevertheless, some studies have alleged links between radiofrequency emissions from certain wireless devices and cell sites and various health problems, or possible interference with electronic medical devices, including hearing aids and pacemakers. There is no definitive evidence of harmful effects from exposure to radiofrequency emissions when the limits imposed by applicable laws and regulations are complied with. Additional studies of radiofrequency emissions are ongoing and there is no certainty as to the results of any such future studies.*

The current concerns over radiofrequency emissions or perceived health risks of exposure to radiofrequency emissions could lead to additional governmental regulation, diminished use of the Corporation's wireless services or product liability lawsuits that might arise or have arisen. Any of these could have a material adverse effect on the Corporation's business, prospects, revenues, financial condition and results of operations.

3. ROGERS COMMUNICATIONS

Rogers Communications recognizes potential litigation relating to health issues in their annual report – Regulatory Risks

Rogers 2025 Annual Report https://about.rogers.com/wp-content/uploads/Rogers-2025-Annual-Report.pdf

Quote: "***Risk Management. RISKS AND UNCERTAINTIES AFFECTING OUR BUSINESS***
Radio frequency emissions. From time to time, media and other reports have highlighted alleged links between radio frequency emissions from wireless devices (including new 5G technology) and various health concerns, including cancer, and interference with various medical devices, including hearing aids and pacemakers. This may discourage the use of wireless devices or expose us to potential litigation even though there are no definitive reports or studies stating that these health issues are directly attributable to radio frequency emissions. Future regulatory actions may result in more restrictive standards on radio frequency emissions from low-powered devices like wireless devices. We cannot predict the nature or extent of any restrictions."

4. TELUS

TELUS recognizes potential impacts of radio frequency emissions in their annual report

Quoting TELUS 2025 Annual Report: **"10.8 Climate and the environment. Risk category: Strategic Changes over the past 12 months**
Potential impacts associated with low levels of non-ionizing radio frequency (RF) emissions from mobile phones and cell towers have been a matter of public concern, and we anticipate that they will continue to be a public concern as we deploy 5G network technology, with the number of small cells in our infrastructure expected to increase as we continue to upgrade our network.
https://www.telus.com/en/about/investor-relations/reports/annual-reports

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Endnotes:

[1] C4ST: https://c4st.org

[2] Christie et al. (1929): https://pmc.ncbi.nlm.nih.gov/articles/instance/2131527/pdf/303.pdf

[3] New Hampshire House Science Technology Committee in Support of HB522. An Industry Perspective on 5G Wireless Technologies. Feb.12, 2019.
https://legislature.vermont.gov/Documents/2020/WorkGroups/Senate%20Finance/Bills/H.513/Public%20Comment/H.513~Annette%20Smith~Presentation%20for%20NH%20House%20Science%20and%20Technology%20Committee~4-16-2019.pdf

[4] http://www.gencourt.state. ***Final Report on Commission to Study the Environmental and Health Effects of Evolving 5G Technology***
nh.us/statstudcomm/committees/1474/reports/5G%20final%20report.pdf

[5] Michigan Energy Policy Committee 5G Hearing. May 29, 2018.

[6]https://static1.squarespace.com/static/593f8894e3df288fc64b6cf0/t/5f974484c96dfb3e3bb07ff8/1603749014612/Clinical+Practice+Guidelines+for+EHS+and+Symposium+Proceedings+-+Final.pdf

[7] House of Commons. HESA committee Meeting: https://www.ourcommons.ca/DocumentViewer/en/41-2/HESA/meeting-57/evidence

[8] Clegg et al. 2020. https://www.sciencedirect.com/science/article/pii/S0360132319305347

[9] Canadian Medical Association Journal. 2013. ***Federal Wi-Fi panel criticized for undisclosed conflict***. https://www.cmaj.ca/content/185/11/E515

[10] Canadian Medical Association Journal. 2014: ***Federal Wi-Fi safety report is deeply flawed, say experts.*** https://www.cmaj.ca/custom-print/129832

[11] Frank J, Melnick R, Moskowitz J, on behalf of the International Commission on the Biological Effects of Electromagnetic Fields (ICBE-EMF). ***A critical appraisal of the WHO 2024 systematic review of the effects of RF-EMF exposure on tinnitus, migraine/headache, and non-specific symptoms.*** Reviews on Environmental Health. 2024. doi: 10.1515/reveh-2024-0069. https://www.degruyterbrill.com/document/doi/10.1515/reveh-2024-0069/html

[12] Frank, J. et al.(2025).***The Systematic Review on RF-EMF Exposure and Cancer by Karipidis et al. (2024) has Serious Flaws that Undermine the Validity of the Study's Conclusions***. https://www.sciencedirect.com/science/article/pii/S0160412024007876

[13] Prevent Cancer Now & Canadians for Safe Technology. (2022). ***Protect Birds, Bees and Trees. Include Anthropogenic Radiofrequency Electromagnetic Radiation in Canadian Environmental Protection Act CEPA Amendments***. *White Paper*, 19 pages. Retrieved from https://preventcancernow.ca/wp-content/uploads/2022/05/Include-Anthropogenic-Radiofrequency-Electromagnetic-Radiation-in-Canadian-Environmental-Protection-Act-CEPA-Amendments_PCN-C4ST_2022-04-07.pdf

[14] Health Canada conducted a major review last year. ***"Analysis of Recommended Localized Human Exposure Limits for Radiofrequency Fields in the Frequency Range, 6 GHz to 300 GHz."*** Health Canada, Consumer & Clinical Radiation Protection Bureau (CCRPB). Approved by Narine Martel, Director, 2021, 243. Retrieved from https://preventcancernow.ca/wp-content/uploads/2022/02/Analysis-of-Recommendations-above-6-GHz_FINAL-Feb-2-2021.pdf