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Comment of Theodora Scarato on Santa Rosa City Council Agenda Number 3.2 study session on 5G and "Small Cell" towers , July 21, 2020

We Must Consider the Environmental Footprint of the Digital Ecosystem.

Engineers say 5G is "an energy hog." The millions of new short "small" cell towers and over 64 billion IoT devices are expected by 2025. Industry reports repeatedly state that energy efficiency goals will not be fully met, and that energy use from wireless devices and networks will grow exponentially, ever increasing our carbon footprint[1][2][3][4][5]. Environmental experts warn that the IOT is an unsustainable technology and will contribute to climate change.

"Behind each byte we have mining and metal processing, oil extraction and petrochemicals, manufacturing and intermediate transports, public works (to bury the cables) and power generation with coal and gas. As a result, the carbon footprint of the global digital system is already 4% of the global greenhouse gas emissions, and it's energy consumption rises by 9% per year."
– Jean-Marc Jancovici, President of The Shift Project, member of the French High Climate Council - "Lean ICT: Towards Digital Sobriety: Report on the Environmental Impact of Information and Communication Technologies, February 2019

I am also submitting to you the July 8, 2020 letter to me from the Environmental Protection Agency Lee Ann B. Veal, Director, Radiation Protection Division, Office of Radiation and Indoor Air which confirms that they have never reviewed the impact to birds, bees or trees. There is no federal health agency that has ever set safety limits for trees or bees. Our outdated wireless radiation limits were never intended to protect birds, bees and trees. No agency even has a funded mandate to ensure our flora and fauna are safe from cell tower radiation. In other words it is a gaping hole in federal accountability.

Documented Impacts to Wildlife and the Environment

- "A review of the ecological effects of RF-EMF" reviewed 113 studies finding RF-EMF had a significant effect on birds, insects, other vertebrates, other organisms and plants in 70% of the

[1] The Shift Project, "Lean ICT: Towards Digital Sobriety: Report on the Environmental Impact of Information and Communication Technologies, February 2019
[2] Andrae & Edler of Huawei Technologies, On Global Electricity Usage of Communication Technology: Trends to 2030 Challenges 2015
[3] The Center for Energy Efficient Telecommunications at the University of Melbourne "The Power of Wireless Cloud", 2013
[4] Shehabi et al., "United States Data Center Energy Usage Report" Berkeley Laboratory, 2016
[5] Morley et al., Lancaster University, "Digitalisation, energy and data demand: The impact of Internet traffic on overall and peak electricity consumption" Energy Research and Social Science, 2018

studies (Cucurachi 2013). Development and reproduction in birds and insects were the most strongly affected. As an example of the several studies on wildlife impacts, a study focusing on RF from antennas found increased sperm abnormalities in mice exposed to RF from GSM antennas (Otitoloju 2010).

