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WSSC Water:

Thank you for the opportunity to present to the WSSC Water committee, and respond to the report by Leeka Kheifets, PhD on potential impacts on human health of advanced metering infrastructure.

I am a public health physician who serves as director of the [Institute for Health and the Environment](#), a Collaborating Center of the World Health Organization, as well as a professor of [Environmental Health Sciences](#) at the University at Albany School of Public Health. I previously served as Director of the Wadsworth Center of the New York State Department of Health, and as Dean of the University at Albany School of Public Health. I received my medical degree from Harvard Medical School, have more than 450 peer-reviewed publications, six books and 50 reviews and book chapters. I am also co-editor of the "[BioInitiative Report](#)," first published in 2007, a comprehensive review of the adverse health effects of radiofrequency electromagnetic fields.

Smart AMI meters and cell phones occupy similar frequency bands of the electromagnetic spectrum, meaning that cell phone research can apply to smart meter radiofrequency radiation (RFR). Smart meter RFR consists of frequent, very intense but very brief pulses throughout the day. Because smart meter exposure over a 24 hour period can be very prolonged (pulses can average 9,600 times a day), and because there is building evidence that the sharp, high intensity pulses are particularly harmful, the cell phone study findings are applicable when discussing adverse health impacts from smart meters.

While the strongest evidence for hazards coming from RFR is for cancer, there is a growing body of evidence showing other effects including impacts to the brain and reproductive system. In addition, some people develop a condition called electro-hypersensitivity (EHS). These individuals respond to being in the presence of RFR with a variety of symptoms, including headache, fatigue, memory loss, ringing in the ears, "brain fog" and burning, tingling and itchy skin. Some reports indicate that up to three percent of the population may develop these symptoms, and that exposure to smart meters is a trigger for development of EHS.

In short:

- Smart meters operate with much more frequent pulses than cell phones, increasing the potential for adverse health impacts.
- Smart meter pulses can average 9,600 times a day, and up to 190,000 signals a day. Cell phones only pulse when they are on.

- Cell phone RFR is concentrated, affecting the head or the area where the phone is stored, whereas smart meter RFR affects the entire body day and night.
- An individual can choose whether or not to use a cell phone and for what period of time. When smart meters are placed on a home the occupants have no option but to be continuously exposed to RFR. Even if they opt-out neighbors will have transmitting meters elevating the ambient levels in the neighborhood.

I am aware that the WSSC received a report entitled “[On potential impacts on human health of advanced metering infrastructure](#)” and I strongly disagree with the conclusion stated at the [WSSC Commission meeting on February 19, 2020](#) at 3:29:40 that "...with smart meters, the exposures are so low that...concern is unwarranted.” The research findings by independent scientists point to a clearer relationship between RFR and health effects than industry-funded studies and independent scientists believe that a network of radiofrequency radiation (RFR) generating meters in a neighborhood poses numerous health and environmental issues warranting attention. It does not make sense to dismiss smart meter exposures as “low” because this is a new network of thousands of RFR transmitting devices. Governments should be reducing RFR exposures, not increasing them.

The adverse health impacts of low intensity RFR are real, significant, and for some people debilitating. I want to stress four fundamentals as the WSSC proceeds to consider wireless meters:

- The Federal Communication Commission's “safety” standards do not apply to protection from biological effects of long-term exposure to low intensity RFR.
- There is no safe level of exposure established for RFR.
- People around the world are suffering from low intensity RFR exposure, being at increased risk of developing cancer, electrical sensitivity as well as other medical conditions.
- The Federal Communication Commission's “safety” standards do not apply to flora and fauna and thus the trees and wildlife exposed to the radiofrequency radiation are without any federal regulations or protections.

Published research documents that radiofrequency radiation is a human carcinogen.

Page 15 of the [WSSC Report](#) states “*International Agency for Research on Cancer has classified RF as a ‘possible human carcinogen’ (Group 2B) based on ‘limited evidence’ from both human and animal studies (Ref.: 15) the weight of evidence has not risen to a level that would change the basis for RF exposure limits.*”

As of 2020, several expert independent scientists have published their evaluation that the scientific evidence has increased and radiofrequency radiation should be classified as proven human carcinogen ([Belpomme et al., 2018](#); [Miller et al., 2018](#); [Hardell and Carlberg, 2019](#)).

The 2011 World Health Organization International Agency for Research on Cancer (WHO/IARC) classification of RF-EMFs as a “possible” human carcinogen was based primarily on evidence from human studies that long-term users of mobile phones held to the head resulted in an elevated risk of developing brain cancer. One major reason that the IARC rating was not at “probable” or “known” was the lack of clear evidence from animal studies for exposure leading to cancer.

