[ORAL ARGUMENT NOT YET SCHEDULED]
No. 20-1025 [Consolidated with 20-1138]

IN THE UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT

ENVIRONMENTAL HEALTH TRUST, et al.,
Petitioners,
v.
FEDERAL COMMUNICATIONS COMMISSION AND UNITED STATES of AMERICA,
Respondents,

PETITION FOR REVIEW OF FINAL ORDER OF THE FEDERAL COMMUNICATIONS COMMISSION

AMICUS BRIEF OF NATURAL RESOURCES DEFENSE COUNCIL AND LOCAL ELECTED OFFICIALS IN SUPPORT OF PETITIONERS

Sharon Buccino
Natural Resources Defense Council
1152 15th Street, NW, Suite 300
202-289-6868
sbuccino@nrdc.org

Counsel for Amici Curiae,
Natural Resources Defense Council et al.

RULE 26.1 DISCLOSURE STATEMENT

Pursuant to the United States Court of Appeals for the District of Columbia Rule 26.1 and Federal Rule of Appellate Procedure 26.1, Natural Resources Defense Council respectfully states that it is a non-profit corporation with no parent companies, subsidiaries or affiliates and has not issued shares to the public. No other *amici curiae* are corporations.

/s/ Sharon Buccino

Counsel for Amici Curiae,
Natural Resources Defense Council et al.

Dated: August 5, 2020

CERTIFICATE AS TO PARTIES, RULINGS, RELATED CASES, AND FILING OF SEPARATE BRIEF

As required by Circuit Rules 28(a)(1) and 29(d), counsel for *amici curiae* hereby certify as follows:

A. Parties

All parties are listed in Petitioners' Joint Opening Brief.

B. Rulings Under Review

The agency action under review is identified in Petitioners' Joint Opening Brief for Petitioners.

C. Related Cases

None.

D. Separate Brief

Undersigned counsel is aware of one additional potential *amicus*, the Building Biology Institute, in support of Petitioners. Counsel consulted to determine if a single amicus brief was practical and determined that it was not. *Amici Natural Resources Defense Council et al*. are focused on the adequacy of environmental review for the construction of wireless infrastructure and the relevance of the FCC's RF standards to that review. The Building Biology

Institute is focused on different issues including the relevance of the RF standards to tort liability for individual harm.

/s/ Sharon Buccino

Counsel for Amici Curiae,
Natural Resources Defense Council et al.

Dated: August 5, 2020

STATEMENT REGARDING ORAL ARGUMENT

Given the impact the challenged FCC order will have on this court's previous decision in NRDC's favor related to environmental review, undersigned counsel for amici respectfully requests the opportunity to participate in oral argument. NRDC successfully challenged a 2018 order by the Federal Communications Commission that had proposed to eliminate environmental and historic review for certain cell towers and other wireless infrastructure. *United Keetoowah Band of Cherokee Indians v. FCC*, 933 F.3d 728 (D.C. Cir. 2019).

The FCC's 2019 order challenged by Petitioners in this case renders such environmental review meaningless. Under the challenged *Order*, environmental review is tied to the RF limits set by the FCC. As long as a wireless service provider certifies that the construction it proposes meets the FCC's RF standards, no environmental analysis is required. The FCC's arbitrary determination that the limits set in 1996 are still adequate today means that environmental review will not occur where it would otherwise if the FCC had followed the mandates of reasoned decision-making under the Administrative Procedure Act.

/s/ Sharon Buccino

Counsel for Amici Curiae,
Natural Resources Defense Council et al.

Dated: August 5, 2020

TABLE OF CONTENTS

TABLE OF AUTHORITIES

Cases

Statutes

Regulations

Other Authorities

GLOSSARY

ANSI	American National Standards Institute
APA	Administrative Procedure Act
CEQ	Council on Environmental Quality
EPA	U.S. Environmental Protection Agency
EMF	Electro-magnetic Fields
FCC	Federal Communications Commission
IEEE	Institute of Electrical and Electronics Engineers
ITU	International Telecommunications Union
NCRP	National Council on Radiation Protection
NEPA	National Environmental Policy Act
RF	Radiofrequency
RFIAWG	Radiofrequency Interagency Work Group
TCA	Telecommunications Act of 1996

INTEREST OF AMICI CURIAE

Amici are a national environmental organization and elected officials who support environmental and public health protections for all and seek inclusive decision-making processes. They rely on the National Environmental Policy Act (NEPA) to ensure that federal government decisions – such as the licensing of use of the spectrum to provide wireless services – are informed by the best available science and input from citizens affected by those decisions.

The FCC's December 4, 2019 order compromises interests of *amici* in three critical ways: (1) The FCC failed to complete an Environmental Impact Statement under NEPA before terminating its inquiry into the adequacy of its radiofrequency (RF) standards. (2) The FCC's inadequate health standards excuse wireless service providers from conducting environmental review even though these services may expose humans and the environment in which they live to harmful radiation. (3) The FCC's order renders any environment review that is done inadequate because it is based on inadequate health standards. Rather than conduct new analysis of the potential environmental harm its actions may cause, the FCC will simply point to its decision in its December 4 order that its RF standards are adequate to satisfy NEPA. This might be fine if the FCC supported its decision with sufficient evidence. As explained by Petitioners, the Commission did not.

Natural Resources Defense Council (NRDC) is a national non-profit environmental advocacy organization that seeks effective environmental and public health policies for all communities. NRDC successfully challenged a 2018 order by the Federal Communications Commission that proposed to eliminate environmental and historic review for certain cell towers and other wireless infrastructure. *United Keetoowah Band of Cherokee Indians v. FCC*, 933 F.3d 728 (D.C. Cir. 2019). The FCC's 2019 order challenged by Petitioners in this case would render such environmental review practically meaningless. When reviewing actions wireless service providers take to use the spectrum as the FCC has authorized, the Commission is unlikely to conduct new environmental analysis. Instead, the FCC will point to its determination in the challenged 2019 order that its health standards are adequate as satisfaction of its duty to look at potential harm. This might be fine if the FCC analyzed recent science and changed its standards to reflect this science. The FCC, however, failed to do so.

Local elected officials[1] are and have been directly affected by the FCC's failure to set RF standards adequate to protect public health and the environment. Verizon and other telecom companies are rapidly constructing enhanced 4G LTE and 5G networks in communities across the country. Elected officials in these communities are accountable to their constituents to protect their health and the

[1] See Addendum, Exh. A, for list of individual elected officials.

environment. The Telecommunications Act of 1996 limits local and state regulation of wireless services based on environmental effects. Congress concentrated authority to set RF standards applicable to construction of wireless infrastructure in the FCC. The FCC's failure to set adequate standards prevents local elected *amici* from delivering the protection they owe those who have elected them.

STATEMENT OF AUTHORITY TO FILE AND AUTHORSHIP AND FINANCIAL CONTRIBUTIONS

All parties have consented to the filing of this brief. This brief was not authored in whole or part by counsel for a party. No party or counsel for a party, and no person other than the *amici curiae* or their counsel, contributed money intended to fund its preparation or submission.

STATUTES AND REGULATIONS

I. National Environmental Policy Act (NEPA)

Signed into law in 1970 by President Nixon, NEPA is an action-forcing statute applicable to all federal agencies. Its commitment is to "prevent or eliminate damage to the environment . . . by focusing government and public attention on the environmental effects of proposed agency action." *Marsh v. Or. Nat. Res. Council*, 490 U.S. 360, 371 (1989) (internal quotations omitted). The statute requires "that the agency will inform the public that it has indeed

considered environmental concerns in its decision-making process." *Balt. Gas and Electric Co. v. NRDC*, 462 U.S. 87, 97 (1983).

NEPA is designed to ensure that agencies look before they leap. NEPA established the Council on Environmental Quality (CEQ) "with the authority to issue regulations interpreting it." *New York v. Nuclear Regulatory Commission*, 681 F.3d 471, 476 (D.C. Cir. 2012), quoting *Dep't of Transp. v. Public Citizen*, 541 U.S. 752, 757 (2004). CEQ regulations require that "environmental information is available to public officials and citizens before decisions are made and before actions are taken." 40 C.F.R. §1500.1(b). *See Oglala Sioux Tribe v. Nuclear Regulatory Comm'n*, 896 F.3d 520 (D.C. Cir. 2018).

CEQ's NEPA regulations require agencies to "insure the professional integrity, including scientific integrity, of the [agency's] discussions and analyses…." 40 C.F.R. §1502.24. Where data is not presented in the NEPA document, the agency must justify not obtaining that data. 40 C.F.R. §1502.22. In addition, the regulations provide that the "[h]uman environment shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment."[2]

[2] CEQ amended its NEPA regulations on July 16, 2020. 85 Fed. Reg. 43304. The language quoted herein refers to the version of CEQ's rules that were in effect at the time the FCC issued its challenged order.

II. Telecommunications Act of 1996 (TCA)

Pursuant to the TCA, the FCC regulates use of spectrum that makes wireless communication possible. Providers of personal wireless services must obtain an FCC license. 47 U.S.C. §§301, 307, 309; 47 C.F.R. §1.903. In addition, a construction permit is required before certain wireless infrastructure can be built. 47 U.S.C. §319. The FCC's regulations require that "[s]tations in Wireless Radio Services . . . be used and operated . . . with a valid authorization granted by the Commission under the provisions of this part. . . ." 47 C.F.R. §1.903.

The FCC's responsibilities include setting standards to protect the public from the environmental effects of radiofrequency (RF) radiation. While several agencies had engaged in research regarding the health and other environmental impacts of RF radiation, Congress in 1996 concentrated regulatory authority over human exposure to RF radiation from communication services and facilities in the FCC. The TCA required the FCC to "prescribe and make effective rules regarding the environmental effects of radio frequency emissions" within 180 days of the Act's enactment.[3] The Act also prohibited state and local regulation of wireless

[3] PL 104–104, February 8, 1996, 110 Stat 56, §704(b) ("RADIO FREQUENCY EMISSIONS.—Within 180 days after the enactment of this Act, the Commission shall complete action in ET Docket 93–62 to prescribe and make effective rules regarding the environmental effects of radio frequency emissions."). The FCC's regulations governing exposure to RF radiation are found at 47 C.F.R. §§1.1307(b), 1.1310.

facilities based on environmental effects of RF emissions so long as those facilities complied with relevant FCC regulations. 47 U.S.C. §332(c)(7)(B)(iv). That same year, Congress eliminated funding for Environmental Protection Agency (EPA) activities related to RF radiation.[4]

SUMMARY OF ARGUMENT

The Federal Communications Commission has failed to protect the public from radiofrequency emissions. The Commission's legal obligations flow from two statutes – the National Environmental Policy Act and the Telecommunications Act. NEPA requires the Commission to analyze the environmental impacts – including those of radiofrequency radiation – of its authorization of wireless service providers. The Telecommunications Act goes further and imposes an affirmative duty on the FCC to protect the public from environmental effects of radiofrequency radiation. The FCC's December 4, 2019,[5] order misinterprets the

[4] Sen. Report 104-140, Department of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Bill, 1996, (Sept. 13, 1995)(to accompany H.R. 2099)(hereafter "*Senate Report 104-140*"), at 91.

[5] FCC, *In the Matter of Proposed Changes in the Commission's Rules Regarding Human Exposure to Radiofrequency Electromagnetic Fields Reassessment of Fed. Commc'ns Comm'n Radiofrequency Exposure Limits & Policies Targeted Changes to the Commission's Rules Regarding Human Exposure to Radiofrequency Electromagnetic Fields*, Docket Nos. ET 03-137, 13-84, 19-226, __ FCC Rcd ___, 2019 WL 6681944 (Dec. 4, 2019)(hereafter "*2019 Order*" or "*Order*")

Commission's responsibilities. The FCC fails to support its decision to rely on its 1996 standards.

When the FCC first addressed RF exposure standards, it did so in response to the Commission's obligations under NEPA. In 1985, the FCC recognized that it was "required to make a threshold determination as to whether the facilities it approves are 'major Federal actions significantly affecting the quality of the human environment,' thus triggering environmental review, regardless of whether federal guidelines or standards currently exist for general public exposure to RF radiation."[6] The Commission's duty under NEPA is to inform.[7] As the FCC itself recognized, it could not authorize the use of the electromagnetic spectrum for wireless services without analyzing the environmental impacts.

Congress gave the FCC additional duties in the TCA, including the responsibility to set standards adequate to protect the environment (including humans) from radiofrequency emissions. The TCA limits state and local regulation of wireless service facilities to the extent they comply with FCC

---

[6] FCC, *In the Matter of Responsibility of the Fed. Commc'ns Comm'n to Consider Biological Effects of Radiofrequency Radiation When Authorizing the Use of Radiofrequency Devices*. *Potential Effects of A Reduction in the Allowable Level of Radiofrequency Radiation on FCC Authorized Commercial Services and Equipment*, General Docket No. 79-144, *Report and Order*, 100 FCC 2d 543, 546 (¶8) (1985)(hereafter "*1985 Order*").

[7] As Petitioners explain, this duty to inform includes the responsibility to complete an Environmental Impact Statement to inform its rulemaking to set health standards for RF radiation. Pet. Br. at 76-78.

emission regulations. In restricting state and local authority to protect the public from radiofrequency emissions, Congress placed the responsibility to protect on the FCC. Congress further concentrated responsibility in the FCC by eliminating funding for EPA activities related to electro-magnetic fields (EMF).[8] The Senate Report on EPA appropriations declares that "EPA should not engage in EMF activities."[9]

Once entrusted with the authority to protect the public from RF emissions, the FCC had the responsibility to exercise that authority. The Commission has failed to do so. The FCC's December 4, 2019, order terminates the Commission's inquiry into the adequacy of its RF standards without making any change to limits that were set over twenty years ago. This action lacks the support in the record that the Administrative Procedure Act (APA) requires. Without meaningful RF limits and an effective way to ensure that they are met, the FCC leaves the public without the protection or even the information that Congress required the FCC to provide.

[8] Electromagnetic fields (EMF) refer to the complete electromagnetic spectrum, which includes radiofrequencies (RF) – a large band of EMF. See Figure 1, at 17. The EPA researched EMF effects in many ranges, including RF.
[9] *See Senate Report 104-140, supra* at note 4 at 91.

ARGUMENT

As Petitioners explain, the FCC's 2019 *Order* violates fundamental principles of the APA. The FCC finalized several actions in the December 4, 2019, order. Most important, it resolved the inquiry it had initiated in 2013 regarding the adequacy of its RF radiation limits. Despite numerous scientific studies of potential harm from exposure below the limits set by the FCC in 1996, the Commission chose not to change them.[10] The FCC misunderstands its responsibilities under NEPA and the TCA. As a result, the record lacks the support for the FCC's decision to continue to rely upon its 1996 limits for RF exposure.

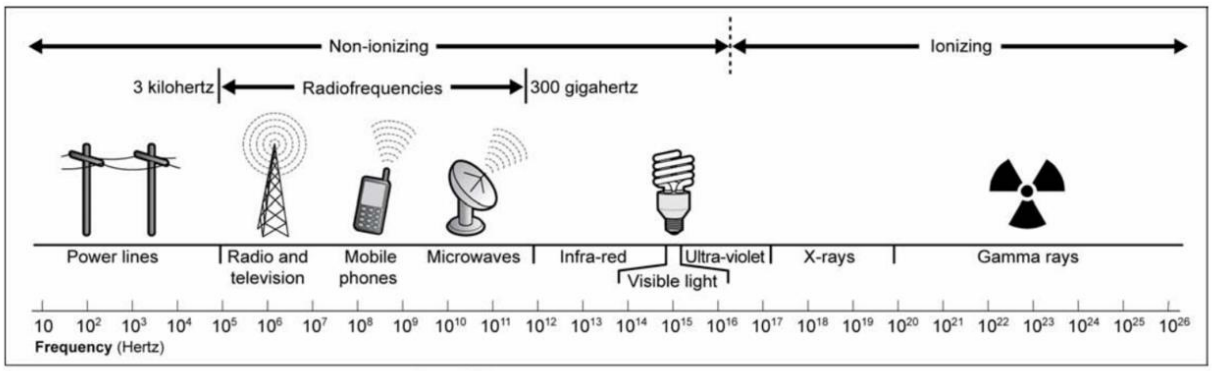
I. Exposure to Radiofrequency Radiation Has Increased with Proliferation of Wireless Services.