- "Exposure of Insects to Radio-Frequency Electromagnetic Fields from 2 to 120 GHz" published in Scientific Reports is the first study to investigate how insects (including the Western honeybee) absorb the higher frequencies (2 GHz to 120 GHz) to be used in the 4G/5G rollout. The scientific simulations showed increases in absorbed power between 3% to 370% when the insects were exposed to the frequencies. Researchers concluded, "This could lead to changes in insect behaviour, physiology, and morphology over time…."
- Studies on bees have found behavioral effects (Kumar 2011, Favre 2011), disrupted navigation Goldsworthy 2009, Sainudeen 2011, Kimmel et al. 2007) decreasing egg laying rate (Sharma and Kumar, 2010) and reduced colony strength (Sharma and Kumar, 2010, Harst et al. 2006).
- Research has also found a high level of damage to trees from antenna radiation. For example, a field monitoring study spanning 9 years involving over 100 trees (Waldmann-Selsam 2016) found trees sustained more damage on the side of the tree facing the antenna.
- A study on Aspen trees near Lyons, Colorado entitled "Adverse Influence of Radio Frequency Background on Trembling Aspen Seedlings " published in the International Journal of Forestry found adverse effects on growth rate and fall anthocyanin production concluding that, "results of this preliminary experiment indicate that the RF background may be adversely affecting leaf and shoot growth and inhibiting fall production of anthocyanins associated with leaf senescence in trembling aspen seedlings. These effects suggest that exposure to the RF background may be an underlying factor in the recent rapid decline of aspen populations. Further studies are underway to test this hypothesis in a more rigorous way."[6]
- An analysis of 45 peer-reviewed scientific publications (1996-2016) on changes in plants due to the non-thermal RF-EMF effects from mobile phone radiation entitled "Weak radiofrequency radiation exposure from mobile phone radiation on plants concludes, "Our analysis demonstrates that the data from a substantial amount of the studies on RF-EMFs from mobile phones show physiological and/or morphological effects (89.9%, $p < 0.001$). Additionally, our analysis of the results from these reported studies demonstrates that the maize, roselle, pea, fenugreek, duckweeds, tomato, onions and mungbean plants seem to be very sensitive to RF-EMFs. Our findings also suggest that plants seem to be more responsive to certain frequencies…"[7]

What we have is a gaping hole in accountability on this issue.

The U.S. Department of the Interior sent a letter in 2014[8] reviewing several research studies showing harm to birds and concluding that "The electromagnetic radiation standards used by the Federal

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[6] Katie Haggerty, "Adverse Influence of Radio Frequency Background on Trembling Aspen Seedlings: Preliminary Observations," *International Journal of Forestry Research*, vol. 2010, Article ID 836278, 7 pages, 2010. doi.org/10.1155/2010/836278.

[7] Malka N. Halgamuge (2017) Review: Weak radiofrequency radiation exposure from mobile phone radiation on plants, *Electromagnetic Biology and Medicine*, 36:2, 213-235, DOI: 10.1080/15368378.2016.1220389.

[8] Washington DC, Veenendaal ME. Department of Interior Letter. *United States Department of the Interior OFFICE OF THE SECRETARY.*

Communications Commission (FCC) continue to be based on thermal heating, a criterion now nearly 30 years out of date and inapplicable today".

A now retired US Fish and Wildlife Service wildlife biologist, former lead on on telecommunications impacts, Dr. Albert Manville, has written to the FCC on impacts to birds and higher frequencies to be used in 5G and authored numerous publications detailing research showing harm to birds[9][10][11]. ". The race to implement 5G and the push by FCC to approve the related 5G license frequencies to industry are very troubling and downright dangerous."

Telecommunications Companies Warn Their Shareholders

In fact, a number of corporations already advise their shareholders that they could face serious financial risks from the health damages due to RF. For instance, Crown Castle's 2019 10-K ANNUAL REPORT states that,

> If radio frequency emissions from wireless handsets or equipment on our communications infrastructure are demonstrated to cause negative health effects, potential future claims could adversely affect our operations, costs or revenues.
> The potential connection between radio frequency emissions and certain negative health effects, including some forms of cancer, has been the subject of substantial study by the scientific community in recent years. We cannot guarantee that claims relating to radio frequency emissions will not arise in the future or that the results of such studies will not be adverse to us.
> ... If a connection between radio frequency emissions and possible negative health effects were established, our operations, costs, or revenues may be materially and adversely affected. We currently do not maintain any significant insurance with respect to these matters.

Most wireless companies, from AT&T to Nokia to T Mobile to Verizon Wireless, have issued similar warnings to their shareholders. Why are shareholders being warned but not the people living near the equipment? These disclosures show that even corporations cannot assure safety.

Due to these evaluations and the published scientific evidence, cell phone manufacturers cannot insure against health damages from the radiofrequency radiation emitted by their products and networks. In fact, most insurance plans do not cover electromagnetic fields (EMF) and have very clear "electromagnetic field exclusions." In order for insurance companies to cover EMF, one often must purchase additional "Pollution Liability" or "Policy Enhancement" coverage.