In 2018, the US National Institute of Environmental Health Sciences National Toxicology Program’s (NTP) Studies of Cell Phone Radiation released their findings that chronic exposure to RFR was associated with “clear evidence” of cancer in RFR-exposed male rats ([NTP, 2018](#)). In addition, exposed animals had significantly more DNA damage, heart damage and low birth weight ([Smith Roe et al., 2020](#)). Similar results in rats have been reported in an independent large scale animal study from the Ramazzini Institute with levels of exposure far lower than the NTP study and similar to those from a mobile phone base station ([Falcioni et al., 2018](#)). This evidence, in conjunction with the human studies, demonstrates conclusively that excessive exposure to RF-EMF results in an increased risk of cancer. In light of this new evidence for cancer in rodents in response to prolonged exposure to mobile phone frequencies, the IARC rating should be raised at least to “probable” (Group 2A) if not “known” (Group 1).

Due to the large scale animal studies as well as additional published research since 2011, the WHO/IARC advisory group published their recommendation that IARC should evaluate non-ionizing radiofrequency radiation as a “high priority” in the next five years. Documentation can be found at [IARC Monographs on the Identification of Carcinogenic Hazards to Humans Report of the Advisory Group to Recommend Priorities for the IARC Monographs during 2020–2024](#) on page 148.

Published research documents adverse effects at levels well below FCC limits.

Page 4 of the [WSSC Report](#) states *“The exposures to RF from smart meter are neither long enough nor strong enough to approach the safety standards set by the Federal Communications Commission (FCC) and other bodies.”*

First, FCC limits are not protective and thus any comparison to these limits has no relevance to impacts on health and the environment. The current weight of scientific evidence refutes the prominent claim that the deployment of wireless technologies poses no health risks at the currently permitted non-thermal radiofrequency exposure levels. Instead, the evidence supports the [International EMF Scientist Appeal](#) by 244 scientists from 41 countries who have published on the subject in peer-reviewed literature and collectively petitioned the WHO and the UN for immediate measures to reduce public exposure to artificial electromagnetic fields and radiation ([Bandara and Carpenter, 2018](#)).

“Numerous recent scientific publications have shown that EMF affects living organisms at levels well below most international and national guidelines. Effects include increased cancer risk, cellular stress,

increase in harmful free radicals, genetic damage, structural and functional changes of the reproductive system, learning and memory deficits, neurological disorders, and negative impacts on general well-being in humans. Damage goes well beyond the human race, as there is growing evidence of harmful effects to both plant and animal life” ([Kelley et al., 2015](#)).

The various agencies setting safety standards including the FCC have failed to impose sufficient guidelines to protect the general public, particularly children who are more vulnerable to the effects of EMF. Reliance on FCC limits does not ensure safety.

Published research documents that even low levels of radiofrequency radiation have adverse impacts.

Page 3 of the [WSSC Report](#) states *“Because Smart meters are not used in close proximity to human body (unlike cell phones, tablets, computers and even WIFI) and because they transmit relatively infrequently their exposure levels are very low and far below U.S. and international exposure limits.”*

Wireless smart meters typically produce atypical, relatively potent and very short pulsed RF/microwaves. Technical spec sheets on AMI water meters show these types of meters transmit very frequently - with a mobile message every 14 seconds at 100 mW and every 71/2 minutes at 1 Watt ([See Neptune R900i Spec Sheet](#)). Constant emissions is the only way for meters to transmit information wirelessly in “real time.” Smart utility meters transmit very high intensity but short pulses. Even if the duration of the pulse is short, the pulse can be intense and research has found that low level exposures have biological effects ([Bioinitiative Report Charts](#)). In addition, the resulting biological effects from an exposure may be due both to the pulsed and polarized characteristics of man-made EMFs emitted wireless technologies which contrast to the non-polarized natural electromagnetic fields humans have been exposed to for decades ([Belyaev, 2015](#), [Panagopoulos et al., 2015](#)).

Second, water utility meters are both inside homes as well as outside homes on walls near living spaces for families. The WSSC report states that “about 60% of WSSC water meters are located inside the basement of homes and 40% are located outside the home at the property line.” Hence, there are opportunities for people to be in close proximity to the meters and receive intense exposures. Equally important is that people will be exposed day and night.

Hundreds of scientists are calling on policymakers to reduce RF levels to protect the public and the environment and identify smart meters as a source of radiofrequency radiation exposure.