Wireless services such as cell phones operate by using a form of electromagnetic radiation – energy moving through space as a series of electric and magnetic waves. The spectrum of electromagnetic radiation ranges from very low frequencies, such as electrical power from power lines to extremely high frequencies such as gamma rays. The portion of the spectrum used by mobile

[10] *2019 Order*, *supra* note 5, at ¶2 ("we find no appropriate basis for and thus decline to propose amendments to our existing limits at this time").

phones and other telecommunications such as radio and television broadcasting is referred to as the radiofrequency (or RF) spectrum as shown below.[11]

Figure 1: The Electromagnetic Spectrum



Source: FCC.

Scientific studies have raised concern about the health and environmental effects of non-ionizing radiation from wireless communication services. Ionizing radiation from x-rays and nuclear power plants, which vibrates at high frequencies and produces large amounts of energy, has long been regarded as extremely dangerous to humans and other living creatures.[12] With enough energy to knock electrons free from their orbit around the nucleus of an atom, ionizing radiation creates unstable atoms with positive and negative charges. Scientists are now

[11] U.S. Government Accountability Office, GAO 12-771, *Telecommunications: Exposure and Testing Requirements for Mobile Phones Should be Reassessed* (2012), at 5.

[12] Martin Blank, *Overpowered: What Science Tells Us About the Dangers of Cell Phones and Other WIFI-Age Devices* (2013), at 29-30.

realizing that non-ionizing radiation also can cause biological effects in all systems of the body and in wildlife, including changes in DNA.[13]

From its earliest days, the U.S. Environmental Protection Agency (EPA)[14] investigated adverse health and environmental effects of non-ionizing radiation. Pursuant to authority under 42 U.S.C. §2021(h), EPA published notice of its intent to develop guidance for federal agencies to limit public exposure to radiofrequency radiation in 1982.[15] FCC Chairman Mark Fowler wrote to EPA encouraging the agency to complete guidance "as expeditiously as possible so that a uniform federal standard will be available for use by the FCC and other affected agencies."[16] In 1986, EPA published a report discussing the sources and levels of radiofrequency radiation to which the public was exposed and other analysis relevant to the development of exposure guidelines.[17]

---

[13] *See*, *e.,g.*, *Id*. at 58("EMF can damage DNA even at low EMF-exposure levels"); 58("exposure not only causes immediate danger, but also unleashes a chain of processes that continue to produce damage well after the exposure itself"); 63("The type of cellular damage caused by EMF is similar to that caused by aging. The residual errors and genetic mutations accumulate, leading to malfunction and disease.").

[14] GAO, *Efforts by the Environmental Protection Agency to Protect the Public from Environmental Nonionizing Radiation* (CED 78-79) (March 29, 1978), at 4-5.

[15] EPA, *Federal Radiation Protection Guidance for Public Exposure to Radiofrequency Radiation*, 47 Fed. Reg. 57338 (December 23, 1982).

[16] Letter from FCC Chairman Mark S. Fowler to Anne Burford, EPA Administrator re Docket 81-43 (February 22, 1983), see Addendum Exh. B.

[17] Norbert M. Hankin, EPA, Office of Air and Radiation, *The Radiofrequency Radiation Environment: Environmental Exposure Levels and RF Radiation Emitting Sources* (July 1986)(EPA-520/1-85-014).

Even as the EPA investigation was underway, the FCC recognized that it had its own legal obligation under NEPA to determine whether the facilities it approves are major federal actions triggering an environmental review. The Commission issued its first regulations addressing RF radiation in 1985.[18] The Commission's obligation to assess the environmental impacts of the actions it authorized did not depend on whether federal guidelines or standards otherwise existed for general public exposure to RF radiation.[19] In the Commission's words, "an agency 'cannot refuse to give serious consideration to environmental factors merely because it thinks that another agency should assume the responsibility for promoting the policies of NEPA.'"[20]

The Commission based its 1985 action on privately promulgated health and safety guidelines for RF radiation established by the American National Standards Institute (ANSI) in 1982,[21] which were based on short-term, acute thermal effects

---

[18] *1985 Order*, *supra* note 6.
[19] *Id*. at 546 (¶8).
[20] *Id.*, quoting *Natural Resources Defense Council, Inc. v. S.E.C.*, 432 F.Supp. 1190, 1207-1208 (D.D.C. 1977), *rev'd on other grounds*, 606 F.2d 1031 (D.C. Cir. 1979).
[21] *Id*. at 551 (¶24). ANSI is an organization comprised mainly of industries that set voluntary national standards for numerous industrial applications and processes. The industry subcommittee for radiofrequency radiation is the Institute of Electrical and Electronics Engineers (IEEE). The subcommittee title is C-95.1 for the microwave bands. The standards they recommend are titled ANSI/IEEE C.95.1 with the last revision year then added. The FCC uses ANSI/IEEE recommendations for "controlled" environments comparable to professional

of exposure to RF radiation. The assumption underlying these standards was that electromagnetic fields were harmful to humans only at levels powerful enough to increase the temperature of human tissue.[22]

At the time, the FCC did not impose specific radiation limits on all the industries it regulated. Rather than prohibiting services that exceeded the voluntary ANSI/IEEE guidelines, the FCC used the guidelines as a trigger to require an analysis of environmental impacts by wireless service providers.[23]

The worldwide explosion of wireless services has dramatically increased exposure of humans and wildlife to radiofrequency radiation. The International Telecommunications Union (ITU) reported an increase in global cellular subscriptions from 15.5% of the population in 2001 to an estimated 96.2% in 2013.[24]

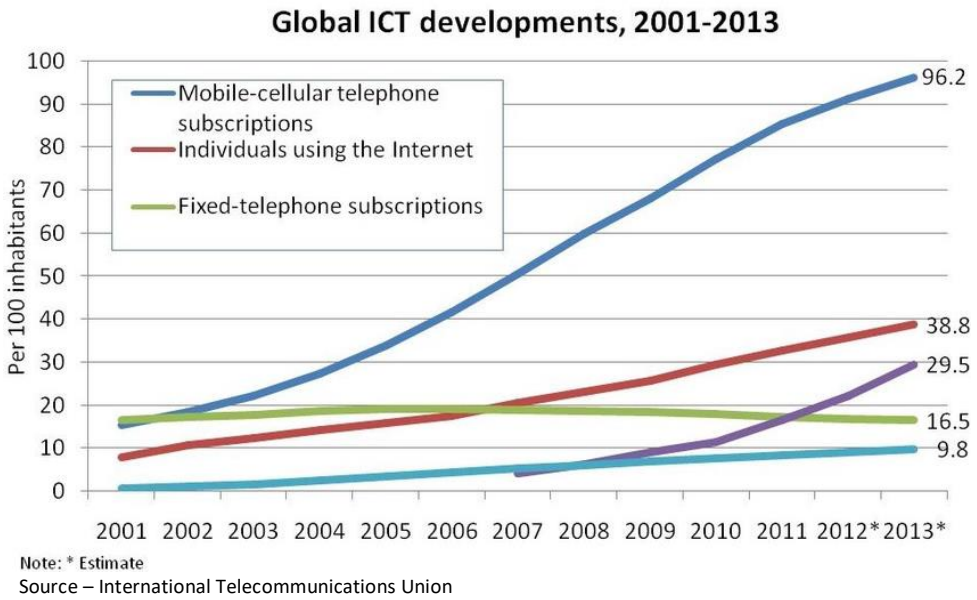
---

exposures. For "uncontrolled" environments where civilians are likely to be exposed, the FCC uses standards developed by the National Council on Radiation Protection (NCRP). B. Blake Levitt, ed., *Cell Towers, Wireless Convenience? Or Environmental Hazard?* (Safe Goods/New Century Publishing 2000), at 35-36.

[22] J. Elder, RADIOFREQUENCY RADIATION: ACTIVITIES AND ISSUES. U.S. Environmental Protection Agency, Washington, D.C., EPA/600/D-86/135 (NTIS PB86217155), 1986, https://cfpub.epa.gov/si/si_public_record_Report.cfm?Lab=NHEERL&dirEntryID=47568.

[23] *Id*., at 251(¶184)(*citing* 42 U.S.C. §4332(2)(C)).

[24] United Nations, International Telecommunication Union, *Global ICT Developments*, available at http://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx. *See generally*, Kenneth A. Jacobsen, *A Tale of Two Circuits: Curbs on Legal Remedies for Exposure to Potentially Harmful Cell Phone Radiation Emissions*, 10 Seton Hall Circuit Review 1, 2-3 (2013).



Ninety-six percent of Americans own a cell phone, over three-quarters of which are smartphones. In contrast to the largely stationary internet of the early 2000s, Americans today are connected to the world of digital information while "on the go" via these smartphones and other mobile devices.[25] According to the FCC's recent wireless competition report, "American demand for wireless services continues to grow exponentially."[26]

So-called 5G – the fifth generation of wireless service technology – dramatically increases human exposure to RF radiation. Previous generations of macro towers could be built several miles apart, but the 5G "millimeter wave

[25] Pew Research Center, *Mobile Fact Sheet* (June 12, 2019), available at https://www.pewresearch.org/internet/fact-sheet/mobile/ .
[26] FCC, *In the Matter of Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Inv.*, WT Docket No. 17-79, *Declaratory Ruling and Third Report and Order*, 33 FCC Rcd 9088, 9096 (¶23) (2018)(hereafter "*2018 Declaratory Order*").

spectrum simply cannot propagate long distances over a few thousand feet—let alone a few hundred."[27] As a result, the FCC anticipates "hundreds of thousands of wireless facilities" will be deployed in the next few years, "equal to or more than the number providers have deployed in total over the last few decades."[28] As the 5G buildout continues, Americans are forced to "live with involuntary 24/7 radiation."[29]

As Petitioners explain, the FCC's December 4, 2019, action ignores this new technology and its impacts. Pet. Br. at 34-36. Such failure to "consider an important aspect of the problem" is exactly the kind of arbitrary and capricious decision-making the Administrative Procedure Act prohibits. *United Keetoowah Band of Cherokee Indians*, 933 F.3d at 738, citing *Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983).

II. FCC Has Not Satisfied its Obligations under NEPA

A. FCC Has Recognized Since 1985 that It Has Obligations under NEPA

As the FCC itself acknowledged, the Commission is "required to make a threshold determination as to whether the facilities it approves are 'major Federal actions significantly affecting the quality of the human environment,' thus

[27] *Id.*, at 9133 (¶91), note 250.
[28] *Id.*, at 9112 (¶47), citing comments by Verizon, AT&T and Sprint.
[29] Christopher Ketchum, Is 5G Going to Kill Us?, *New Republic* (May 8, 2020), Addendum at Exh. C.

triggering environmental review."[30] Providers of personal wireless services must obtain an FCC license. 47 U.S.C. §§301, 307, 309; 47 C.F.R. §1.903. In addition, a construction of certain wireless infrastructure such as a cell tower sometimes requires an FCC permit. 47 U.S.C. §319. Courts have confirmed the application of NEPA to FCC actions. *See, e.g.*, *Am. Bird Conservancy, Inc. v. FCC*, 516 F.3d 1027 (D.C. Cir. 2008)(failure to consider potential impacts of cell towers on migratory birds violated NEPA); *Washington Utilities and Transp. Comm'n v. FCC*, 513 F.2d 1142, 1167 (9th Cir. 1975)(The Commission is required "to consider environmental values 'at every distinctive and comprehensive stage of the (agency's) process.'"), *abrogated on other grounds by Booth v. Churner*, 532 U.S. 731, 741 n. 6 (2001).

B. 2019 Order Fails to Fulfill the FCC's NEPA Obligations

The FCC's *Order* fails to satisfy its duties to inform the public as well as to inform its own decision. First, the FCC failed to complete any NEPA analysis to support its order or explain why the order did not trigger the FCC's NEPA obligations. Pet. Br. at 78-79. Numerous scientific studies were available to the FCC if it had taken its environmental review responsibilities seriously.[31] Instead,

[30] *1985 Order*, *supra* note 6, at 546 (¶8).
[31] *See infra* notes 52-58 and accompanying text.

the FCC stuck its head in the sand and did not even mention many of these studies of potential environmental harm in its 2019 order.

Second, the 2019 order limits the environmental review that occurs when companies construct facilities to provide the services that the FCC has licensed. As amended by the December 4 order, the FCC's rules excuse companies from submitting an environmental assessment of the impacts of proposed wireless services and facilities as long as such actions meet the FCC's RF limits.[32] Whether environmental review occurs rests upon whether the FCC has done its job in setting adequate RF radiation limits. As explained in Petitioners' brief, the FCC has failed to complete the job Congress gave it. Pet. Br. at 62-68.

If allowed to stand, the FCC's 2019 order eviscerates the environmental review this court recently ruled that the Commission must provide. On August 9, 2019, this court held that the FCC had failed to justify its elimination of review

[32] *2019 Order*, *supra* note 5, at App A, amending 47 C.F.R. §1.1307 ("With respect to the limits on human exposure to RF provided in Section 1.1310 of this chapter, applicants to the Commission for the grant or modification of construction permits, licenses or renewals thereof, temporary authorities, equipment authorizations, or any other authorizations of radiofrequency sources must either: (i) determine that they qualify for an exemption pursuant to Section 1.1307(b)(3); (ii) prepare an evaluation of the human exposure to RF radiation pursuant to Section 1.1310; or (iii) prepare an Environmental Assessment if those RF sources would cause human exposure to levels of RF radiation in excess of the limits in Section 1.1310.").

under NEPA and the National Historic Preservation Act. *United Keetoowah Band of Cherokee Indians*, 933 F.3d 728. The FCC did not appeal that decision.

Instead, the FCC tries to circumvent the court's prior decision with the challenged order. The Commission ended its inquiry into the adequacy of its 1996 limits on RF radiation without changing them or providing sufficient evidence to justify them. Pet. Br. 67-68. Moreover, the Commission offered no meaningful response to the numerous peer-reviewed scientific studies received as part of the inquiry that raised concerns about the environmental effects from exposure to radiation below the FCC's limits. Pet. Br. 65. The FCC's inadequate RF standards preclude adequate environmental review.

As a result of its 2019 order, the FCC avoids providing the information that NEPA requires. As wireless service providers propose to construct hundreds of new towers and other infrastructure across the country to use the spectrum pursuant to FCC licenses, the FCC is unlikely to conduct new environmental analysis. Instead, the Commission will invoke the determination that its health standards are adequate as satisfaction of its duty to look at potential harm. This might be fine had the FCC analyzed recent science and changed its standards to reflect this science. Instead, the Commission chose to stick its head in the sand – exactly the kind of government action that NEPA is designed to prevent.

Under the FCC's *Order*, *no* environmental review under NEPA is required if proposed wireless services fall below the FCC's RF standards. And the wireless service provider determines on its own whether it has met the standards. A wireless service provider's determination that its facilities are exempt excuses completion of an environmental assessment under NEPA. 47 C.F.R. § 1.1312(a). As a result of the provider's determination that it is exempt, the FCC receives *no information* from the company about the environmental effects of RF radiation from those facilities and the devices they support. The public does not get any information either.

III. FCC Misunderstands Its Obligations under the TCA

A. Congress Gave the FCC the Responsibility to Protect the Public from RF Hazards

As wireless communication expanded, Congress fundamentally changed the legal framework governing telecommunications. The Telecommunications Act of 1996 was the first major revision to federal telecommunications law since 1934. In deregulating the radio, television, cable and telephone industries, the Act touched off an explosion of wireless communication services. One way the Act facilitated rapid deployment of new technologies was by concentrating regulatory authority over the environmental effects of RF radiation in the FCC.

Congress prohibited state and local regulation of wireless facilities based on environmental effects of radiofrequency emissions so long as the facilities

complied with FCC regulations concerning such emissions.[33] The Act required the FCC to "prescribe and make effective rules regarding the environmental effects of radio frequency emissions" within 180 days.[34]

Seeking to avoid a patchwork of standards across the country, Congress gave the FCC the authority and responsibility to establish exposure limits to address the environmental effects of RF radiation.[35] Wireless service providers did not want the difficulty and expense of complying with different local and state regulations.[36] The regulatory responsibility that Congress gave the FCC in 1996 to *limit* the environmental impacts differed from its previous responsibility under NEPA to *understand* the impacts.

