Request for Information on Electromagnetic Fields (EMFs), Radiofrequency (RF) Radiation, and Wireless Radiation Exposure

Exposure Standards and Risk Assessment

5. What existing national and international exposure standards, guidelines, or regulatory frameworks should federal health agencies consider when evaluating the potential adverse health effects of human exposure to RF/EMF?

Existing International Exposure Standards and Regulatory Frameworks: Other countries, in particular Europe and European Union have documented research of health effects of EMFS and various sources of electricity such as major power lines and have used this data to inform policy. Environmental Health Sciences refers to one such example from the Netherlands: " Since 2005, policies have been in place to reduce ELF-EMF in homes, schools, and kindergartens. A 2018 Health Council report reaffirmed links to cancer and recommended reducing ELF-EMF. In 2013, houses under 380–220 kV lines were bought out because of the ELF EMF exposure. In 2023, the government issued an updated policy on overhead power lines and other electricity infrastructure, like substations, to prevent new situations where people stay for a long time in the area near overhead power lines and where the magnetic field exceeds 4 mG (annual average). This was based on a 2022 scientific literature review and recommendations of the Health Council which states:…" just as was the case for children, leukemia may occur more frequently in adults who live close to overhead power lines. The Health Council considers this to be an additional argument in support of the existing precautionary policy, and its earlier recommendation to consider expanding this policy to include, for example, underground high-voltage cables and transformer stations."[1]

The list of European countries taking protective policy action against adverse effects includes Germany, Israel, French Polynesia, France, Denmark, Solvenia, Switzerland, Luxumberg, Croatia, Norway, Denmark, Finland, Italy, Belgium [2][3]

n. *What scientific, technical, or regulatory changes by federal health agencies, if any, would improve the assessment, disclosure, and regulation of wireless radiation exposure?*

1. Assessment: Develop a framework to categorize existing literature. Dimensions for categorization include:
    a. Context: laboratory or real world setting
    b. Research Design: Randomized Control Trial –blind or double-blind, comparison, focus group, individual accounts, narratives, epidemiological studies
    c. Exposure measurement and metrics, e.g. source proximity ,duration, frequency

d. Direction of causal inferences: assume low health status leads to Electro sensitivity (ES) or that ES to low health status?

e. Bias: Funder

i. Some professional scientific and research associations include funder as criteria when conducting meta evaluations or assessing research.

ii. David Carpenter, MD, Director of the Institute for Health and the Environment at the University at Albany, published a research review in *Environmental Research* concluding that a study's source of funding affects its findings, stating that:

"When one allows for bias reflected in source of funding, the evidence that magnetic fields increase risk of cancer is neither inconsistent nor inconclusive. Furthermore, adults are also at risk, not just children, and there is strong evidence for cancers in addition to leukemia, particularly brain and breast cancer."

-David Carpenter in *Environmental Research* "Extremely low frequency electromagnetic fields and cancer: How source of funding affects results"[4]

f. Language bias. A notable feature of abstracts of research designed to distinguish between adverse effects for those identified as ES compared to general population samples is the negative language towards those with ES. Terms to describe reports of adverse effects include : claim, proclaim, alleged. Hard to measure symptoms are deemed ""subjective symptoms" and when research fails to confirm a difference the solutions include cognitive treatment for "psychological problems" or attribute perception of ES to other health issues. This is negative bias appears to predominate in US research. European studies such as from Sweden and the European Union (EU), seem to avoid such negative bias.

g. Disclosure: Companies employing and deploying equipment and devices (see # x below) should be required to disclose and monitor emissions and safety risks. This should take precedent over any interpretations of other legislation that is interpreted to discourage or prohibit discussion of adverse health effects. Needs to be public notices with recourse to installation of equipment. The burden should be on industry to develop and demonstrate safety of their technologies. must have local control: federal legislation that takes ability to restrict away. industry benefits not public.

h. Regulation of wireless radiation exposure –see #5 above for international examples.

i. Current federal legislation is Industry supported as it benefits industry and removes and limits residents' input and ability to restrict placement, monitoring, and strength of emissions. An alternative approach would be to incentivize industry to monitor emissions and develop and implement technologies with lower RF emissions as well as methods to shield and protect from emissions. For example, wired internet does not have the RF

emissions of Wi-Fi and is less costly, more secure and more reliable. The goal would be to encourage innovative safe technologies and protect living organisms—people, animals, insects, plants, trees-from negative effects of RF/EMF and other electrical and radiation emissions.

ii. Environmental Health Trust (EHT) and Environmental Health Sciences (EHS) websites contain numerous studies that address many of the questions in this RFI. For example, EHS addresses current regulations:

" Numerous peer-reviewed published scientific papers document research that indicates that the human exposure limits of the FCC and ICNIRP are unable to adequately protect public health. For example, a peer-reviewed paper published in *Environmental Health* analyzed data from major research studies using procedures developed by the U.S. Environmental Protection Agency (EPA) and found that current human exposure limits for the wireless radiofrequency (RF) radiation emitted from cell phones, cell towers, and wireless devices "fail" to protect public health and need to be strengthened by at least 200 times after they analyzed the animal cancer findings of the $30 million U.S. National Toxicology Program (NTP) study to determine the dose of wireless radiation associated with an excess cancer risk of one per 100,000, a level typically used by the EPA to determine safety limits for environmental hazards. When data from the Italian Ramazzini Institute animal studies were evaluated, the limit for ambient cell tower radiation needed to be reduced by 4,200 times.