According to CFC Underwriting LTD in London, the UK agent for Lloyd's:

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[9] ECFS Filing Detail. https://www.fcc.gov/ecfs/filing/10603156011199. Accessed July 8, 2020.
[10] Albert M. Manville Ph.D. Former U.S. Fish and Wildlife Service Senior Biologist. Memorandum on the Bird and Wildlife Impacts of Non-ionizing Radiation. Environmental Health Trust. Accessed July 8, 2020.
[11] Manville AM. *Collisions, Electrocutions, and Next Steps-Manville BIRD STRIKES AND ELECTROCUTIONS AT POWER LINES, COMMUNICATION TOWERS, AND WIND TURBINES: STATE OF THE ART AND STATE OF THE SCIENCE B NEXT STEPS TOWARD MITIGATION 1*.; 2002.

> The Electromagnetic Fields Exclusion (Exclusion 32) is a General Insurance Exclusion and is applied across the market as standard. The purpose of the exclusion is to exclude cover for illnesses caused by continuous long-term non-ionising radiation exposure i.e. through mobile phone usage.

Even AT&T Mobile Insurance excludes loss from "pollutants" and its policy defines "Pollutants" as "Any solid, liquid, gaseous, or thermal irritant or contaminant including smoke, vapor, soot, fumes, acid, alkalis, chemicals, artificially produced electric fields, magnetic field, electromagnetic field, sound waves, microwaves, and all artificially produced ionizing or non- ionizing radiation and waste," (pg. 4) AT &T Mobile Insurance Policy, February 2014.

If insurance companies will not insure EMF and if even telecommunications companies consider EMF is a "pollutant," how can governments allow such an environmental pollutant without also warning their citizens as companies do?

5G Will Increase RF Exposures to the Environment and 5G Antenna Beamforming Exposures Cannot Be Accurately Measured

A 2019 European Parliament Report "5G Deployment: State of Play in Europe, USA, and Asia[12] confirms increased exposure from the 5G/4G Densification stating, "increased exposure may result not only from the use of much higher frequencies in 5G but also from the potential for the aggregation of different signals, their dynamic nature, and the complex interference effects that may result, especially in dense urban areas." The report points out that it currently "is not possible to accurately simulate or measure 5G emissions in the real world," stating,

> [T]he 5G radio emission fields are quite different to those of previous generations because of their complex beamformed transmissions in both directions – from base station to handset and for the return. Although fields are highly focused by beams, they vary rapidly with time and movement and so are unpredictable, as the signal levels and patterns interact as a closed loop system. This has yet to be mapped reliably for real situations, outside the laboratory.

A 2018 study published in Annals of Telecommunications found increased RF-EMF exposure from small cell LTE networks in two urban cities in France and the Netherlands. Researchers measured the RF-EMF from LTE (Long-Term Evolution) MC (macro cells meaning large cell towers) and SC networks (low-powered small cell base stations) and found that the small cell networks increased the radio emissions from base stations (called downlink) by a factor of 7–46 while decreasing the radio emissions from user equipment exposure (called) by a factor of 5–17. So while the devices themselves could emit less radiation, the cell antennas will increase the levels from cell antennas (Mazloum et al., 2019). This

[12] BLACKMAN, C. and FORGE, S. (2019). *5G Deployment State of Play in Europe, USA and Asia*. [PDF] European Parliament's Committee on Industry, Research and Energy. Available at: https://www.europarl.europa.eu/RegData/etudes/IDAN/2019/631060/IPOL_IDA(2019)631060_EN.pdf [Accessed 24 Feb. 2020].

study shows the increased exposures would be involuntary. We can turn our phones off, but we cannot turn off the antennas in the neighborhood. Birds, bees and trees have no choice.