In addition to barring state and local regulation of the environmental effects of RF radiation, Congress limited EPA oversight by eliminating EPA's funding for activities related to RF radiation.[37] At the time, EPA was poised to issue new standards for RF radiation. It had briefed both the FCC and the National

[33] 47 U.S.C. § 332(c)(7)(B)(iv).
[34] PL 104–104, *supra* note 3.
[35] Report by. Rep. Bliley, Committee on Commerce, H.R. Rep. No. 204(I), 104th Cong., 1st Sess. 1995.
[36] *See, e.g.,* Carol R. Goforth, "A Bad Call: Preemption of State and Local Authority to Regulate Wireless Communication Facilities on the Basis of Radiofrequency Emissions," 44 N.Y.L. Sch. L. Rev. 311, 364 (2001) ("compliance [with different state and local regulations] would be difficult and time-consuming for the telecommunications industry").
[37] *See Senate Report 104-140, supra* note 4, at 91("EPA shall not engage in EMF activities.").

Telecommunications and Information Administration regarding its work to develop RF exposure guidelines. In Phase 1, EPA recommended moving forward immediately to address thermal impacts of RF radiation. In Phase 2, acknowledging potential non-thermal effects, EPA proposed convening a group of national experts to address "modulated and nonthermal exposures."[38] Three months later, EPA informed the FCC that it would have final guidelines by early 1996[39] based on technical input from the Radiofrequency Interagency Work Group (RFIAWG)[40] in which the FCC participated.

EPA never completed this work.[41] By eliminating EPA's funding for it, Congress gave the FCC the authority to control limits on RF radiation from wireless services. With that authority came responsibility.

---

[38] Memorandum from Robert F. Cleveland, Office of Engineering and Technology to FCC Secretary, *Ex Parte* Presentation by U.S. Environmental Protection Agency (March 22, 1995), at 6-7, see Addendum Exh. D.

[39] Letter from E. Ramona Trovata, EPA, Office of Radiation and Indoor Air, to Richard M. Smith, Chief, FCC, Office of Engineering and Technology (June 19, 1995), see Addendum Exh. E.

[40] The RFIAWG was established in 1995 by the EPA which chaired the group. It is made up of representatives from federal agencies with a stake in RF issues. Its purpose is to coordinate/exchange information related to RF exposures and advise federal agencies accordingly. The RFIAWG has not met in the last two years.

[41] In a July 8, 2020, letter to Theodora Scarato, Executive Director, Environmental Health Trust, EPA's Director of the Radiation Protection Division, Lee Ann B. Veal, confirms that EPA's "last review [of the research on damage to memory by cell phone radiation] 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." See Addendum Exh. F.

B. 2019 Order Fails to Fulfill the FCC's Responsibility to Protect the Public

The FCC fails in the 2019 order to recognize its regulatory responsibility to protect the public from RF radiation. Although the FCC has aggressively limited state and local authority to protect the public from the environmental effects of RF radiation,[42] it has failed to collect and review the information it needs to support its own RF radiation standards, which were last updated in 1996.

1. FCC Failed to Justify its RF Standards

In its 2019 order, the FCC resolved the inquiry it had initiated in 2013 regarding the adequacy of its RF radiation limits. Despite numerous scientific studies of potential harm from exposure below the limits set by the FCC in 1996, the Commission made the decision not to change them.[43]

The Commission had not updated its RF standards since 1996. Following issuance of the FCC's original standards in 1985, ANSI/IEEE adopted new guidelines in 1992 for RF radiation exposure that applied to additional categories, including cell phones. The FCC proposed updating its NEPA regulations to reflect

[42] *See, e.g., 2018 Declaratory Ruling*, supra note 26 at 9096 (¶24)(Commission has acknowledged "an urgent need to remove any unnecessary barriers to such deployment").
[43] *2019 Order*, *supra* note 5, at ¶2.

ANSI/IEEE's new findings.[44] While the FCC's proposal was pending, Congress passed the Telecommunications Act, which directed the FCC to "prescribe and make effective rules regarding the environmental effects of radio frequency emissions."[45] Recognizing the importance of these standards, Congress dictated that the FCC complete its pending rulemaking within 180 days of enactment of the TCA. The Commission finalized its rules on August 1, 1996.[46]

The FCC's responsibility did not end with its 1996 rulemaking. Just like EPA must ensure that its public-health protections reflect current science, the FCC must ensure its RF standards are up-to-date based on current knowledge. The Commission has failed to do so. As early as 1999, the RFIAWG, which included scientists and officials from across the government, criticized the FCC's standards for failing to be based on biological factors.[47] Based instead on dosimetric factors, the standards were designed to make the technology work rather than to protect life. Over ten years later, the FCC still has not changed the limits to address the RFIAWG's criticism. The Commission ignored the critical issues raised by the

---

[44] FCC, *In the Matter of Guidelines for Evaluating the Envtl. Effects of Radiofrequency Radiation*, ET Docket No. 93-62, *Notice of Proposed Rulemaking*, 8 FCC Rcd 2849 (¶1) (1993).
[45] PL 104-104, *supra* note 3.
[46] FCC, *Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation*, ET Docket No. 93-62, *Report and Order*, 11 FCC Rcd 15123 (1996).
[47] RFIAWG Letter to Richard Tell, Chair, IEEE SCC28 (SC4), Risk Assessment Group (June 17, 1999). See Addendum Exh. G. This letter is included in the FCC docket at https://ecfsapi.fcc.gov/file/7520941598.pdf.

RFIAWG even though the group included the FCC's own Senior Scientist in the Office of Engineering & Technology, Robert Cleveland.[48]

The FCC's obligation to "prescribe and make effective rules" is especially critical given the limit on the ability of state and local governments to set their own health standards applicable to radiofrequency emissions.[49] The TCA prohibits state and local regulation of "the placement, construction and modification of personal wireless service facilities on the basis of the environmental effects of RF emissions to the extent that such facilities comply with the [FCC's] RF standard."[50] Adding more force to this prohibition, the Act gives companies the right to sue a state or local government challenging "any final action or failure to act" inconsistent with the TCA's limitations on state and local authority.[51] The Act requires courts to resolve such lawsuits on an expedited basis.[52]

Such large limitations on state and local authority have left elected officials across the country reluctant to restrict industry proposals for new wireless services and towers and other infrastructure necessary to provide them. In approving use permits for three Verizon wireless telecommunications towers in Sonoma, for example, the Sonoma County Commission felt "there was no other option that

[48] *Id*. (attached list of members).
[49] 47 U.S.C. §332(c)(7)(B)(iv).
[50] 47 U.S.C. §332(c)(7)(B)(iv).
[51] 47 U.S.C. §332(c)(7)(B)(v).
[52] *Id*.

wouldn't invite a lawsuit from Verizon."[53] In fact, Verizon had previously filed suit against multiple jurisdictions in California that refused their applications, including Monterey, Danville, Piedmont, Hillsborough, Seaside and Los Altos.[54]

Courts have frequently struck down local government attempts to regulate siting of wireless facilities. In Pennsylvania, for example, a court held the Smithfield Township Board of Supervisors unlawfully denied a permit application because the proposed use was "detrimental to the health, safety and general welfare of the present or future residents of Smithfield Township." The court granted the application. According to the court, the permit applicant Verizon Wireless did not bear the burden to establish that its proposed activity did not have detrimental effects to health, safety and welfare. *Ne. Pennsylvania SMSA LP v. Smithfield Twp. Bd. of Supervisors*, 433 F. Supp. 3d 703, 717 (M.D. Pa. 2020).

Given the cost of litigation, local governments are reluctant to spend taxpayer dollars to defend efforts to regulate wireless infrastructure even when they might prevail in the end. The result is local governments feel powerless to respond to citizen concerns about the wireless infrastructure including the potential impacts to constituents' health.

---

[53] Christian Kallen, "Sonoma's Planning Commission Approves Verizon Application for 3 New Cell Towers," *Sonoma Index-Tribune* (Jan. 27, 2020), available at https://legacy.sonomanews.com/news/10640120-181/sonomas-planning-commmission-approves-verizon?sba=AAS.

[54] *Id.*

Congress gave the FCC responsibility to protect the public from RF hazards. The Commission has the burden to justify that its standards are effective. Rather than provide such justification, the Commission's 2019 order decides that its 1996 limits are adequate despite significant evidence suggesting that they are not.

2. FCC Failed to Respond to Evidence of Environmental Harm

As Petitioners explain, radiofrequency radiation generated by wireless service has biological effects that can harm human health as well as other living creatures in the environment. Pet. Br. at 18-20, 23, 26, 34-35. In 2012, in twenty-four technical chapters, the BioInitiative Working Group authors discussed the content and implications of about 1,800 peer-reviewed scientific studies conducted since 2007.[55] These studies indicate, among other things, DNA damage, carcinogenicity and reproductive effects. Over 250 scientists from over 44 nations have signed an International Appeal calling for protection from non-ionizing electromagnetic field exposure.[56] Such information was in the record before the FCC, but the Commission failed to address it. Pet. Br. 19, 23-24, 36.

---

[55] BioInitiative Working Group, A Rationale for Biologically-based Exposure Standards for Low-Intensity Electromagnetic Radiation (2012), https://bioinitiative.org/. The BioInitiative Working Group Report is cited to numerous times in the record before the FCC in this matter.

[56] International Appeal, Scientists Call for Protection from Non-ionizing Electromagnetic Field Exposure, https://emfscientist.org/index.php/emf-scientist-appeal. The International Appeal is cited to numerous times in the record before the FCC in this matter. *See also*, Comments of B. Blake Levitt and Henry C. Lai, *In Matter of Reassessment of Federal Communications Commission*

In addition to its impact on humans, radiofrequency radiation poses harmful effects to flora and fauna. In a review of 113 studies from peer-reviewed publications, seventy percent of the studies concluded that radiofrequency electromagnetic fields had a significant effect on birds, insects and plants.[57] In a 2013 literature review, the authors concluded that even for short exposure periods (<15 mins to a few hours), non-thermal effects were seen that can persist for long periods.[58]

Scientific research also indicates that electromagnetic fields can disrupt navigation abilities of migratory birds.[59] In five field studies analyzing the impact of RF-EMF exposure on bird populations living near cell phone towers or base-stations, a significant effect was observed in breeding density, reproduction, or

---

Radiofrequency Exposure Limits and Policies (E.T. Docket No. 13-84)(Aug. 25, 2013). The comments can be found in the FCC docket at https://ecfsapi.fcc.gov/file/7520939733.pdf.

[57] S. Cucurachi, W.L.M. Tamis, M.G. Vijver, W.J.G.M. Peijnenburg, J.F.B. Bolte & G.R. de Snoo, *A review of the ecological effects of radiofrequency electromagneticfields (RF-EMF)*, 51 ENVTL. INT'L, 116 – 140 (2013), https://doi.org/10.1016/j.envint.2012.10.009.

[58] Senavirathna Mudalige, Don Hiranya Jayasanka and Takashi Asaeda, *The significance of microwaves in the environment and its effect on plants*, *Environmental Reviews*, 2014, 22(3): 220-228, https://doi.org/10.1139/er-2013-0061.

[59] Peter Thalau, Dennis Gehring, Christine Nießner, Thorsten Ritz & Wolfgang Wiltschko, *Magnetoreception in birds: the effect of radiofrequency fields*, 12 J. R. SOC. INTERFACE, (Dec. 2, 2014), https://royalsocietypublishing.org/doi/10.1098/rsif.2014.1103 .

species composition.[60] The Department of the Interior raised concerns regarding the harm that non-ionizing electromagnetic radiation may cause to migratory birds.[61] These are just a few of the many scientific studies that were available to the FCC if it had chosen to take its duty to protect the public from environmental harm seriously. As Petitioners explain, such failure to consider and respond to the studies addressing the potential of environmental harm violated fundamental principles of the Administrative Procedures Act as well as the responsibility that Congress gave the FCC in the TCA. Pet. Br. at 50-51, 62-68.

CONCLUSION

With authority comes responsibility. When Congress concentrated authority over radiofrequency radiation in the FCC, it imposed a duty to protect as well as inform. The Telecommunications Act of 1996 required the FCC to "prescribe and make effective rules regarding the environmental effects of radio frequency emissions." As a result, the record supporting the FCC's December 4, 2019, action must show that its RF standards are safe and reliable. The environmental review

[60] Cucurachi et al., *supra*, note 60, at 122.
[61] Letter from Willie R. Taylor, Director, Office of Environmental Policy and Compliance, Dept. of Interior, to Eli Veenendaal, National Telecommunications and Information Administration, Dept. of Commerce (Feb. 7, 2014), https://ecfsapi.fcc.gov/file/10618237899075/Department-of-Interior-Feb-2014-letter-on-Birds-and-RF%20(1).pdf .

required by NEPA is indispensable to such determination. The burden is on the FCC to justify its RF standards. It is a burden the Commission has failed to meet. For the reasons stated herein, as well as in Petitioners' Brief, the Court should vacate the challenged order.

CERTIFICATE OF COMPLIANCE

1. This brief complies with the type-volume limitation of Fed. R. App. P.29(a)(5) because this brief contains 6,356 words, excluding the parts of the brief exempted by Fed. R. App. P. 32(f). This statement is based on the word count function of Microsoft Office Word 2016.

2. This brief complies with the typeface requirements of Fed. R. App. P. 32(a)(5) and the type style requirements of Fed. R. App. P. 32(a)(6) because this brief has been prepared in a proportionally spaced typeface using Microsoft Office Word 2016 in 14-point Times New Roman font for the main text and 14-point Times New Roman font for footnotes.

/s/ Sharon Buccino

Counsel for Amici Curiae,
Natural Resources Defense Council et al.

Dated: August 5, 2020

CERTIFICATE OF SERVICE

I hereby certify that on this 5th day of August, 2020, I electronically filed the foregoing Amicus Brief in Support of Petitioners on behalf of the Natural Resources Defense Council and Local Elected Officials as listed in Addendum, with the Clerk of the Court for the United States Court of Appeals for the District of Columbia by using the Court's CM/ECF system. I further certify that service was accomplished on all participants in the case via the Court's CM/ECF system. Required hard copies of the briefs are being delivered to the Court and counsel of record via first-class mail.

/s/ Sharon Buccino

Attorney for Amici,
Natural Resources Defense Council et al.

Dated: August 5, 2020

ADDENDUM

Statutes and Regulations

Statutes

5 U.S.C. §706(2)

The reviewing court shall--

(2) hold unlawful and set aside agency action, findings, and conclusions found to be--

(A) arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law;

(B) contrary to constitutional right, power, privilege, or immunity;

(C) in excess of statutory jurisdiction, authority, or limitations, or short of statutory right;

(D) without observance of procedure required by law;

(E) unsupported by substantial evidence in a case subject to sections 556 and 557 of this title or otherwise reviewed on the record of an agency hearing provided by statute; or

(F) unwarranted by the facts to the extent that the facts are subject to trial de novo by the reviewing court.

42 U.S.C. § 2021

(h) Consultative, advisory, and miscellaneous functions of Administrator of Environmental Protection Agency
The Administrator of the Environmental Protection Agency shall consult qualified scientists and experts in radiation matters, including the President of the National Academy of Sciences, the Chairman of the National Committee on Radiation Protection and Measurement, and qualified experts in the field of biology and medicine and in the field of health physics. The Special Assistant to the President for Science and Technology, or his designee, is authorized to attend meetings with, participate in the deliberations of, and to advise the Administrator. The Administrator shall advise the President with respect to radiation matters, directly

or indirectly affecting health, including guidance for all Federal agencies in the formulation of radiation standards and in the establishment and execution of programs of cooperation with States. The Administrator shall also perform such other functions as the President may assign to him by Executive order.