This risk assessment analysis was conducted by scientists Dr. Ronald L. Melnick, a retired 28 year toxicologist from the National Institute of Environmental Health Sciences, and Dr. Joel M. Moskowitz, School of Public Health at the University of California, Berkeley on behalf of the International Commission on the Biological Effects of Electromagnetic Fields (ICBE-EMF).[5]

p. *How, if at all, should a classification system account for exposure-related characteristics, including operating frequency, power density, specific absorption rate (SAR), electric- and magnetic-field strength, modulation and pulse characteristics, duty cycle, beamforming, simultaneous exposure to multiple frequencies, duration of exposure, distance from the source, proximity to the body, and cumulative exposure over time?*

A classification system including such metrics and measures should be formalized and integrated into a framework as. assessing patterns in research post hoc, and will contribute to identifying gaps in research

for prospective syntheses and analyses (see "5n 1. Assessment" above for categories. These mentioned in here ("p") would be included in Measurement and metrics.

6. *What scientific evidence exists about potential adverse health effects caused by current exposure limits?*

Please review voluminous amount of existing studies. EHT, EHS, and the 11,000 pages of peer reviewed Literature submitted in legal case against FCC in 2021.[6]

8. *What, if any, improvements in exposure assessment methodologies are needed to better evaluate real-world exposure conditions?*

In addition to the types of existing studies and those that would fill gaps (see #5 above for dimensions of a framework), it's critical to ask about the experiences of those who report adverse effects from various devices and equipment. Start with qualitative data-individual interviews and focus groups with targeted sampling. First ask about what they experience, what exacerbates their symptoms, what relieves their symptoms. Second, develop check lists of symptoms and situations (types, frequency, and duration of exposure) that can be administered to a larger sample of those reporting adverse effects and those not reporting.

Hotels and offices are replete with Wi-Fi and pose particular challenges to those electro sensitivity (ES). Sleep disruption is a commonly reported symptom and documented in the research literature. Suggested remedies are to remove or reduce source of exposure.[7]

Measuring effects is complicated because of known and unknown exposure factors Electro sensitivity may be developed due to exposure to power lines, unshielded electrical wires running in walls near bedrooms or offices where persons may spend most of their days and nights for years. Most people are unaware of these types of exposure. There are estimated 25 million or 1 in 13 Americans suffering from undiagnosed illnesses and symptoms.8 How many of these "illnesses" and symptoms might be attributable to unknown sources of electricity and EMFS?

The natural real world offers countless opportunities for comparison groups and thus, comparative data of prevalence of symptoms. Some neighborhoods have underground electrical wires and fiber optic or internet wires, others are above ground. Some houses are located next to major power lines or neighborhood "primary" stronger electrical power lines. Some neighborhoods have smart meters installed and others have traditional analog meters. People work in high rise buildings with a high volume of Wi-Fi versus others who work at home. Wired internet could be made available to a sample of homes and results compared with those with 24/7 Wi-Fi. Similarly, a sample of households could agree to turn off their internet routers at night and results compared to a sample where routers are on all night with included sub groups when the router is within one foot of bed or in another room- x feet away from bedrooms. Similar real world experiments can be designed for those with "smart" homes and smart meters.

9. *What, if any, technical and exposure-related information should be disclosed to consumers, residents, workers, schools, healthcare providers, and local governments?*

There needs to be public disclosure to all the groups identified above of the most current information and international policies. Currently the vast majority of the population knows only what media outlets with substantial funding by telecommunication companies want them to know and believe. For example, at times there has been relentless advertising of 5G including at major TV channels running advertisements for 5G multiple times an hour.

The public including all the above-mentioned entities need information about safer alternatives. For example, most people likely think that the only way to access the internet is through Wi-Fi and 5G capability. Wired internet is more secure, more reliable and less costly. Industry benefits from keeping the public unaware of wired internet access. By some estimates, wired internet could be a low-cost utility available to all, but that might affect a major revenue stream (billions) for telecom companies. However, other incentives to industry for innovative safer practices could help redirect industry. An informed public will lead to a greater demand for safer technologies, which will in turn bolster regulatory efforts.