The [WSSC Report](#) page 21 states that *“A group of scientists published an appeal in which they question adequacy of existing guidelines for RF from variety of devices, including smart meters...most official organizations do not share this concern.”*

The International EMF Scientist Appeal signed by over 250 scientists states “Based upon peer-reviewed, published research, we have serious concerns regarding the ubiquitous and increasing exposure to EMF generated by electric and wireless devices. These include—but are not limited to—radiofrequency radiation (RFR) emitting devices, such as cellular and cordless phones and their base stations, Wi-Fi, broadcast antennas, smart meters...”

There are numerous medical organizations recommending that exposure to radiofrequency be reduced and they include [American Academy of Pediatrics](#), [ANSES, France’s National Agency for Food, Environmental and Occupational Health Safety](#), [Turin Medical Association of Italy](#), [The American Academy of Environmental Medicine](#), [Swiss Physicians Association of Doctors for Environmental Protection](#), [African Cancer Organisation](#), [The Cyprus National Committee on Environment and Child Health](#), [Austrian Medical Association](#), [Athens Medical Association](#), [Canadian Parliament House Standing Committee on Health](#).

For anyone to downplay the exposure from smart meters as contributing just a “low” level downplays the actuality that a person’s total exposure comes from a combination of sources inside and outside the home. Smart meters would contribute to this total daily exposure. The toxic metal lead is not known to be safe at any level and companies worked for years to downplay the science showing harm. It makes sense to reduce exposure as much as possible.

Children and pregnant women are most vulnerable to radiofrequency radiation.

Children, and especially fetuses, are more vulnerable than adults for most environmental exposures ([Sly and Carpenter, 2012](#)). This is because their cells are rapidly dividing and their organ systems are not mature. As a result, events that perturb cellular function early in life can result in abnormalities later. There is a building body of evidence indicating that exposure to RF-EMFs has adverse effects on cognition and neurobehavior, especially in children and adolescents. Of concern is the fact that any adverse effects during development may have life-long consequences and that young people, because they will have a longer life span will receive greater cumulative exposure than adults ([Belpomme et. al, 2018](#)).

Research on animals ([Bas et al., 2009](#); [Deshmukh et al., 2015](#); [Shahin et al., 2017](#); [Megha et al., 2015](#); [Aldad et al., 2012](#); [Zhang et al., 2015](#)) shows impacts from RFR to the brain such as alterations in neurodevelopment and behavior of offspring, impaired learning and spatial memory, a deleterious impact on hippocampal, pyramidal or cortical neurons and induced markers of oxidative stress and inflammation in the brain. Human data is consistent with these animal studies as they have found higher cell phone radiation associated with behavioral problems and memory damage ([Divan et al., 2012](#); [Birks et al. 2017](#); [Foerster et. al., 2018](#)).

The research showing impacts from radiofrequency on the brain again highlights the importance of reducing exposure to children and pregnant women. There is no safe level of radiofrequency radiation identified.

Radiofrequency radiation has been found to interact with other toxic exposures and have synergistic reactions.

Early life exposure to lead has long been known to harm children and impact their ability to pay attention. Two studies have shown that prenatal ([Choi et al., 2017](#)) or postnatal ([Byun et al., 2017](#)) mobile phone exposure results in greater neurobehavioral effects in children with elevated lead levels than those seen with elevated lead alone. These results indicate that EMFs can have synergistic actions with other environmental contaminants known to cause a reduction in intelligence quotient (IQ).

In addition, replicated results from animal studies show co-carcinogenic and tumor promoting effects from RF-EMF when RF is combined with a known carcinogen ([Tillmann et al., 2010](#); [Lerchl et al., 2015](#)). The studies used a very low level of radiofrequency radiation yet found increases in tumors from the combined exposures.

Industry influence is impacting the science on radiofrequency radiation.

The evaluation of RFR health risks is often ignored by government authorities. Conflicts of interest and ties to the industry seem to have contributed to the biased reports by various organizations ([Hardell, 2007](#); [2017](#); [Hardell and Carlberg, 2020](#); [Hardell and Nyberg, 2020](#); [Harvard University Press, 2018](#); [Ledford, 2010](#); [Starkey, 2016](#)). The lack of proper unbiased risk evaluation of radiofrequency radiation places populations at risk. I published an article ([Carpenter, 2019](#)) on lower frequency electromagnetic radiation and found that when one allows for bias reflected in source of funding, the scientific evidence that magnetic fields increase risk of cancer is neither inconsistent nor inconclusive. It is clear when one excludes biased reports from individuals and organizations that have conflicts of interest that the adverse health effects resulting from exposure to RFR are well-documented, are found consistently in studies from around the world, and require that government and regulatory agencies take action to protect the public from excessive exposure to RFR.



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