42 U.S.C. § 4332

(2) all agencies of the Federal Government shall—

(C) include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on--

(i) the environmental impact of the proposed action,

(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,

(iii) alternatives to the proposed action,

(iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and

(v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

Prior to making any detailed statement, the responsible Federal official shall consult with and obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved. Copies of such statement and the comments and views of the appropriate Federal, State, and local agencies, which are authorized to develop and enforce environmental standards, shall be made available to the President, the Council on Environmental Quality and to the public as provided by section 552 of Title 5, and shall accompany the proposal through the existing agency review processes;

47 U.S.C. §301 - License for radio communication or transmission of energy

It is the purpose of this chapter, among other things, to maintain the control of the United States over all the channels of radio transmission; and to provide for the use

of such channels, but not the ownership thereof, by persons for limited periods of time, under licenses granted by Federal authority, and no such license shall be construed to create any right, beyond the terms, conditions, and periods of the license. No person shall use or operate any apparatus for the transmission of energy or communications or signals by radio (a) from one place in any State, Territory, or possession of the United States or in the District of Columbia to another place in the same State, Territory, possession, or District; or (b) from any State, Territory, or possession of the United States, or from the District of Columbia to any other State, Territory, or possession of the United States; or (c) from any place in any State, Territory, or possession of the United States, or in the District of Columbia, to any place in any foreign country or to any vessel; or (d) within any State when the effects of such use extend beyond the borders of said State, or when interference is caused by such use or operation with the transmission of such energy, communications, or signals from within said State to any place beyond its borders, or from any place beyond its borders to any place within said State, or with the transmission or reception of such energy, communications, or signals from and/or to places beyond the borders of said State; or (e) upon any vessel or aircraft of the United States (except as provided in section 303(t) of this title); or (f) upon any other mobile stations within the jurisdiction of the United States, except under and in accordance with this chapter and with a license in that behalf granted under the provisions of this chapter.

47 U.S.C. §307 – Licenses

(a) Grant

The Commission, if public convenience, interest, or necessity will be served thereby, subject to the limitations of this chapter, shall grant to any applicant therefor a station license provided for by this chapter.

(b) Allocation of facilities

In considering applications for licenses, and modifications and renewals thereof, when and insofar as there is demand for the same, the Commission shall make such distribution of licenses, frequencies, hours of operation, and of power among the several States and communities as to provide a fair, efficient, and equitable distribution of radio service to each of the same.

(c) Terms of licenses

(1) Initial and renewal licenses

Each license granted for the operation of a broadcasting station shall be for a term of not to exceed 8 years. Upon application therefor, a renewal of such license may be granted from time to time for a term of not to exceed 8 years from the date of expiration of the preceding license, if the Commission finds that public interest, convenience, and necessity would be served thereby. Consistent with the foregoing provisions of this subsection, the Commission may by rule prescribe the period or periods for which licenses shall be granted and renewed for particular classes of stations, but the Commission may not adopt or follow any rule which would preclude it, in any case involving a station of a particular class, from granting or renewing a license for a shorter period than that prescribed for stations of such class if, in its judgment, the public interest, convenience, or necessity would be served by such action.

(2) Materials in application

In order to expedite action on applications for renewal of broadcasting station licenses and in order to avoid needless expense to applicants for such renewals, the Commission shall not require any such applicant to file any information which previously has been furnished to the Commission or which is not directly material to the considerations that affect the granting or denial of such application, but the Commission may require any new or additional facts it deems necessary to make its findings.

(3) Continuation pending decision

Pending any administrative or judicial hearing and final decision on such an application and the disposition of any petition for rehearing pursuant to section 405 or section 402 of this title, the Commission shall continue such license in effect.

(d) Renewals

No renewal of an existing station license in the broadcast or the common carrier services shall be granted more than thirty days prior to the expiration of the original license.

(e) Operation of certain radio stations without individual licenses

(1) Notwithstanding any license requirement established in this chapter, if the Commission determines that such authorization serves the public interest,

convenience, and necessity, the Commission may by rule authorize the operation of radio stations without individual licenses in the following radio services: (A) the citizens band radio service; (B) the radio control service; (C) the aviation radio service for aircraft stations operated on domestic flights when such aircraft are not otherwise required to carry a radio station; and (D) the maritime radio service for ship stations navigated on domestic voyages when such ships are not otherwise required to carry a radio station.

(2) Any radio station operator who is authorized by the Commission to operate without an individual license shall comply with all other provisions of this chapter and with rules prescribed by the Commission under this chapter.

(3) For purposes of this subsection, the terms "citizens band radio service", "radio control service", "aircraft station" and "ship station" shall have the meanings given them by the Commission by rule.

(f) Areas in Alaska without access to over the air broadcasts

Notwithstanding any other provision of law, (1) any holder of a broadcast license may broadcast to an area of Alaska that otherwise does not have access to over the air broadcasts via translator, microwave, or other alternative signal delivery even if another holder of a broadcast license begins broadcasting to such area, (2) any holder of a broadcast license who has broadcast to an area of Alaska that did not have access to over the air broadcasts via translator, microwave, or other alternative signal delivery may continue providing such service even if another holder of a broadcast license begins broadcasting to such area, and shall not be fined or subject to any other penalty, forfeiture, or revocation related to providing such service including any fine, penalty, forfeiture, or revocation for continuing to operate notwithstanding orders to the contrary.

47 U.S.C. §309 – Application for License

(a) Considerations in granting application

Subject to the provisions of this section, the Commission shall determine, in the case of each application filed with it to which section 308 of this title applies, whether the public interest, convenience, and necessity will be served by the granting of such application, and, if the Commission, upon examination of such application and upon consideration of such other matters as the Commission may

officially notice, shall find that public interest, convenience, and necessity would be served by the granting thereof, it shall grant such application.

47 U.S.C. §319 – Construction permits

(a) Requirements

No license shall be issued under the authority of this chapter for the operation of any station unless a permit for its construction has been granted by the Commission. The application for a construction permit shall set forth such facts as the Commission by regulation may prescribe as to the citizenship, character, and the financial, technical, and other ability of the applicant to construct and operate the station, the ownership and location of the proposed station and of the station or stations with which it is proposed to communicate, the frequencies desired to be used, the hours of the day or other periods of time during which it is proposed to operate the station, the purpose for which the station is to be used, the type of transmitting apparatus to be used, the power to be used, the date upon which the station is expected to be completed and in operation, and such other information as the Commission may require. Such application shall be signed by the applicant in any manner or form, including by electronic means, as the Commission may prescribe by regulation.

(b) Time limitation; forfeiture

Such permit for construction shall show specifically the earliest and latest dates between which the actual operation of such station is expected to begin, and shall provide that said permit will be automatically forfeited if the station is not ready for operation within the time specified or within such further time as the Commission may allow, unless prevented by causes not under the control of the grantee.

(c) Licenses for operation

Upon the completion of any station for the construction or continued construction of which a permit has been granted, and upon it being made to appear to the Commission that all the terms, conditions, and obligations set forth in the application and permit have been fully met, and that no cause or circumstance arising or first coming to the knowledge of the Commission since the granting of the permit would, in the judgment of the Commission, make the operation of such station against the public interest, the Commission shall issue a license to the

lawful holder of said permit for the operation of said station. Said license shall conform generally to the terms of said permit. The provisions of section 309(a) to (g) of this title shall not apply with respect to any station license the issuance of which is provided for and governed by the provisions of this subsection.

(d) Government, amateur, or mobile station; waiver

A permit for construction shall not be required for Government stations, amateur stations, or mobile stations. A permit for construction shall not be required for public coast stations, privately owned fixed microwave stations, or stations licensed to common carriers, unless the Commission determines that the public interest, convenience, and necessity would be served by requiring such permits for any such stations. With respect to any broadcasting station, the Commission shall not have any authority to waive the requirement of a permit for construction, except that the Commission may by regulation determine that a permit shall not be required for minor changes in the facilities of authorized broadcast stations. With respect to any other station or class of stations, the Commission shall not waive the requirement for a construction permit unless the Commission determines that the public interest, convenience, and necessity would be served by such a waiver.

47 U.S.C. §332(c)(7)

(c) Regulatory treatment of mobile services

(7) Preservation of local zoning authority
(A) General authority
Except as provided in this paragraph, nothing in this chapter shall limit or affect the authority of a State or local government or instrumentality thereof over decisions regarding the placement, construction, and modification of personal wireless service facilities.
(B) Limitations
(i) The regulation of the placement, construction, and modification of personal wireless service facilities by any State or local government or instrumentality thereof--
(I) shall not unreasonably discriminate among providers of functionally equivalent services; and
(II) shall not prohibit or have the effect of prohibiting the provision of personal wireless services.

(ii) A State or local government or instrumentality thereof shall act on any request for authorization to place, construct, or modify personal wireless service facilities within a reasonable period of time after the request is duly filed with such government or instrumentality, taking into account the nature and scope of such request.
(iii) Any decision by a State or local government or instrumentality thereof to deny a request to place, construct, or modify personal wireless service facilities shall be in writing and supported by substantial evidence contained in a written record.
(iv) No State or local government or instrumentality thereof may regulate the placement, construction, and modification of personal wireless service facilities on the basis of the environmental effects of radio frequency emissions to the extent that such facilities comply with the Commission's regulations concerning such emissions.
(v) Any person adversely affected by any final action or failure to act by a State or local government or any instrumentality thereof that is inconsistent with this subparagraph may, within 30 days after such action or failure to act, commence an action in any court of competent jurisdiction. The court shall hear and decide such action on an expedited basis. Any person adversely affected by an act or failure to act by a State or local government or any instrumentality thereof that is inconsistent with clause (iv) may petition the Commission for relief.

Regulations

40 C.F.R. §1500.1

(b) NEPA procedures must insure that environmental information is available to public officials and citizens before decisions are made and before actions are taken. The information must be of high quality. Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA. Most important, NEPA documents must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail.

40 C.F.R. §1502.22

When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking.

(a) If the incomplete information relevant to reasonably foreseeable significant adverse impacts is essential to a reasoned choice among alternatives and the overall costs of obtaining it are not exorbitant, the agency shall include the information in the environmental impact statement.

(b) If the information relevant to reasonably foreseeable significant adverse impacts cannot be obtained because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, the agency shall include within the environmental impact statement:

(1) A statement that such information is incomplete or unavailable; (2) a statement of the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment; (3) a summary of existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment, and (4) the agency's evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community. For the purposes of this section, “reasonably foreseeable” includes impacts which have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason.

(c) The amended regulation will be applicable to all environmental impact statements for which a Notice of Intent (40 CFR 1508.22) is published in the Federal Register on or after May 27, 1986. For environmental impact statements in progress, agencies may choose to comply with the requirements of either the original or amended regulation.

40 C.F.R. §1502.24

Agencies shall insure the professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements. They shall identify any methodologies used and shall make explicit reference by footnote to the scientific and other sources relied upon for conclusions in the statement. An agency may place discussion of methodology in an appendix.

47 C.F.R. §1.903

(a) General rule. Stations in the Wireless Radio Services must be used and operated only in accordance with the rules applicable to their particular service as set forth in this title and with a valid authorization granted by the Commission under the provisions of this part, except as specified in paragraph (b) of this section.

(b) Restrictions. The holding of an authorization does not create any rights beyond the terms, conditions and period specified in the authorization. Authorizations may be granted upon proper application, provided that the Commission finds that the applicant is qualified in regard to citizenship, character, financial, technical and other criteria, and that the public interest, convenience and necessity will be served. See §§ 301, 308, and 309, 310 of this chapter.

(c) Subscribers. Authority for subscribers to operate mobile or fixed stations in the Wireless Radio Services, except for certain stations in the Rural Radiotelephone Service, is included in the authorization held by the licensee providing service to them. Subscribers are not required to apply for, and the Commission does not accept, applications from subscribers for individual mobile or fixed station authorizations in the Wireless Radio Services. Individual authorizations are required to operate rural subscriber stations in the Rural Radiotelephone Service, except as provided in § 22.703 of this chapter. Individual authorizations are required for end users of certain Specialized Mobile Radio Systems as provided in § 90.655 of this chapter. In addition, certain ships and aircraft are required to be individually licensed under parts 80 and 87 of this chapter. See §§ 80.13, 87.18 of this chapter.

47 C.F.R. §1.1307

(a) Commission actions with respect to the following types of facilities may significantly affect the environment and thus require the preparation of EAs by the applicant (see §§ 1.1308 and 1.1311) and may require further Commission environmental processing (see §§ 1.1314, 1.1315 and 1.1317):

(1) Facilities that are to be located in an officially designated wilderness area.

(2) Facilities that are to be located in an officially designated wildlife preserve.

(3) Facilities that:

(i) May affect listed threatened or endangered species or designated critical habitats; or

(ii) are likely to jeopardize the continued existence of any proposed endangered or threatened species or likely to result in the destruction or adverse modification of proposed critical habitats, as determined by the Secretary of the Interior pursuant to the Endangered Species Act of 1973.

Note: The list of endangered and threatened species is contained in 50 CFR 17.11, 17.22, 222.23(a) and 227.4. The list of designated critical habitats is contained in 50 CFR 17.95, 17.96 and part 226. To ascertain the status of proposed species and habitats, inquiries may be directed to the Regional Director of the Fish and Wildlife Service, Department of the Interior.

(4) Facilities that may affect districts, sites, buildings, structures or objects, significant in American history, architecture, archeology, engineering or culture, that are listed, or are eligible for listing, in the National Register of Historic Places (see 54 U.S.C. 300308; 36 CFR parts 60 and 800), and that are subject to review pursuant to section 1.1320 and have been determined through that review process to have adverse effects on identified historic properties.

(5) Facilities that may affect Indian religious sites.

(6) Facilities to be located in floodplains, if the facilities will not be placed at least one foot above the base flood elevation of the floodplain.

(7) Facilities whose construction will involve significant change in surface features (e.g., wetland fill, deforestation or water diversion). (In the case of wetlands on Federal property, see Executive Order 11990.)

(8) Antenna towers and/or supporting structures that are to be equipped with high intensity white lights which are to be located in residential neighborhoods, as defined by the applicable zoning law.

(b) In addition to the actions listed in paragraph (a) of this section, Commission actions granting construction permits, licenses to transmit or renewals thereof, equipment authorizations or modifications in existing facilities, require the preparation of an Environmental Assessment (EA) if the particular facility, operation or transmitter would cause human exposure to levels of radiofrequency radiation in excess of the limits in §§ 1.1310 and 2.1093 of this chapter.

Applications to the Commission for construction permits, licenses to transmit or renewals thereof, equipment authorizations or modifications in existing facilities must contain a statement confirming compliance with the limits unless the facility, operation, or transmitter is categorically excluded, as discussed below. Technical information showing the basis for this statement must be submitted to the Commission upon request. Such compliance statements may be omitted from license applications for transceivers subject to the certification requirement in § 25.129 of this chapter.

47 C.F.R. §1.1310

(a) Specific absorption rate (SAR) shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in § 1.1307(b) of this part within the frequency range of 100 kHz to 6 GHz (inclusive).

(b) The SAR limits for occupational/controlled exposure are 0.4 W/kg, as averaged over the whole body, and a peak spatial-average SAR of 8 W/kg, averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the parts of the human body treated as extremities, such as hands, wrists, feet, ankles, and pinnae, where the peak spatial-average SAR limit for occupational/controlled exposure is 20 W/kg, averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). Exposure may be averaged over a time period not to exceed 6 minutes to determine compliance with occupational/controlled SAR limits.

(c) The SAR limits for general population/uncontrolled exposure are 0.08 W/kg, as averaged over the whole body, and a peak spatial-average SAR of 1.6 W/kg, averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the parts of the human body treated as extremities, such as hands, wrists, feet, ankles, and pinnae, where the peak spatial-average SAR limit is 4 W/kg, averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). Exposure may be averaged over a time period not to exceed 30 minutes to determine compliance with general population/uncontrolled SAR limits.

(d)(1) Evaluation with respect to the SAR limits in this section must demonstrate compliance with both the whole-body and peak spatial-average limits using technically supported measurement or computational methods and exposure conditions in advance of authorization (licensing or equipment certification) and in

a manner that facilitates independent assessment and, if appropriate, enforcement. Numerical computation of SAR must be supported by adequate documentation showing that the numerical method as implemented in the computational software has been fully validated; in addition, the equipment under test and exposure conditions must be modeled according to protocols established by FCC–accepted numerical computation standards or available FCC procedures for the specific computational method.

(2) For operations within the frequency range of 300 kHz and 6 GHz (inclusive), the limits for maximum permissible exposure (MPE), derived from whole-body SAR limits and listed in Table 1 in paragraph (e)(1) of this section, may be used instead of whole-body SAR limits as set forth in paragraphs (a) through (c) of this section to evaluate the environmental impact of human exposure to RF radiation as specified in § 1.1307(b) of this part, except for portable devices as defined in § 2.1093 of this chapter as these evaluations shall be performed according to the SAR provisions in § 2.1093.