10. *What data sources or surveillance systems currently exist to monitor potential adverse health effects associated with RF radiation exposure? Should additional data sources or surveillance systems be developed? Please discuss the benefits and challenges of the following data sources and surveillance systems, as relevant:*

a. *disease registries*

b. occupational monitoring

c. environmental monitoring

d. longitudinal cohort studies

e. biomonitoring

f. adverse event reporting

g. disease or illness clusters

The above methods for monitoring and tracking each have their advantages and challenges. Environmental monitoring is foundational and could be supported by deployment registries that monitor type of devices and output for equipment, e.g. cell towers, phones, satellites. A national database has been suggested.[9]

Adverse event reporting is perhaps the most critical to advance understanding and science and to develop methods of prevention and safeguards. Currently there is an enormous ignorance of and stigma towards Electro sensitivity (ES) and reactions to EMFs (see above discussion of bias even in the scientific literature). Because of this stigma and bias, there needs to be anonymous reporting option.

13. According to scientific evidence, how do the technologies below affect cumulative exposure patterns?

a. 5G.

b. 6G.

c. Wi-Fi.

d. Satellite-based communications.

e. Internet of Things (IoT).

f. *Wearable technologies.*

h. Smart cities.

i. Autonomous vehicles.

j. Wireless medical devices.

k. Communication enabled smart meters.

Each of the above-mentioned devices and technologies emit significant RF/EMF and other electrical forces, the cumulative effect can pose serious adverse effects. It is important that the overarching research framework (as described and referenced in #5 above) include all of these sources, their relative emissions, proximity, frequency, duration, safeguards, and ameliorative methods.

14. What scientific evidence exists regarding potential adverse environmental effects associated with RF radiation?

The pioneering work of Arthur Firstenberg has numerous scientific studies on the effects of RF/EMFS on the natural environment including, birds, bees, pollinators trees and plants. See his "Invisible Rainbow" and "The Earth and I".[10] See Environmental Health Trust and Environmental Health Sciences websites for more information on this topic.

15. What types of scientific evidence should be considered when evaluating RF exposure associated with wireless infrastructure? Please comment on:

a. proximity to homes, schools, childcare facilities, healthcare facilities, and/or workplaces.

b. cumulative neighborhood exposure.

c. antenna density.

d. small-cell deployment.

e. livestock.

Scientific evidence related to each of these exposures is central to guiding safeguards and spurring safer technologies. Each of these should be incorporated into the larger framework discussed in #5 above and explored in terms of monitoring, adverse reporting, regulations, policy, and further research.

17. How can federal health agencies improve coordination of EMF and RF radiation research? Please comment on potential roles for federal health agencies including, but not limited to:

a. HHS Food and Drug Administration (FDA).

b. HHS National Institutes of Health (NIH).

c. HHS Centers for Disease Control and Prevention (CDC).

Add the U.S. National Toxicology Program. They have contributed to this issue in their previous work: "Numerous peer-reviewed published scientific papers document research that indicates that the human exposure limits of the FCC and ICNIRP are unable to adequately protect public health. For example, a peer-reviewed paper published in *Environmental Health* analyzed data from major research studies using procedures developed by the U.S. Environmental Protection Agency (EPA) and found that current human exposure limits for the wireless radiofrequency (RF) radiation emitted from cell phones, cell towers, and wireless devices "fail" to protect public health and need to be strengthened by at least 200 times after they analyzed the animal cancer findings of the $30 million U.S. National Toxicology Program (NTP) study to determine the dose of wireless radiation associated with an excess cancer risk of one per 100,000, a level typically used by the EPA to determine safety limits for environmental hazards. When data from the Italian Ramazzini Institute animal studies were evaluated, the limit for ambient cell tower radiation needed to be reduced by 4,200 times.

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18. Please identify any additional scientific evidence, technical information, data, or recommendations that federal health agencies should consider when evaluating potential adverse health effects associated with RF/EMF radiation exposure.

Given the growing number of people suffering from neurological diseases and symptoms including Alzheimer's and Parkinson's (and their enormous financial costs), it is important to integrated the findings that RFI negatively effects neurological health into frameworks and further research and educational efforts.