Please contact me with any questions.
Theodora Scarato
Executive Director, Environmental Health Trust
EHTrust.org

Letter from the EPA

--------- Forwarded message ---------
From: **Veal, Lee**<Veal.Lee@epa.gov>
Date: Wed, Jul 8, 2020 at 11:32 AM
Subject: RE: Letter with specific Questions Related to the FDA review and to the EPA, CDC, NIOSH and FDA Jurisdiction on EMFs
To: Theodora Scarato <Theodora.Scarato@ehtrust.org>

Dear Director Scarato;

Thank you for sending us your questions and references regarding radiofrequency (RF) radiation. Up through the mid-1990s, EPA did study non-ionizing radiation. The Telecommunications Act of 1996 directs the Federal Communications Commission (FCC) to establish rules regarding RF exposure, while the U.S. Food and Drug Administration (FDA) sets standards for electronic devices that emit non-ionizing or ionizing radiation. EPA does not have a funded mandate for radiofrequency matters, nor do we have a dedicated subject matter expert in radiofrequency exposure. The EPA defers to other agencies possessing a defined role regarding RF. Although your questions are outside our current area of responsibilities, we have provided a response to each one as you requested.

1. *What is your response to these scientists' statements regarding the FDA report and the call to retract it?*

   EPA Response: The EPA does not have a funded mandate for radiofrequency matters, has not conducted a review of the FDA report you cited or the scientists' statements, and therefore has no response to it.

2. *To the FDA- What consultants were hired for the FDA review and report on cell phone radiation?*

   EPA Response: This is not an EPA matter. Please refer this question to the FDA.

3. *What US agency has reviewed the research on cell phone radiation and brain damage? I ask this because the FDA only has looked at selected studies on cancer. If your agency has not, please simply state you have not.*

   EPA Response: EPA's last review was in the 1984 document Biological Effects of Radiofrequency Radiation (EPA 600/8-83-026F). The EPA does not currently have a funded mandate for radiofrequency matters.

4. What US agency has reviewed the research on damage to memory by cell phone radiation? If so, when and send a link to the review.

   EPA Response: EPA's last review was in the 1984 document Biological Effects of Radiofrequency Radiation (EPA 600/8-83-026F). The EPA does not currently have a funded mandate for radiofrequency matters.

5. *What US agency has reviewed the research on damage to trees from cell phone radiation? If so, when was it issued and send a link to the review.Note this study showing damage from long term exposure to cell antennas.*

   EPA Response: The EPA does not have a funded mandate for radiofrequency matters, and we are not aware of any EPA reviews that have been conducted on this topic. We do not know if any other US agencies have reviewed it.

6. *What US agency has reviewed the research on impacts to birds and bees? If so, when and send a link to the review. I will note the latest research showingpossible impacts to bees from higher frequencies to be used in 5G.*

   EPA Response: The EPA does not have a funded mandate for radiofrequency matters, and we are

not aware of any EPA reviews that have been conducted on this topic. We do not know if any other US agencies have reviewed it.

7. *What is a safe level of radiofrequency radiation? I ask this because the FDA and FCC both state they do not need to test cell phones at body contact and it is proven that phones will create exposure that are higher than FCC limits when phones are tested in these positions.*

   The Telecommunications Act of 1996 directs the FCC to establish rules regarding radiofrequency (RF) exposure.The U.S. Food and Drug Administration (FDA) sets standards for electronic devices that emit non-ionizing or ionizing radiation. The EPA defers to these regulatory authorities for the establishment of safe levels of radiofrequency radiation.