(3) At operating frequencies above 6 GHz, the MPE limits listed in Table 1 in paragraph (e)(1) of this section shall be used in all cases to evaluate the environmental impact of human exposure to RF radiation as specified in § 1.1307(b) of this part.

(4) Both the MPE limits listed in Table 1 in paragraph (e)(1) of this section and the SAR limits as set forth in paragraphs (a) through (c) of this section are for continuous exposure, that is, for indefinite time periods. Exposure levels higher than the limits are permitted for shorter exposure times, as long as the average exposure over a period not more than the specified averaging time in Table 1 in paragraph (e)(1) is less than (or equal to) the exposure limits. Detailed information on our policies regarding procedures for evaluating compliance with all of these exposure limits can be found in the most recent edition of FCC's OET Bulletin 65, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields,” and its supplements, all available at the FCC's internet website: https://www.fcc.gov/general/oet-bulletins-line, and in the Office of Engineering and Technology (OET) Laboratory Division Knowledge Database (KDB) (https://www.fcc.gov/kdb).

Note to paragraphs (a) through (d): SAR is a measure of the rate of energy absorption due to exposure to RF electromagnetic energy. These SAR limits to be used for evaluation are based generally on criteria published by the American

National Standards Institute (ANSI) for localized SAR in Section 4.2 of "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," ANSI/IEEE Std C95.1–1992, copyright 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017. These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," NCRP Report No. 86, Section 17.4.5, copyright 1986 by NCRP, Bethesda, Maryland 20814. Limits for whole body SAR and peak spatial-average SAR are based on recommendations made in both of these documents. The MPE limits in Table 1 are based generally on criteria published by the NCRP in "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," NCRP Report No. 86, Sections 17.4.1, 17.4.1.1, 17.4.2 and 17.4.3, copyright 1986 by NCRP, Bethesda, Maryland 20814. In the frequency range from 100 MHz to 1500 MHz, these MPE exposure limits for field strength and power density are also generally based on criteria recommended by the ANSI in Section 4.1 of "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," ANSI/IEEE Std C95.1–1992, copyright 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017.

(e)(1) Table 1 to § 1.1310(e)(1) sets forth limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields.

Table 1 to § 1.1310(e)(1)—Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(i) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63*(100)		≤6
3.0-30	1842/f	4.89/f	*(900/f^2)	<6

		)		
30-300	61.4	0.163	1.0	<6
300-1,500	.	f/300		<6
1,500-100,000	.		5	<6
(ii) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63*(100)		<30
1.34-30	824/f	2.19/f	*(180/f^2)	<30
30-300	27.5	0.073	0.2	<30
300-1,500	.	f/1500		<30
1,500-100,000	.		1.0	<30

f = frequency in MHz. * = Plane-wave equivalent power density.

(2) Occupational/controlled exposure limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure.The phrase fully aware in the context of applying these exposure limits means that an exposed person has received written and/or verbal information fully

explaining the potential for RF exposure resulting from his or her employment. With the exception of transient persons, this phrase also means that an exposed person has received appropriate training regarding work practices relating to controlling or mitigating his or her exposure. In situations when an untrained person is transient through a location where occupational/controlled limits apply, he or she must be made aware of the potential for exposure and be supervised by trained personnel pursuant to § 1.1307(b)(2) of this part where use of time averaging is required to ensure compliance with the general population exposure limit. The phrase exercise control means that an exposed person is allowed and also knows how to reduce or avoid exposure by administrative or engineering work practices, such as use of personal protective equipment or time averaging of exposure.

(3) General population/uncontrolled exposure limits apply in situations in which the general public may be exposed, or in which persons who are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure. For example, RF sources intended for consumer use shall be subject to the limits for general population/uncontrolled exposure in this section.

47 C.F.R. §1.1312

(a) In the case of facilities for which no Commission authorization prior to construction is required by the Commission's rules and regulations the licensee or applicant shall initially ascertain whether the proposed facility may have a significant environmental impact as defined in § 1.1307 of this part or is categorically excluded from environmental processing under § 1.1306 of this part.

(b) If a facility covered by paragraph (a) of this section may have a significant environmental impact, the information required by § 1.1311 of this part shall be submitted by the licensee or applicant and ruled on by the Commission, and environmental processing (if invoked) shall be completed, see § 1.1308 of this part, prior to the initiation of construction of the facility.

(c) If a facility covered by paragraph (a) of this section is categorically excluded from environmental processing, the licensee or applicant may proceed with construction and operation of the facility in accordance with the applicable licensing rules and procedures.

(d) If, following the initiation of construction under this section, the licensee or applicant discovers that the proposed facility may have a significant environmental effect, it shall immediately cease construction which may have that effect, and submit the information required by § 1.1311 of this part. The Commission shall rule on that submission and complete further environmental processing (if invoked), see § 1.1308 of this part, before such construction is resumed.

(e) Paragraphs (a) through (d) of this section shall not apply to the construction of mobile stations.

ADDENDUM

Exhibits

Exhibit A – List of Elected Officials who have Joined Brief as *Amici Curiae*

Exhibit B – Letter from FCC Chairman Mark S. Fowler to Anne Burford, EPA Administrator re Docket 81-43 (February 22, 1983)

Exhibit C – Christopher Ketchum, Is 5G Going to Kill Us?, *New Republic* (May 8, 2020)

Exhibit D – Memorandum from Robert F. Cleveland, Office of Engineering and Technology to FCC Secretary, *Ex Parte* Presentation by U.S. Environmental Protection Agency (March 22, 1995)

Exhibit E – Letter from E. Ramona Trovata, EPA, Office of Radiation and Indoor Air, to Richard M. Smith, Chief, FCC, Office of Engineering and Technology (June 19, 1995)

Exhibit F – Letter from EPA Director of the Radiation Protection Division, Lee Ann B. Veal to Theodora Scarato, Executive Director, Environmental Health Trust (July 8, 2020)

Exhibit G – RFIAWG Letter to Richard Tell, Chair, IEEE SCC28 (SC4), Risk Assessment Group (June 17, 1999)

EXHIBIT A

List of Elected Officials who have Joined Brief as *Amici Curiae*

Treasa Barrett, Mayor of the City of Petaluma, Petaluma, California

Twan Beliger, Northfield Township Trustee, Northfield, Michigan

Larry Bragman, Marin Municipal Water District, Marin County, California

Cheryl Davila, Member, City Council of Berkeley, California

Cindy Dyballa, City Councilmember, City of Takoma Park, Maryland

Michael Eger, District One Councilor, West Springfield, Massachusetts

Renee Goddard, Mayor, Town of Fairfax, California

Paul Hebert, Barnstable Town Councilor, Barnstable, Massachusetts

Kacy Kostiuk, City Councilmember, City of Takoma Park, Maryland

Peter Kovar, City Councilmember, City of Takoma Park, Maryland

Caitlin Quinn, Trustee, Petaluma City School Board, Petaluma, California

Terry J. Seamens, City Councilmember, City of Takoma Park, Maryland

Kathrin Sears, Marin County Supervisor, District 3, Marin County, California

Jarrett Smith, City Councilmember, City of Takoma Park, Maryland

Kate Stewart, Mayor, City of Takoma Park, Maryland

Kelly Takaya King, Council Member, County of Maui, Hawaii

Rebecca Villegas, County of Hawaii - Council District 7, Hawaii County, Hawaii

Tina Wildberger, Hawaii State Representative, House District 11, South Maui: Kihei, Wailea, Makena, Hawaii

EXHIBIT B

A 81-43
II-D-9

FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D. C. 20554

February 22, 1983

OFFICE OF
THE CHAIRMAN

Anne M. Burford
Administrator
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

In re: Docket A-81-43

Dear Mrs. Burford:

This letter is in response to the Environmental Protection Agency's Advance Notice of Proposed Recommendations in Docket A-81-43, Federal Radiation Protection Guidance for Public Exposure to Radiofrequency Radiation (47 Fed. Reg. 57338, December 23, 1982).

The Federal Communications Commission (FCC) is responsible for licensing facilities and authorizing equipment, not operated by the federal government, that utilize radiofrequency (RF) energy. In carrying out these responsibilities the FCC must comply with the requirements of the National Environmental Policy Act of 1969 (NEPA) to consider the environmental impact of its "major actions...significantly affecting the quality of the human environment"[42 U.S.C. §4332(2)(c), 1976].

In 1979, the Commission issued a Notice of Inquiry (44 Fed. Reg. 37008, 1979) to gather information to help us determine the extent to which RF radiation hazards should be considered by us in our licensing and authorization procedures. As a result of that inquiry and an assessment of our statutory obligations under NEPA, the Commission issued a Notice of Proposed Rule Making (NPRM) (47 Fed. Reg. 8214, 1982) in February of last year. A copy is enclosed.

The FCC's NPRM proposes to amend Section 1.1305 of the Commission's Rules, 47 C.F.R. §1.1305, for assessing the environmental consequences of FCC actions by adding a new subsection to address the matter of potential hazards of RF and microwave radiation. Pursuant to this proposal, the Commission would treat grants of construction permits or licenses to transmit as "major actions" subject to its NEPA processing requirements (47 C.F.R. §1.1301-1.1319) if the proposed operations would result in exposure of workers or the general public to levels of RF radiation in excess of those established by federal agencies having jurisdiction thereover.

To determine whether an action should be treated as a "major action" the Commission plans to rely on standards for exposure to RF radiation established by federal agencies such as EPA. The FCC lacks the necessary expertise and statutory authority to promulgate its own health and safety standards and, therefore, must look to EPA and other responsible agencies for guidance in this area.

There is presently no standard set by the federal government for exposure of the general public to RF radiation. However, several state and local governments are establishing their own standards in this area. We cannot judge whether an applicant's failure to comply with one of these non-federal standards constitutes an environmental impact issue. In addition, the Commission and its regulatees are concerned about safe exposure levels and the possibility of a confusing and costly proliferation of inconsistent state and local standards. For these reasons, we believe that a definitive federal standard is imperative.

Therefore, we would like to make clear our support for your guidance development. We encourage the EPA to complete this process as expeditiously as possible so that a uniform federal standard will be available for use by the FCC and other affected agencies.

We will be happy to cooperate in any way possible in this effort. Our Office of Science and Technology will be responsible for coordinating further activities with EPA's Office of Radiation Programs.

Sincerely,

Mark S. Fowler
Chairman

Enclosure

cc: Ms. Kathleen M. Bennett,
Assistant Administrator for
Air, Noise, and Radiation, EPA

Norbert N. Hankin,
Office of Radiation Programs, EPA

Central Docket Section, EPA

EXHIBIT C

Is 5G Going to Kill Us All?

A new generation of superfast wireless internet is coming soon. But no one can say for sure if it's safe.

ILLUSTRATION BY SARAH WILSON-AUSTENSEN

Christopher Ketcham / May 8, 2020

0:00 / 38:35

Audio: Listen to this article.

On a hot day last summer, Debbie Persampire, a 47-year-old homemaker who believes that cell phones are poisoning her children, took me on a tour of her irradiated house on Long Island. Her kids were at school, her husband was at work, and the house, a modest, tidy split-level typical of the suburbs, was spectacularly quiet. She brandished a handheld battery-powered device called an Acoustimeter to measure the radiation and waved me on up the stairs to the second floor, into the rooms where her children slept.

Outside, roughly 70 feet from the beds of her son, who is 12 years old, and her daughter, who is 10, was the source of her concern: a cell site, a nondescript box the shape of a small steamer trunk that was affixed to a utility pole just beyond the fence line. Crown Castle, the nation's largest provider of communications infrastructure, installed the unit in May 2017, and it began operating seven months later. It emitted, like all cell sites, a constant stream of microwave electromagnetic fields, or EMFs.

The Acoustimeter, detecting high EMF levels, had been buzzing and chirruping, its LED panel spiking. Then abruptly it went silent as we entered her son's room. Persampire swept the device toward the window, with its view of the street and the fence and the utility pole, and the buzzing started up again. With a glint in her eyes, she told me to take note of this fact. "Higher readings by the window," she said. "But along the walls, no."

In April 2019, a few months before my visit, she had put on some old clothes, hauled a ladder in from the garage, and spent the day painting the walls and ceilings of the children's rooms in a grim matte black more suitable for a death metal club. Known as YShield HSF54, the paint came in just one color. She'd purchased it from LessEMF, of Latham, New York, a company that also sells Acoustimeters. LessEMF, whose tagline is "Work, sleep, live better in the electrified world," claims YShield is effective at absorbing EMFs. Persampire had received from LessEMF a shipment of 10 liters of Yshield (just over two and a half gallons) at the hefty price of $658, along with her Acoustimeter, which set her back $400 more. With each stroke of the paint, she said, "came a sense of relief, like I could breathe again."

"We live with involuntary 24/7 radiation, even in my children's beds as they sleep."

Her husband and children, she told me, trusted she was doing the right thing. "If anyone thought I was crazy, they didn't say so," she said. "I didn't know much about this topic before Crown Castle placed that antenna. Then I read the science, and now I know more than I ever wanted to know. We live with involuntary 24/7 radiation, even in my children's beds as they sleep."

One of the studies that prompted her concern was a 2018 report by the National Toxicology Program, a branch of the National Institute for Environmental Health Sciences. Commissioned by the Food and Drug Administration to examine the human health risks of cell phone radiation, NTP researchers placed lab rats in "reverberation chambers"—metal boxes resembling microwave ovens—and, over a period of two years, exposed certain rats for nine hours a day, every day, to EMFs of the type that flow ubiquitously from Wi-Fi hubs and cell sites into our laptops, iPads, smartphones, and, of course, our bodies.

The researchers concluded there was "clear evidence" that cell phone radiation in exposed male rats can cause cancers and precancerous lesions in the heart and brain. The lead designer of the study, veteran toxicologist Ron Melnick, reported that the researchers also found tumors in rats' prostate glands, DNA damage in brain cells, heart muscle disease, and reduction in birth weights.

Persampire was stunned. "My initial reaction was, How is it possible that this can be ignored? When is this going to catch on like wildfire and have everyone making changes?" She promptly ditched her home Wi-Fi router, hard-wiring the family's computers and installing a landline phone with a long cord. While that diminished the risk, it hardly eliminated it. Persampire knew from her research that the microwave radiation beamed from cell sites was in the air, all around us. We were exposed whether we used it or not.

The NTP report was not an outlier. There were similarly alarming results in numerous other research studies. With each report she read, Persampire's concern grew into a kind of panic. There was the warning in 2011 by the International Agency for Research on Cancer, a branch of the World Health Organization in Lyon, France, that cell phone radiation was a "possible carcinogen." There was the voluminous BioInitiative Report, begun in 2007, based on the work of 29 scientists and health experts from 10 countries, who reviewed over 1,800 studies of EMF health effects published since 2007. Persampire read every one of its 1,557 pages and even reached

out to its co-editor, Dr. David Carpenter, a medical doctor who directs the Institute for Health and the Environment at the State University of New York at Albany. She asked if she should be worried. Carpenter said she should.

Then in 2019, she came across the website of a group called the International EMF Scientists Appeal. Among its more than 250 members, the group counted biophysicists, biochemists, and physicians from 43 countries, including professors at Harvard Medical School, Columbia University, and Johns Hopkins, who collectively had published in professional journals some 2,000 papers and letters on the biological effects of microwave EMFs. In recent years, the group issued a series of "urgent" pleas to the WHO and the United Nations Environment Programme to "address the global public health concerns related to exposure to cell phones." The first of its nine recommendations was that "children and pregnant women be protected" from exposure.

The signatories of the EMF Scientists Appeal were particularly concerned with a vaunted new wireless communications system known as 5G, which, they warned, was totally untested for human health risk. Searching online and making a few calls, Persampire soon learned that the cell site 70 feet from her children's bedrooms was in fact a 5G-capable unit. What this meant for the safety of her kids, she did not know. Worse, she soon realized, nobody did.

On October 13, 1983, Bob Barnett, then the president of Ameritech Mobile Communications, placed the first commercial cell phone call. The recipient, as befitted the historic occasion, was the grandson of Alexander Graham Bell, who had invented the telephone more than a century before. Barnett placed the call on a Motorola DynaTAC 8000X. It weighed two pounds, was 13 inches long, operated only for 30 minutes before needing a charge, and retailed for $4,000.