McCarty DE, Carrubba S, Chesson AL, Frilot C, Gonzalez-Toledo E, Marino AA. **Electromagnetic hypersensitivity: evidence for a novel neurological syndrome.** Int J Neurosci. **121(12):670-676, 2011.**

OBJECTIVE: We sought direct evidence that acute exposure to environmental-strength electromagnetic fields (EMFs) could induce somatic reactions (EMF hypersensitivity). METHODS: The subject, a female physician self-diagnosed with EMF hypersensitivity, was exposed to an average (over the head) 60-Hz electric field of 300 V/m (comparable with typical environmental-strength EMFs) during controlled provocation and behavioral studies. RESULTS: In a double-blinded EMF provocation procedure specifically designed to minimize unintentional sensory cues, the subject developed temporal pain, headache, muscle twitching, and skipped heartbeats within 100 s after initiation of EMF exposure ($p < .05$). The symptoms were caused

primarily by field transitions (off-on, on-off) rather than the presence of the field, as assessed by comparing the frequency and severity of the effects of pulsed and continuous fields in relation to sham exposure. The subject had no conscious perception of the field as judged by her inability to report its presence more often than in the sham control. DISCUSSION: The subject demonstrated statistically reliable somatic reactions in response to exposure to subliminal EMFs under conditions that reasonably excluded a causative role for psychological processes. CONCLUSION: EMF hypersensitivity can occur as a bona fide environmentally inducible neurological syndrome.[12]

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[1] https://ehsciences.org/powerlines-emf-elf-magnetic-fields-health/#UEEMF-Global-Policies-To-Min-Exposure

[2] https://ehsciences.org/powerlines-emf-elf-magnetic-fields-health/#UEEMF-Global-Policies-To-Min-Exposure

[3] **Germany:** A 2013 Ordinance requires all feasible measures to minimize ELF-EMF exposure. 220 kV lines cannot be erected over buildings intended for long-term human occupancy.

1. **Israel:** The maximum permissible ELF-EMF exposure in schools and residences is 4 mG per recommendations of the Ministry of Environment and the Ministry of Health.
2. **French Polynesia:** The government-run public awareness campaign advises maintaining at least 1–1.5 meters from induction stoves and other EMF-generating appliances.
3. **France:** Ministerial guidance discourages new hospitals, maternity wards, and childcare facilities near power lines, cables, and transformers where fields exceed 1 µT. The grid operator must monitor EMF emissions near power lines, and citizens can request measurements via local authorities.
4. **Slovenia:** ELF limits are set at 10% of the EU reference value for new or modified installations near residences, schools, kindergartens, hospitals, playgrounds, parks, and public buildings.
5. **Denmark:** Utilities must measure magnetic fields at new installations; annual averages should not exceed 4 mG, and no kindergartens or new buildings may be built near high-voltage lines.
6. **Switzerland:** The Non-Ionizing Radiation Protection Act establishes precautionary EMF exposure limits for new installations at 1 µT (10 mG) called an installation limit value. The country also measures, monitors, and reports EMF levels.
7. **Croatia:** Reduced ELF-EMF limits apply to sensitive areas, including homes, offices, schools, playgrounds, kindergartens, maternity wards, hospitals, and care facilities.
8. **Luxembourg:** Ministerial recommendation prohibits new living spaces within 20 meters of 65 kV lines and 30 meters of 100–220 kV lines.
9. **Finland:** The radiation authority STUK advises avoiding permanent residences where magnetic flux density continuously exceeds ~0.4 µT.
10. **Norway:** A 0.4 µT "investigation level" applies to new homes, schools, kindergartens, and power lines; if exceeded, exposure-reduction measures are evaluated and implemented if reasonable.
11. **Italy:** The 2017 Environment Ministry Decree recommends minimizing indoor ELF-EMF exposure; a precautionary "attention value" applies to 24-hour median exposure in homes, schools, playgrounds, and other spaces where people spend over 4 hours.
12. **Belgium:** In Flanders, new power lines should be avoided near schools and childcare centers, and exposure over homes should be minimized. Year-averaged exposure near new schools and childcare centers should not exceed 4 mG. In Brussels, transformers near areas where children under 15 may be present must maintain a 24-hour average below 4 mG.

[4] https://www.sciencedirect.com/science/article/abs/pii/S0013935119304852

[5] https://ehsciences.org/cell-tower-radiation-limits-worldwide/

[6] Download: August 13, 2021 United States Court of Appeals, District of Columbia Circuit ENVIRONMENTAL HEALTH TRUST, ET AL., PETITIONERS v. FEDERAL COMMUNICATIONS COMMISSION AND UNITED STATES OF AMERICA

[7] Gomez and Hagstrom

[8] Reported on CBS news 10.20.26 after discussion of well-known actor Christina Applegates' undiagnosed debilitating symptoms.

9 **Gobba F.** Subjective non-specific symptoms related with electromagnetic fields: description of 2 cases].Epidemiol Prev. 26(4):171-175, 2002. See also attached file of abstract.

[10] The invisible rainbow : a history of electricity and life by Arthur Firstenberg.
Firstenberg, Arthur, author. White River Junction, Vermont ; London, UK : Chelsea Green
2020 – 2020; The Earth and I by Arthur Firstenberg, Skyhouse Publishing, NY, NY, 2024

[11] https://ehsciences.org/cell-tower-radiation"-limits-worldwide/

12 Retrieved from Environmental Health Sciences.org