8. *The FDA and FCC have been provided with information and published data showing the fact that cell phones create cell phone radiation exposures that violate FCC limits. What agency has the job of ensuring accountability that the American public is not exposed to RF radiation that exceeds FCC limits. The FCC has test protocols that say body contact tests are not needed. The FDA refers to the FCC. Yet the fact is that cell phones exceed FCC limits when tested in body contact positions. Are the FCC limits legitimate? These FCC limits are being violated. Who is the responsible agency that will ensure Americans are protected? The FCC says their rules are not being violated as their rules allow for a space between the phone or device and the body? The FDA says there is a safety factor so there is no need for them to act (and will not state what the safety factor for a cell phone is) . YET government limits are being exceeded. Are agencies fine with limits being violated? If so please explain at what level of cell phone radiation a federal agency will step in? If so, which agency has jurisdiction? (March 12, 2019 Publication on Om Gandhi's paper on radiation emissions violating FCC limits 11 times and August 21, 2019 Chicago Tribune cell phone testing data released)*

   EPA Response: The Telecommunications Act of 1996 directs the FCC to establish rules regarding radiofrequency (RF) exposure. The U.S. Food and Drug Administration (FDA) sets standards for electronic devices that emit non-ionizing or ionizing radiation. The EPA does not have a funded mandate for radiofrequency matters, and the questions you raise are outside of EPA's areas of responsibilities and current expertise. Please refer this question to FCC and FDA.

9. *The National Toxicology Program states clear evidence of cancer was found and the FDA disputes this because it was just an animal study. However birds fly and nest on cell antennas mounted on towers, bees fly in front of antennas and family pets (dogs, cats) will sit directly on or near Wi-Fi routers and smart speakers despite the fact that the manuals state humans should be*

at a minimum of 20 cm from wireless devices (far more from antennas of towers). What about the impact to these animals? What is the US government doing to ensure safety for wildlife and family pets?

EPA Response: The EPA does not have a funded mandate for radiofrequency matters, and the questions you raise are outside of EPA's area of responsibility and current expertise. We defer to FDA to provide a response regarding their findings.

10. *Please send me the staff member of your respective agency who is on the Interagency Radiofrequency Workgroup as I have repeatedly tried to get this information and it is never provided to me.*

EPA Response: The Radiofrequency Interagency Work Group (RFIAWG) is an informal forum for exchange of information and the group does not meet to set, or advise on, policy, rulemaking or guidance. The group has not met in more than two years.

11. *The FDA only reviewed selected studies on cancer until 2018. Most recently, the American Cancer Society funded* radiation in*people with genetic susceptibilities. The National Toxicology Program published research showing DNA damage. Will the FDA be updating it's review with these studies? If not, then what agency is accountable to American public to ensure humans are not harmed?*

EPA Response: The questions you raise are outside of EPA's areas of responsibilities and current expertise. Please direct questions about FDA activities to FDA.

12. *What agency ensures safety related to extremely low frequency (ELF-EMF) electromagnetic fields- also non ionizing? Currently we have no federal limit, no federal guidelines and confirmed associations with cancer and many other health effects. Kaiser Permanente researchers have published several studies linking pregnant women's exposure to magnetic field electromagnetic fields to not only increased miscarriage and but also increased ADHD, obesity and asthma in the*

woman's prenatally exposed children. A recent large scale study again found associations with cancer. Please clarify which US agency has jurisdiction over ELF-EMF exposures?

EPA Response: There are no U.S. Federal standards limiting residential or occupational exposure to electric and magnetic fields (EMF) from power lines. The EPA does not have a funded mandate for radiofrequency matters.

13. When it comes to cell phone radiation SAR thresholds, what is your understanding of the "safety factor" in place?

EPA Response: EPA last commented on FCC proposals for SAR limits in the 1996FCC 96-236. The Telecommunications Act of 1996 directs the FCC to establish rules regarding radiofrequency (RF) exposure.The U.S. Food and Drug Administration (FDA) sets standards for electronic devices that emit non-ionizing or ionizing radiation. The EPA defers to these regulatory authorities for the establishment of safe levels of radiofrequency radiation.

Sincere regards,

Lee Ann B. Veal

Director, Radiation Protection Division

Office of Radiation and Indoor Air

www.epa.gov/radiation