No doubt the audio quality was far from perfect, but improvements would come at a breakneck pace. The bricklike first-generation, or "1G," phones of the 1980s gave way in subsequent decades to ever more miniaturized and inexpensive 2G devices, which allowed users to hear clearly and talk at length. 2G also enabled a totally new form of communication called texting. The 2000s brought 3G, which offered higher-quality

telephony; miraculous-seeming, if torturously slow, internet access; and primitive video. With Long-Term Evolution, or LTE, and 4G systems in the 2010s came full-on internet browsing, streaming movies, Instagram, and porn at your fingertips—the smartphone as we know it today.

5G promises to usher in a new golden age of wireless, a world of total connectivity.

On the horizon is the new protocol, 5G, fifth-generation wireless, which has been celebrated as heralding a "fourth industrial revolution." Boasting transmission speeds as much as five times faster than current LTE and 4G systems, 5G promises to usher in a new golden age of wireless, a world of total connectivity.

With 5G, the latency of transmission—the lag between the moment information is sent and received—will drop to very low levels. That means crystal-clear audio, video chats, and teleconferencing in absolute real time, and films downloaded in mere seconds. It will also, at last, enable the much-ballyhooed "internet of things" to usher in a hyperconnected future. As *Wired* put it, with breathless fanfare: "All the things we hope will make our lives easier, safer, and healthier will require high-speed, always-on internet connections."

With the internet of things, just about every appliance in your home—televisions, refrigerators, stovetops, dishwashers, coffee kettles, ovens, toasters, and lighting and heating systems—will connect to a seamless slipstream of electromagnetic frequencies and communicate among themselves. Additionally, 5G will make possible the widespread use of driverless cars, piloted by machine intelligence; routine telemedicine procedures conducted robotically by surgeons via remote connections; aerial drone deliveries of goods; and other high-tech magic as yet unimaginable. "5G is about to change the world," a Qualcomm vice president wrote this year, declaring "potential 5G use cases as infinite, or at least only as finite as the frontier of human innovation."

All that potential explains why antennas like the one by Persampire's home are springing up everywhere. The telecom industry has reported that 5G will require over 800,000 cell sites by 2026, over twice the number that has been built to date. The antennas will be clustered lower to the ground, closer to homes, businesses, offices, schools, and parks; affixed to utility poles, on cell towers, on

residences, and rooftops. They likely won't look much different from the unit outside Persampire's house, and most of us will probably not notice their arrival.

The build-out, one of the most expensive communications infrastructure expansions in U.S. history, is expected to require tens of billions of dollars of investment and, it's hoped, bring in many times that in profits, adding over $17 trillion to the global economy by 2035, by one estimate.

Meanwhile, millions of miles of new fiber-optic cable will be laid underground or strung on utility poles to support the insatiable hunger for bandwidth. And as consumers enter the upgrade cycle for 5G-capable devices, many millions of new phones will be manufactured and sold globally over the next five years, while the total number of connected internet-of-things devices will rise to an estimated 50 billion by 2022.

5G, in other words, is big money, and for obvious reasons the telecom service providers, the phone manufacturers and distributors, the fiber-optic cable and cell site manufacturers and installers would prefer that the rollout proceed without impediment.

One of the central tenets of modern public health regulation is the precautionary principle. This is the commonsense idea that without clear evidence that innovations are safe for the public, their use should be restricted, if not avoided altogether.

When I first wrote about cell phone radiation in 2010, I met a neuroscientist named Allan Frey who had spent decades in the field of bioelectromagnetics, which is the study of the effects of EMFs on living organisms. Working at General Electric's Advanced Electronics Center at Cornell University in the 1960s, Frey devised an experiment whereby frogs would be exposed to certain microwave frequencies. His findings were surprising. The radiation, he discovered, could trigger heart arrhythmias, and with a slight change in the frequencies, he could stop the frogs' hearts from beating altogether.

The prevailing wisdom had previously held that only the ionizing frequencies in the electromagnetic spectrum (x-rays, gamma rays, and the like) could disrupt living

cells and produce an adverse biological effect. According to this orthodoxy, the only way frequencies below the ionizing part of the spectrum could alter living organisms is with what's called a thermal effect, when the radiation is directed at very high power to heat up tissue, as in a microwave oven.

Frey's study looked at nonthermal effects from low-power microwave frequencies—the levels similar, as it happens, to those by which our smartphones operate today. Among his most significant discoveries was that such frequencies can indeed be made dangerous using what is known as modulation. In simple terms, modulation occurs when a signal is embedded with another signal that carries information, such as the sounds, pictures, and movies on your phone. This second signal modulates the "carrier" signal.

In a study published in 1975 in the *Annals of the New York Academy of Sciences*—a study famous in the field of bioelectromagnetics—Frey reported that low-power microwave frequencies at certain modulations could induce "leakage" in the barrier between the circulatory system and the brain in rats. Breaching the blood-brain barrier is a serious matter, exposing the brain to toxins, viruses, and bacteria.

Another longtime researcher in this field, Henry Lai, then a professor of bioengineering at the University of Washington, in the 1990s showed with fellow researcher Narendra P. Singh that modulated microwave frequencies in exposed rats could cause breaks in DNA strands, such that genetic mutations might result and be passed on. The damage, shockingly, occurred with a single two-hour exposure.

Pall warned that microwave EMFs are "much more active in children than in adults," because children have thinner skulls.

In 2003, a neurosurgeon named Leif Salford replicated Frey's blood-brain barrier work and went a step further, finding that modulated microwave frequencies could actually *kill* brain cells in rats. "A rat's brain is very much the same as a human's," Salford told the BBC. "They have the same blood-brain barrier and neurons. We have good reason to believe that what happens in rats' brains also happens in humans'."

What troubles experts in bioelectromagnetics most is that the destructive effects these studies have documented occurred at levels far below the human safety

exposure limits set by the Federal Communications Commission.

In September 2017, Dr. Martin Pall, a professor emeritus of biochemistry at Washington State University, presented the evidence of risk at an event sponsored by the National Institutes of Health. Pall cited 18 studies that revealed microwave EMFs could alter the structure of the testes and ovaries, lower sperm count, and diminish the production of sex hormones. Twenty-five studies suggested that EMFs could produce "neurological/neuropsychiatric effects," including, in Pall's litany, "insomnia, fatigue, depression, headache" in humans and "major changes in brain structure seen in animals." At least 21 studies, including those conducted by Lai and Singh, attested to single-strand and double-strand breaks in cellular DNA. Some 32 studies found oxidative stress and free radical damage to cells and elevated levels of apoptosis, or programmed cell death, which can cause neurodegenerative disorders such as dementia. Pall warned that microwave EMFs are "much more active in children than in adults," because children, among other factors, have thinner skulls, allowing EMFs to more deeply penetrate the brain, and higher densities of stem cells that apparently are more sensitive to microwave radiation.

All of these effects, he noted, occur at exposure levels "orders of magnitude" lower than those allowed by current U.S. and international safety guidelines. Pall takes the risk so seriously that he now wears a metal mesh undergarment designed, he says, to deflect the electropollutants emanating from cell sites, mobile phones, and Wi-Fi antennas. He does not carry a cell phone or use Wi-Fi, and his work computer is hard-wired.

At the conclusion of his talk, he turned to the question of 5G technology. He invoked the precautionary principle: Given the research to date about earlier generations of microwave telecom systems, the 5G rollout, Pall told the NIH assembly, was "absolutely insane."

You can think of an electromagnetic frequency like ocean waves reaching the shore at a set interval. The more frequent the waves, the smaller the distance between them, i.e., the shorter the "wavelength." So, for example, a frequency of three gigahertz has a wavelength of 99 centimeters; at 300 GHz, the wavelength is less than a millimeter.

The extremely high frequencies—what scientists call millimeter waves, which range from 30 to 300 GHz—carry information at faster speeds. While 2G, 3G, and 4G function at frequencies as low as 700 megahertz and as high as 2.5 GHz, 5G will operate using millimeter waves. These penetrate objects less easily, which explains the need for vastly increased numbers of cell sites at closer proximity to users. (As 5G-capable cell sites come online in the next few years, the earlier generations of microwave systems will not fade away but will remain in operation as a kind of backup, meaning that total levels of exposure will vastly increase.)

Millimeter waves have never before been made available for public communications systems. They have, however, been utilized by the U.S. military, and what little we know about those applications gives some observers pause. The U.S. Air Force, for example, has developed weapons using millimeter waves to cause the skin of enemy combatants (or, as the need arises, unruly crowds of citizens) to heat up painfully. One of these weapons, known as the Active Denial System, can send a high-power beam of energy a distance of up to 1,000 meters to penetrate less than one-sixty-fourth of an inch into the skin, inflaming the skin's surface.

The most comprehensive review of the biological effects of millimeter waves was conducted by a team at the U.S. Army Medical Research Detachment at Brooks Air Force Base, in San Antonio, and published in 1998. The research group observed "[p]rofound MMW effects ... at all biological levels, from cell-free systems, through cells, organs, and tissues, to animal and human organisms." Significantly, it also noted that "many of the reported effects were principally different from those caused by heating, and their dose and frequency dependencies often suggested nonthermal mechanisms"—which is to say that, once again, the research showed bioeffects from microwave frequencies that occurred well below the power levels required to cause heating.

EMF researchers have pointed out that millimeter waves are less able to penetrate skin than lower-frequency waves, suggesting they should therefore be less dangerous. Yet the variety of bioeffects described by the Army Medical Research team were "quite unexpected from a radiation penetrating less than 1 mm into biological tissues," as the report stated. The researchers admitted to being confounded by the evidence, saying that the observed effects "could not be readily explained."

"The government, I think, knows more than it's willing to say."

The report added that "biological effects of a prolonged or chronic MMW exposure of the whole body ... have never been investigated." The safety limits, it pointed out, are "based solely on predictions," an approach it deemed "not necessarily adequate."

Last October, Dr. Joel Moskowitz, of the School of Public Health at the University of California, Berkeley, asserted in *Scientific American* that exposure to millimeter waves "can have adverse physiological effects." His article was titled, "We Have No Reason to Believe 5G Is Safe." Moskowitz has spent more than four decades in the field of public health research and policy, and now directs the Center for Family and Community Health at Berkeley. According to his review of the recent literature—what little of it there is—millimeter waves might negatively affect the peripheral nervous system, the immune system, and the cardiovascular system. "The research suggests," he wrote, "that long-term exposure may pose health risks to the skin (e.g., melanoma), the eyes (e.g., ocular melanoma) and the testes (e.g., sterility)."

The research suggests—in other words, we really don't know.

"When we talk about 5G, we're not working with a full deck," Louis Slesin, the editor and publisher of *Microwave News,* a journal that covers microwave technology, told me. "With 5G, not only are there practically no health studies, we don't have a clue about the modulations that will be used." He noted that the studies about millimeter waves remain classified. "The government, I think, knows more than it's willing to say."

In December 2018, concerned about the health implications of the 5G rollout, Senator Richard Blumenthal, the Democrat from Connecticut, sent a letter to the Federal Communications Commission's Brendan Carr, noting that "most of our current regulations regarding radiofrequency safety were adopted in 1996 and have not yet been updated for next generation equipment and devices." He asked him to cite any recent studies demonstrating the technology's safety. Carr replied in part by citing an FDA statement that claimed "the available scientific evidence continues to not support adverse health effects in humans caused by exposures at or under the current radiofrequency energy exposure limits."

Blumenthal found Carr's response so lacking that he pressed the issue two months later, in a February 6 hearing of the Senate Committee on Commerce, Science, and Transportation. The hearing was titled, "Winning the Race to 5G and the Next Era of Technology Innovation in the United States." The witnesses included, among others, executives from CTIA, the wireless industry trade association.

Declaring that "Americans deserve to know what the health effects are," Blumenthal asked the hearing's witnesses directly: "How much money has the industry committed to supporting additional independent research? ... Is that independent research ongoing? Has any been completed?"

What was extraordinary was that these top-tier industry executives freely admitted there were no studies showing 5G systems would be safe for the public. The telecom industry had dedicated no money to such research; none was ongoing, none had been completed.

Top-tier industry executives freely admitted there were no studies showing 5G systems would be safe for the public.

"So we are kind of flying blind here, as far as health and safety is concerned," Blumenthal concluded.

Still, he didn't seem especially surprised by the nonresponse. The objective of the session was not to protect the public, after all, but to support the industry, and whatever the health risks of 5G, they were quickly brushed aside in an hours-long hearing dominated by demands that government regulators grease the efficiency of the rollout. Meredith Attwell Baker, president of CTIA, counseled the senators that "the U.S. is not the only country to recognize the transformational impact of 5G. There is international consensus: The nations that lead on 5G will capture millions of new jobs and billions in economic growth."

To hear the witnesses tell it, the only real risks were to American tech-sector profits and national security, due to the commanding position among 5G equipment suppliers of Chinese-owned companies Huawei and ZTE. (The U.S. has ceded the 5G infrastructure market to foreign manufacturers.)

Michael Wessel, a member of the U.S.-China Economic and Security Review Commission, told the committee that China is "already doing everything it can legally and illegally" to ensure its superiority. Baker framed 5G as part of a global techno-industrial arms race. "We cannot take our foot off the accelerator," she cautioned. "To fully realize the technological breakthroughs we are talking about, we need more spectrum, and we need it as soon as possible."

Asked to comment on the lack of research on the potential health effects of the technology the industry is so restless to bring to market, a spokesperson for CTIA insisted that "the safety of consumers is the wireless industry's first priority," adding, "We follow the guidance of experts when it comes to cellphones and health effects." Quoting the FCC's latest evaluation of the health risks, conducted in 2019, the CTIA spokesperson told me in an email, "'No scientific evidence establishes a causal link between wireless device use and cancer or other illnesses.'"

The spokesperson directed me to Eric Swanson, a professor of theoretical physics at the University of Pittsburgh and a paid consultant to the telecom industry. "[F]ederal agencies responsible for regulating the safety of cell phones and wireless infrastructure," he wrote in an emailed statement that was vetted by CTIA, "have not found any link between electromagnetic fields allowed by the FCC regulations and cancer or other adverse health effects." Swanson also insisted, "The consensus of the world-wide health and safety organizations is that non-ionizing fields at the levels allowed by the FCC regulations are safe."

As proof of this "consensus," he cited declarations of cell phone EMF safety that had been issued by the FDA, the National Cancer Institute, the American Cancer Society, the European Scientific Committee on Emerging and Newly Identified Health Risks, the WHO, and the Institute of Electrical and Electronics Engineers' International Committee on Electromagnetic Safety.

But while these regulatory and health advocacy organizations may be in agreement, no such consensus exists in the scientific community. I forwarded Swanson's 3,500-word statement to Joel Moskowitz of Berkeley. "The majority of scientists who study non-ionizing EMFs and publish peer-reviewed research on this topic disagree with these organizations," he told me. One need only look, for example, to the hundreds of independent researchers—Moskowitz is one of them—who have signed the International EMF Scientists Appeal.

The 2018 publication of the National Toxicology Program's EMF study prompted considerable relief among researchers and public health advocates alarmed at the lack of discussion around the technology's risks. The findings of cancer and other effects in rats exposed to phone frequencies would, it was hoped, change the national conversation.

Dr. Ron Melnick, 76, oversaw the design and protocols for the EMF rodent experiment. He retired from the NTP in 2009, having spent 28 years studying the toxicity of everything from perfluorinated chemicals, which leach from Teflon cookware, to the by-products of water chlorination. One of his most consequential investigations involved butadiene, a compound found in cigarette smoke and tailpipe emissions. In the wake of Melnick's studies of the chemical, the U.S. Occupational Safety and Health Administration reduced the permissible exposure by 99.9 percent.

The protocols that Melnick crafted for the rodent study—not least the reverberation chambers as an approximation of human exposure—came under rigorous review from officials at the EPA, FDA, NIOSH, and the Bioelectromagnetics Society, among others. From these peer reviewers, the unanimous conclusion was that this would be the most authoritative animal study yet conducted in the U.S. for assessing human risk. It would also, as it happens, be the most expensive toxicity investigation that taxpayers ever funded, at a cost of $30 million.

Not long after the publication of the final results of the NTP study, a group of researchers at the Ramazzini Institute, a nonprofit cancer research lab in Bologna, Italy, released the findings of their own study of the health effects of EMF radiation. The lead author of the experiments, Dr. Fiorella Belpoggi, had spent most of her 44-year career, like Melnick, looking at suspect agents—solvents, plastics, pesticides, fuel additives, and asbestos, among others—and now had turned her attention to the toxicity of microwave EMFs.

"I cannot affirm that millimeter waves are dangerous, but no one can affirm that they are not."

Rather than using Melnick's custom-designed reverberation chambers to examine the effects of radiation from nearby sources, the Ramazzini team examined

exposures from more distant "farfield" sources, such as cell towers. But the results aligned. "They observed, as we did, an increase of glial cell tumors of the brain and Schwann cell tumors of the heart," Belpoggi told me in an email. "Such rare tumors in the same strain of rats, in both studies statistically significant, at different levels of exposure—near-field and farfield—in two different laboratories, cannot be just by chance."

I asked Belpoggi about the significance of the NTP and Ramazzini studies for determining human safety exposure limits. "What I do not understand is why, for example, the chemical industry has to demonstrate the safety of a compound before putting it into the market," she replied, "but the technology industry has no such rule, and they disseminate their products without any study of the impact on public health." She offered one theory to explain the discrepancy: "The economic value of the telecom industry now is enormous." Like Martin Pall, Belpoggi called for application of the precautionary principle, both for exposure from current microwave systems and for the new system of 5G millimeter waves. "I cannot affirm that millimeter waves are dangerous," she told me, "but no one can affirm that they are not."

In the U.S., the FDA ignored the Ramazzini findings. As for the NTP report, the agency issued a statement in 2018 denying the study's validity for determining human safety, despite the fact that it had commissioned the study, and the federal government had lavishly funded it, for that very purpose. Reaffirming the FCC's 1996 exposure limits, the director of the Center for Devices and Radiological Health at the FDA, Jeffrey Shuren, wrote in a letter that the FDA had "concluded that no changes to the current standards are warranted at this time," and stated flatly that "NTP's experimental findings should not be applied to human cell phone usage." The FDA assured the public, in direct contradiction of the NTP results, that "the available scientific evidence to date does not support adverse health effects."

Ron Melnick was shocked. "I've never experienced a government agency dismissing cancer results, as was done by the FDA with cancer and cell phone radiation," he told me. "FDA asked the NTP to assess human risk, the results were provided—and now they're saying they don't accept the results?"

CTIA had asked Eric Swanson, the telecom consultant, to comment on the NTP study, which he attacked, in his emailed statement, for what he called the "unreliable statistical significance of the … study conclusions." He warned of the likelihood of false positives due to "obvious flaws in the study." Yet the putative flaws he identified, according to Joel Moskowitz, had been debunked by both former and present NTP staffers, among them Ron Melnick in an article for the journal *Environmental Research*, in which he refuted the "unfounded criticisms" one by one. "The methods employed by the NTP are considered by most toxicologists to be the gold standard," Moskowitz told me. He called the FDA's dismissal of the study "a travesty" and suggested that "political considerations" were likely to blame.

Political considerations—meaning industry influence—may be playing an outsize role in the scientific determinations of other groups that have granted microwave telecom systems a clean bill of health. The WHO's conclusion that the systems are safe, for example, relies on exposure limits recommended by the International Commission for Non-Ionizing Radiation Protection, a nongovernmental organization whose advising scientists on EMF issues are closely tied to telecom companies. Last year, in a series titled "The 5G Mass Experiment," a pan-European group of investigative journalists found that of the 14 chief scientists at ICNIRP who crafted cell phone EMF safety guidelines, 10 had received funding from industry. The conclusion was that these ICNIRP members comprise a "small circle of insiders who reject alarming research," effectively serving their telecom paymasters by setting lax exposure limits.

The WHO itself appears to be divided on the issue. Its own cancer research branch, the International Agency for Research on Cancer, classified microwave EMFs as "possibly carcinogenic to humans" in 2011. Last year, an IARC advisory group of 29 scientists examined the peer-reviewed research on cancer risk and then advised that IARC revisit its 2011 decision and prioritize microwave EMFs for another review. It is uncertain whether IARC will do so.

On my way to meet Debbie Persampire, riding the Long Island Rail Road from New York City, I sat in a car near a group of preteens, who each clutched a smartphone close to their body. The kids giggled and swiped and played music and videos as their mothers sat silently nearby, mesmerized by their own phones.

Our embrace of the wonders of wireless might someday prove to be a vast crime against humanity.

Persampire picked me up at the train station, and I mentioned the scene in the car. "The science is telling us the devices are utterly dangerous," she said. "The combination of the danger with their clearly addictive nature—well, we need to start thinking about what we're doing."

Persampire's answer was to start a grassroots coalition called Citizens for 5G Awareness, which has been busily agitating since its founding in 2018. It has pestered elected officials with email and letter-writing campaigns, testified before county commissions, organized street rallies and protests, hosted public screenings of its new favorite film, *Generation Zapped*, and, not least, shared grim YouTube videos. One documents an experiment conducted by schoolchildren who discovered that plants were unable to grow when placed near a Wi-Fi antenna. Another shows a teenage girl in Eugene, Oregon, testifying that Wi-Fi exposure in her school made her sick.

At Persampire's house, I met several of the group's core members, including Fay Tsamis, a real estate manager who tried to convince the local school district to ban Wi-Fi from classrooms. When school officials dismissed her concerns, Tsamis took the enormous step of removing her kids from Wi-Fi exposure to homeschool them.

As I talked with these newly minted citizen activists, I was reminded that modern public health calamities, from asbestos to auto safety to leaded gasoline and tobacco, often follow a predictable narrative. Industry dismisses the health risk, government regulators shrug and look away, and a beleaguered minority is left to sound the alarm. Sometimes, as with the anti-vax movement, they're proven wrong; but sometimes their warnings are all too prescient. According to Persampire, some 200 new antennas, designed to operate with 5G millimeter waves, have already been built in the Huntington municipality.

In 2017, numerous signatories of the EMF Scientist Appeal called for a moratorium on the rollout of 5G wireless. These scientists were so distressed by the technology's risks that they invoked the principles of the Nuremberg Code regarding experimentation on unwitting subjects. Our embrace of the wonders of wireless, they said, might someday prove to be a vast crime against humanity—one in which the

telecom industry treats the public like so many lab rats confined to our personalized toxic reverberation chambers.

Christopher Ketcham is the author of *This Land: How Cowboys, Capitalism and Corruption are Ruining the American West*.

Read More: Apocalypse Soon, Internet, Smartphone, Internet Of Things, Infrastructure, Telecommunications, Federal Communications Commission, Food And Drug Administration, World Health Organization, Congress, Environmental Protection Agency, Environment

EXHIBIT D

EX PARTE OR LATE FILED

RECEIVED
MAR 23 1995
FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

MEMORANDUM

OFFICE OF ENGINEERING AND TECHNOLOGY

DOCKET FILE COPY ORIGINAL

Manage the spectrum and provide technical leadership to create new opportunities for competitive technologies and services for the American public.
— Mission Statement —

Date: March 22, 1995

To: Secretary, FCC

From: Robert F. Cleveland, Office of Engineering & Technology

Subject: ET Docket 93-62
Ex Parte Presentation by U.S. Environmental Protection Agency

Please be advised that on March 21, 1995, the U.S. Environmental Protection Agency (EPA), represented by Dennis O'Connor and Norbert Hankin, met with staff from the FCC and from the National Telecommunications and Information Administration (NTIA) regarding the EPA's efforts to develop exposure recommendations for radiofrequency electromagnetic fields. Attending this meeting from the FCC were: Robert Bromery, Robert Cleveland, Bruce Franca, Stevenson Kaminer, Thomas Stanley, David Sylvar and Jerry Ulcek. NTIA was represented by Janet Healer. During this meeting EPA staff briefed the participants on the EPA's activities and its schedule related to the development of these recommendations. The attached documents were provided to FCC and NTIA staff by the EPA, and they summarize the topics discussed at the meeting.

Please place this memorandum and the attachments into the record of the above-referenced proceeding.

ATTACHMENTS (9)

0562

No. of Copies rec'd 0+5
List A B C D E

DEVELOPMENT OF RF RADIATION EXPOSURE GUIDELINES

BRIEFING FOR THE

FEDERAL COMMUNICATIONS COMMISSION

OFFICE OF RADIATION AND INDOOR AIR
U.S. ENVIRONMENTAL PROTECTION AGENCY

March 21, 1995

0563

BACKGROUND

1986, July	"Federal Radiation Protection Guidance; Proposed Alternatives for Controlling Public Exposure to Radiofrequency Radiation; Notice of Proposed Recommendations"
1992, Jan.	SAB report - recommended that Guidance be completed
1993, Apr.	RF Radiation Conference
1993, Nov.	Comments to the Federal Communications Commission
1994, April	EMF strategy adopted

0564

RF RADIATION CONFERENCE

MAJOR CONCLUSIONS

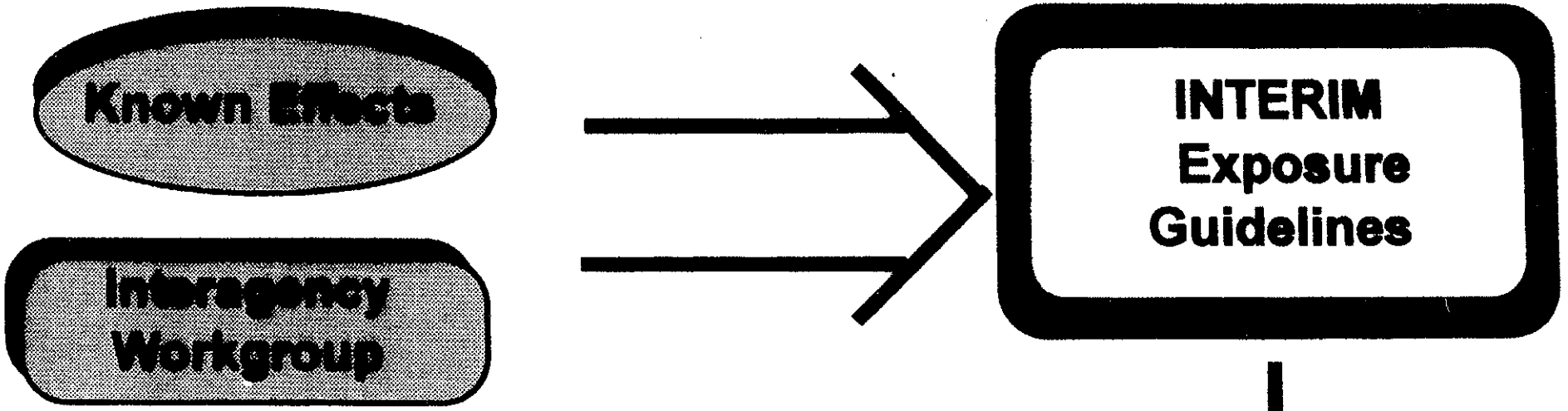
- **EPA guidelines needed**
- **Sufficient** information - **heat/temperature related effects**
- **Insufficient** information: **nonthermal exposures**

  modulation

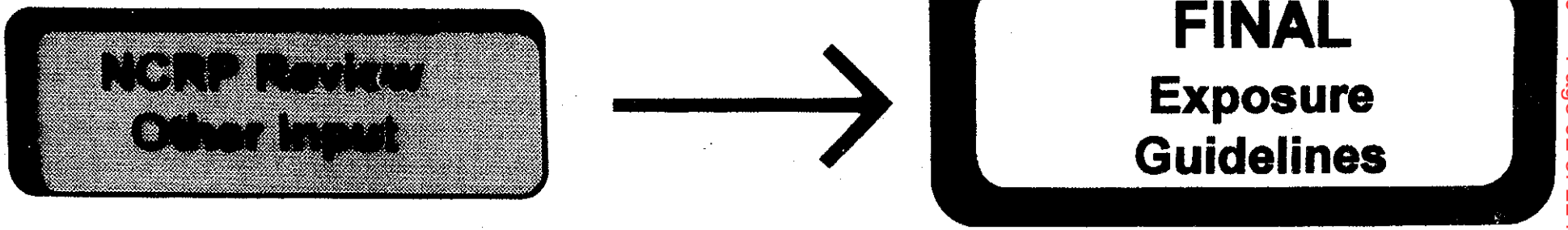
0565

RF STRATEGY

PHASE 1 (Health Effects)



PHASE 2 (Modulation)



0566

Hybrid Approach to Exposure Limits

- **Phase 1: Interim RF Radiation Exposure Guidelines**

  - Based upon **EPA comments to the FCC**
  - Combines best features of **NCRP, ANSI/IEEE, IRPA, ...** guidelines
  - Builds upon **existing** health effects research
  - **Simple, less controversial**

    no need for: risk estimates
    impact analysis

  - **Does not** include modulation, chronic exposure, nonthermal effects

0567

Modulated and Nonthermal Exposures

♦ Phase 2: Modulation

- **NCRP Commentary** (two years)
- Current situation

  insufficient data
  developing issue

- Approach

  NCRP Commentary
  focus on **exposure limits**
  convenes **National experts**

- Commentary

  Addresses **important/controversial issues**
  basis for **Background Information Document**

- Input from ongoing research

  SAG - wireless communications

0568

PROCESS

- Convene **workgroup**

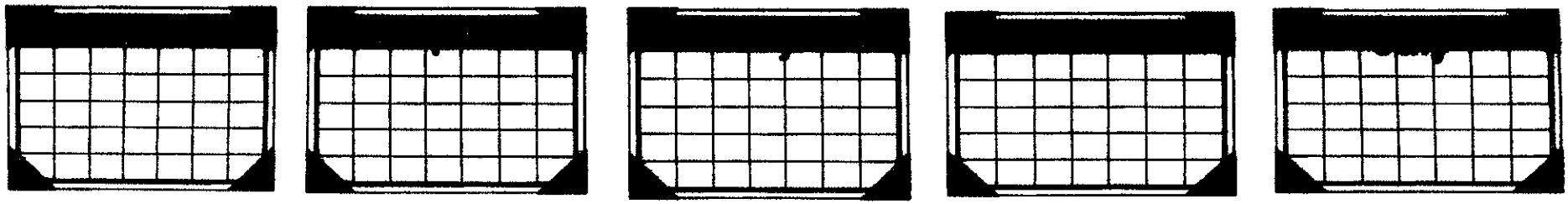
  Federal Agency: EPA, FDA, NIOSH, OSHA, FCC, NTIA

- Preparation of **Draft Guidelines documents**

- Reviews and Revisions

- **Guidelines Report**

[redacted]



Review Process

RF Workgroup

Industry and Federal Agency

OMB

Draft RF Guidance

Issue Interim RF Guidance

0570

NEXT STEPS

- Implement review process
- Draft report revisions
- Incorporate comments

EXHIBIT E

ET 93-62

DOCKET FILE COPY ORIGINAL

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

RECEIVED

JUN 30 1995

JUN 19 1995

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

OFFICE OF AIR AND RADIATION

Richard M. Smith, Chief
Office of Engineering and Technology
Federal Communication Commission
1919 M Street, NW
Washington, DC 20554

Dear Mr. Smith:

Due to your pending rulemaking action, I am writing to inform you of the Environmental Protection Agency (EPA) schedule for development of *Guidelines for Limiting Public Exposure to Radiofrequency (RF) Radiation*.

The guidelines are substantially complete, and are beginning to enter the review phase. The review plan for the guidelines will include a 30 day pre-publication review by the RF Inter-Agency Work Group, a 60 day review by selected stakeholders, and final review by OMB (90 days). Issuance of the final guidelines should be in early 1996.

We have established an effective and inclusive process for completing the guidelines. Our approach is rooted in the November 1993 comments from EPA on the Federal Communications Commission (FCC) Notice of Proposed Rulemaking. Last year, selected federal agencies, including the FCC, formed an RF Interagency Work Group to coordinate RF issues among federal agencies, provide technical input to the guidelines, and act as a sounding board to assess the general approach employed in the guidelines. Ongoing discussions about the guidelines with important stakeholders are also underway. For example, the upcoming meeting with the Electromagnetic Energy Alliance is an illustration of the dialogue which is necessary to insure that the guidelines are broadly accepted thereby affording the FCC the opportunity to reference these guidelines as part of their rulemaking.

No. of Copies rec'd 0+2
List A B C D E

0572

Completion of the guidelines in a timely manner remains a priority of this office. In accomplishing this, the assistance and support of the FCC has been invaluable. In particular, Robert Cleveland has offered valuable technical review and insights which substantially improved the guidelines.

Sincerely,

E. Ramona Trovato

E. Ramona Trovato, Director
Office of Radiation and Indoor Air

EXHIBIT F

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 showing possible 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 1996 FCC 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

EXHIBIT G

DEPARTMENT OF HEALTH AND HUMAN SERVICES **Public Health Service**

National Institute for Occupational
Safety and Health
Robert A. Taft Laboratories
4676 Columbia Parkway
Cincinnati OH 45226-1998
June 17, 1999

Mr. Richard Tell
Chair, IEEE SCC28 (SC4)
Risk Assessment Work Group
Richard Tell Associates, Inc.
8309 Garnet Canyon Lane
Las Vegas, NV 89129-4897

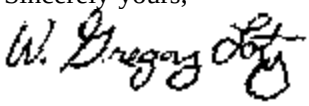
Dear Mr. Tell:

The members of the Radiofrequency Interagency Work Group (RFIAWG) have identified certain issues that we believe need to be addressed to provide a strong and credible rationale to support RF exposure guidelines. I am writing on behalf of the RFIAWG members to share these ideas with you and other members of the IEEE SCC28, Subcommittee 4 Risk Assessment Work Group. Our input is in response to previous requests for greater participation on our part in the SCC28 deliberations on RF guidelines. The issues, and related comments and questions relevant to the revision of the IEEE RF guidelines, are given in the enclosure. No particular priority is ascribed to the order in which the issues are listed.

The views expressed in this correspondence are those of the members of the Radiofrequency Interagency Work Group and do not represent the official policy or position of the respective agencies.

The members of the RFIAWG appreciate your consideration of our comments and welcome further dialog on these issues. Feel free to contact me or any member of the RFIAWG directly. A list of the members of the RFIAWG is enclosed, with contact information for your use.

Sincerely yours,



W. Gregory Lotz, Ph.D.
Chief, Physical Agents Effects Branch
Division of Biomedical and
Behavioral Science

Enclosures (2)
cc: N. Hankin
J. Elder
R. Cleveland
R. Curtis
R. Owen
L. Cress
J. Heale

RF Guideline Issues

Identified by members of the federal RF Interagency Work Group, June 1999

Issue: Biological basis for local SAR limit

The C95.1 partial body (local) exposure limits are based on an assumed ratio of peak to whole body SAR; that is, they are dosimetrically, rather than biologically based. Instead of applying a dosimetric factor to the whole body SAR to obtain the local limits, an effort should be made to base local SAR limits on the differential sensitivity of tissues to electric fields and temperature increases. For example, it seems intuitive that the local limits for the brain and bone marrow should be lower than those for muscle, fat and fascia; this is not the case with the current limits which implicitly assume that all tissues are equally sensitive (except for eye and testicle). If no other data are available, differential tissue sensitivity to ionizing radiation should be considered.

If it is deemed necessary to incorporate dosimetric factors into the resulting tissue-specific SAR limits these should be based on up-to-date dosimetric methods such as finite-difference time-domain calculations utilizing MRI data and tissue-specific dielectric constants. For certain exposure conditions FDTD techniques and MRI data may allow better simulation of peak SAR values. Consideration should be given to the practical tissue volume for averaging SAR and whether this volume is relevant to potential effects on sensitive tissues and organs.

Issue: Selection of an adverse effect level

Should the thermal basis for exposure limits be reconsidered, or can the basis for an unacceptable/adverse effect still be defined in the same manner used for the 1991 IEEE guidelines? Since the adverse effect level for the 1991 guidelines was based on acute exposures, does the same approach apply for effects caused by chronic exposure to RF radiation, including exposures having a range of carrier frequencies, modulation characteristics, peak intensities, exposure duration, etc., that does not elevate tissue temperature on a macroscopic scale?

Selection criteria that could be considered in determining unacceptable/adverse effects include:

a) adverse effects on bodily functions/systems
b) minimal physiological consequences
c) measurable physiological effects, but no known consequences

If the adverse effect level is based on thermal effects in laboratory animals, the literature on human studies (relating dose rate to temperature elevation and temperature elevation to a physiological effect) should be used to determine if the human data could reduce uncertainties in determination of a

safety factor.

Issue: Acute and chronic exposures

There is a need to discuss and differentiate the criteria for guidelines for acute and chronic exposure conditions. The past approach of basing the exposure limits on acute effects data with an extrapolation to unlimited chronic exposure durations is problematic. There is an extensive data base on acute effects with animal data, human data (e.g. MRI information), and modeling to address thermal insult and associated adverse effects for acute exposure (e.g., less than one day). For lower level ("non-thermal"), chronic exposures, the effects of concern may be very different from those for acute exposure (e.g., epigenetic effects, tumor development, neurologic symptoms). It is possible that the IEEE RF radiation guidelines development process may conclude that the data for these chronic effects exist but are inconsistent, and therefore not useable for guideline development. If the chronic exposure data are not helpful in determining a recommended exposure level, then a separate rationale for extrapolating the results of acute exposure data may be needed. In either case (chronic effects data that are useful or not useful), a clear rationale needs to be developed to support the exposure guideline for chronic as well as acute exposure.

Issue: One tier vs two tier guidelines:

A one tier guideline must incorporate all exposure conditions and subject possibilities (e.g., acute or chronic exposure, healthy workers, chronically ill members of the general public, etc.). A two tier guideline, as now exists, has the potential to provide higher limits for a specific, defined population (e.g., healthy workers), and exposure conditions subject to controls, while providing a second limit that addresses greater uncertainties in the data available (about chronic exposure effects, about variations in the health of the subject population, etc.). A greater safety factor would have to be incorporated to deal with greater uncertainty in the scientific data available. Thus, a two-tier guideline offers more flexibility in dealing with scientific uncertainty, while a one-tier guideline would force a more conservative limit to cover all circumstances including the scientific uncertainties that exist.

Issue: Controlled vs. uncontrolled (applicability of two IEEE exposure tiers)

The current "controlled" and "uncontrolled" definitions are problematic, at least in the civilian sector, particularly since there are no procedures defined in the document to implement the "controlled" condition. The new guidelines should offer direction for the range of controls to be implemented and the training required for those who knowingly will be exposed (e.g. workers), along the lines of the existing ANSI laser safety standards. This essential element needs to be included for whatever limits are defined, be they one-tier or two-tier.

For example, the OSHA position is that the "uncontrolled" level is strictly an "action" level which

indicates that there is a sufficiently high exposure (compared to the vast majority of locations) to merit an assessment to determine what controls and training are necessary to ensure persons are not exposed above the "controlled" limit. Many similar "action" levels are part of OSHA and public health standards. Should this interpretation be incorporated into the IEEE standard as a means to determine the need to implement a safety plan? [The laser standard has a multi-tiered (Class I, II, III, IV) standard which similarly requires additional controls for more powerful lasers to limit the likelihood of an excess exposure, even though the health effect threshold is the same.]

On the other hand, if it is determined that certain populations (due to their health status or age) are more susceptible to RF exposures, then a multi-tiered standard, applicable only to those specific populations, may be considered.

The ANSI/IEEE standard establishes two exposure tiers for controlled and uncontrolled environments. The following statement is made in the rationale (Section 6, page 23): "The important distinction is not the population type, but the nature of the exposure environment." If that is the case, consideration should be given to providing a better explanation as to why persons in uncontrolled environments need to be protected to a greater extent than persons in controlled environments. An uncontrolled environment can become a controlled environment by simply restricting access (e.g., erecting fences) and by making individuals aware of their potential for exposure. After such actions are taken, this means that the persons who previously could only be exposed at the more restrictive uncontrolled levels could now be exposed inside the restricted area (e.g., inside the fence) at controlled levels.

What biologically-based factor changed for these people? Since the ostensible public health reason for providing greater protection for one group of persons has historically been based on biological considerations or comparable factors, it is not clear why the sentence quoted above is valid.

Issue: Uncertainty factors

The uncertainties in the data used to develop the guideline should be addressed. An accepted practice in establishing human exposure levels for agents that produce undesirable effects is the application of factors representing each area of uncertainty inherent in the available data that was used to identify the unacceptable effect level. Standard areas of uncertainty used in deriving acceptable human dose for agents that may produce adverse (but non-cancer) effects include

(1) extrapolation of acute effects data to chronic exposure conditions,
(2) uncertainty in extrapolating animal data to humans in prolonged exposure situations,
(3) variation in the susceptibility (response/sensitivity) among individuals,

(4) incomplete data bases,
(5) uncertainty in the selection of the effects basis, inability of any single study to adequately address all possible adverse outcomes.

If guidelines are intended to address nonthermal chronic exposures to intensity modulated RF radiation, then how could uncertainty factors be used; how would this use differ from the historical use of uncertainty factors in establishing RF radiation guidelines to limit exposure to acute or sub-chronic RF radiation to prevent heat-related effects?

There is a need to provide a clear rationale for the use of uncertainty factors.

Issue: Intensity or frequency modulated (pulsed or frequency modulated) RF radiation

Studies continue to be published describing biological responses to nonthermal ELF-modulated and pulse-modulated RF radiation exposures that are not produced by CW (unmodulated) RF radiation. These studies have resulted in concern that exposure guidelines based on thermal effects, and using information and concepts (time-averaged dosimetry, uncertainty factors) that mask any differences between intensity-modulated RF radiation exposure and CW exposure, do not directly address public exposures, and therefore may not adequately protect the public. The parameter used to describe dose/dose rate and used as the basis for exposure limits is time-averaged SAR; time-averaging erases the unique characteristics of an intensity-modulated RF radiation that may be responsible for producing an effect.

Are the results of research reporting biological effects caused by intensity-modulated, but not CW exposure to RF radiation sufficient to influence the development of RF exposure guidelines? If so, then how could this information be used in developing those guidelines? How could intensity modulation be incorporated into the concept of dose to retain unique characteristics that may be responsible for a relationship between exposure and the resulting effects?

Issue: Time averaging

Time averaging of exposures is essential in dealing with variable or intermittent exposure, e.g., that arising from being in a fixed location of a rotating antenna, or from moving through a fixed RF field. The 0.1 h approach historically used should be reassessed, but may serve this purpose adequately. Time averaging for other features of RF exposure is not necessarily desirable, however, and should be reevaluated specifically as it deals with modulation of the signal, contact and induced current limits, and prolonged, or chronic exposure. These specific conditions are discussed in a little more detail elsewhere.

If prolonged and chronic exposures are considered to be important, then there should be a

reconsideration of the time-averaging practices that are incorporated into existing exposure guidelines and used primarily to control exposure and energy deposition rates in acute/subchronic exposure situations.

Issue: Lack of peak (or ceiling) limits for induced and contact current

A recent change in the IEEE guidelines allows for 6 minute, rather than 1 second, time-weighted-averaging for induced current limits. This change increases the concern about the lack of a peak limit for induced and contact currents. Will the limits for localized exposure address this issue, i.e., for tissue along the current path?

Issue: Criteria for preventing hazards caused by transient discharges

The existing IEEE recommendation states that there were insufficient data to establish measurable criteria to prevent RF hazards caused by transient discharges. If specific quantitative criteria are still not available, can qualitative requirements be included in the standard to control this hazard (e.g., metal objects will be sufficiently insulated and/or grounded, and/or persons will utilize sufficient insulating protection, such as gloves, to prevent undesirable transient discharge.)?

ISSUE: Limits for exposure at microwave frequencies

Concerns have been expressed over the relaxation of limits for continuous exposures at microwave frequencies above 1500 MHz. The rationale provided in the current guideline (Section 6.8) references the fact that penetration depths at frequencies above 30 GHz are similar to those at visible and near infrared wavelengths and that the literature for skin burn thresholds for optical radiation "is expected to be applicable." The rationale then implies that the MPE limits at these high frequencies are consistent with the MPE limits specified in ANSI Z136.1-1986 for 300 GHz exposures. This is apparently the rationale for "ramping up" to the MPE limits for ***continuous*** exposure of 10 mW/cm^2 at frequencies above 3 GHz (controlled) or 15 GHz (uncontrolled). The rationale should be given as to why this ramp function has been established at relatively low microwave frequencies (i.e., 1500 MHz and above), rather than being implemented at higher frequencies that are truly quasi-optical. For example, one option could be two ramp functions, one beginning at 300 MHz, based on whole- or partial-body dosimetry considerations, and another at higher frequencies (say 30-100 GHz) to enable consistency with the laser standard. Such a revision should help reduce concern that the standard is not restrictive enough for continuous exposures at lower microwave frequencies where new wireless applications for consumers could make this an issue in the future.

Issue: Replication/Validation

Published peer-reviewed studies that have been independently replicated/validated should be used to establish the adverse effects level from which exposure guidelines are derived. The definition of "replicated/validated" should not be so restrictive to disallow the use of a set of reports that

are scientifically valid but are not an exact replication/validation of specific experimental procedures and results.

Peer-reviewed, published studies that may not be considered to be replicated/validated, but are well done and show potentially important health impacts provide important information regarding uncertainties in the data base used to set the adverse effect level (e.g., incomplete data base).

Issue: Important Health Effects Literature Areas:

Documentation should be provided that the literature review process included a comprehensive review of the following three areas:

1) long-term, low-level exposure studies (because of their importance to environmental and chronic occupational RFR exposure);
2) neurological/behavioral effects (because of their importance in defining the adverse effect level in existing RFR guidelines); and
3) micronucleus assay studies (because of their relevance to carcinogenesis).

Issue: Compatibility of RFR guidelines

Compatibility of national and international RFR guidelines remains a concern. It is important for the IEEE Committee to address this issue by identifying and discussing similarities and differences in a revised IEEE guideline and other RFR guidelines. Compatibility/noncompatibility issues could be discussed in the revised IEEE guideline or as a companion document distributed at the time the revised IEEE guideline is released to the public.

Radiofrequency Interagency Work Group Members

Alphabetical Listing

Cleveland, Robert
Senior Scientist
Federal Communications Commission
Office of Eng & Technology, Room, 230
2000 M St. NW
Washington, DC 20554
(202) 418-2422
(202) 481-1918 (fax)
rclevela@fcc/gov

Cress, Larry
US FDA, CDRH
Radiation Biology Branch, DLS, OST
9200 Corporate Blvd. (HFZ-114)
Rockville, MD 20850
(301) 443-7173
(301) 594-6775 (fax)
lwc@cdrh.fda.gov

Curtis, Robert A.
OSHA
Dir-U.S. Dept. of Labor/OSHA
OSHA Health Response Team
1781 S. 300 W.
Salt Lake City, UT 84115-1802
(801) 487-0521, ext. 243
(801) 487-1190 (fax)
rac@osha-slc.gov

Elder, Joseph A.
US Environmental Protection Agency
U.S. EPA, NHEERL (MD-87)
2525 Highway 54
Research Triangle Park, NC 27711
(919) 541-2542
(919) 541-4201 (fax)
elder.joe@epamail.epa.gov

Hankin, Norbert N.
U. S. Environmental Protection Agency
Mailcode 6604J
U.S. EPA
Washington, DC 20460
(202) 564-9235
(202) 565-2038 (fax)
hankin.norbert@epamail.epa.gov

Healer, H. Janet
NTIA
Department of Commerce (H-4099)
14th & Constitution Ave., NW
Washington, DC 20230
(202) 482-1850
(202) 482-4396 (fax)
jhealer@ntia.doc.gov

Lotz, W. Gregory
Chief, Physical Agents Effects Branch
National Institute for Occupational Safety and Health
4676 Columbia Parkway C-27
Cincinnati, OH 45226-1998
(513)533-8153
(513) 533-8139 (fax)
wlotz@cdc.gov

Owen, Russell D.
U.S. FDA/CDRH (HFZ-114)
Chief, Radiation Biology Branch (HFZ-114)
9200 Corporate Blvd.
Rockville, MD 20850
(301) 443-7153
(301) 761-1842 (fax)
rdo@cdrh.fda.gov