NEW YORK LAW SCHOOL

NYLS Law Review

Volume 44 | Issue 2 Article 4

January 2001

A BAD CALL: PREEMPTION OF STATE AND LOCAL AUTHORITY TO REGULATE WIRELESS COMMUNICATION FACILITIES ON THE BASIS OF RADIOFREQUENCY EMISSIONS

Carol R. Goforth

A BAD CALL: PREEMPTION OF STATE AND LOCAL AUTHORITY TO REGULATE WIRELESS COMMUNICATION FACILITIES ON THE BASIS OF RADIOFREQUENCY EMISSIONS

CAROL R. GOFORTH*

Early in 1996, Congress enacted a complicated piece of federal legislation entitled the Telecommunications Act of 1996 (the "Telecom Act").[1] When President Clinton signed the Telecom Act into law on February 8, 1996, he characterized it as "truly revolutionary legislation that [would] bring the future to our doorstep."[2] The legislation was promoted as being "pro-competitive," and "deregulatory," and supporters claimed that it would offer consumers lower prices, better service, and faster access to new technologies.[3]

The Telecom Act applies broadly to the entire telecommunications industry, and many of its provisions are of unquestioned benefit to the American public. However, buried among the many complicated provisions of the statute is a section which precludes state and local governments from regulating the placement of "personal wireless facilities" on the basis of the "environmental effects" of radio-frequency emissions, to the extent that such emissions are within the Federal Communication Commission's safety guidelines.[4] Although it may not be obvious, the technical phrase "personal wireless facilities" refers primarily to the tow-

---

* Clayton N. Little, Professor of Law, University of Arkansas School of Law. Special thanks go to Jared Robertson for his extraordinarily adept research assistance, and to my friend and colleague, Professor Jake Looney, for his comments and suggestions on an earlier draft. This article was supported, in part, by a research grant from the University of Arkansas School of Law.

1. Telecommunications Act of 1996, Pub. L. No. 104-104, 110 Stat. 56 (incorporated into the Federal Communications Act of 1934 and codified at scattered sections of 47 U.S.C.).

2. Thomas G. Krattenmaker, *The Telecommunications Act of 1996,* 29 CONN. L. REV. 123, 123 (1996) (quoting President William J. Clinton, *Remarks on Signing the Telecommunications Act of 1996: February 8, 1996,* 32 WKLY COMP. PRES. DOC. 215 (Feb. 12, 1996).

3. Susan Lorde Martin, Comment, *Communications Tower Sitings: The Telecommunications Act of 1996 and the Battle for Community Control,* 12 BERKELY TECH. L.J. 483 (1997).

4. 47 U.S.C. § 332(c)(7)(B)(iv) (Supp. IV 1998).

ers which cellular and personal communications services (PCS) providers have been building in ever-increasing numbers. In addition, "environmental effects" is a euphemism which was apparently intended to encompass any impact that radio-frequency emissions may have on human health.[5] Unfortunately, even though the FCC has promulgated exposure guidelines for such emissions, the Commission has never claimed to be an expert in human health matters and generally relies on industry to set the standards.[6] The effects of radio-frequency (RF) emissions are only now being studied, and everyone acknowledges that the scientific data is far from complete.[7]

As a practical matter, this seemingly trivial section in the massive Telecom Act removes from state and local governments power to make decisions about where cellular and PCS towers should be located in order to protect citizens from possible health risks. The potential magnitude of this problem becomes apparent when one considers the number of towers being built by the telecommunications industry.

By now, virtually every community in the country has been touched by the phenomenon which has been called "the pin-cushioning of America."[8] Some commentators have complained that towers which provide space for the PCS and/or cellular antennas have been appearing "like mushrooms after the rain."[9] It is predicted that 100,000 new towers will be needed in the next few years to accommodate the growing needs of

---

5. *Cf.* Iowa Wireless Services v. City of Moline, 29 F. Supp. 2d 915, 924 (C.D. Ill. 1998) ("While it is clear from the record that the City of Moline considered potential health effects of the tower, it is less clear that they considered environmental effects.").

6. For a detailed examination of the FCC guidelines and the process pursuant to which they were promulgated, *see infra* notes 111-134and accompanying text.

7. This subject is addressed in considerable detail in Part II.B.

8. *See, e.g.*, Steve Adams, *Companies Asked to put Towers on Hold,* THE PATRIOT LEDGER, Oct. 8, 1997 at 17 (noting that neighbors often object to the height and appearance of towers, and reporting a comment that one area was "becoming a pincushion for these towers."); *News,* BATON ROUGE ADV., Oct. 16, 1997, at 2B (reporting adoption of an ordinance requiring co-location of towers to avoid the possibility of the area "looking like a pin cushion."); *Counties Flex Power over Cellular Towers,* BUSINESS-NORTH CAROLINA, June 1, 1997 (noting that "[n]o place wants to end up a pin cushion stuck full of 200-foot pins.").

9. Philip E. Harriman, Editorial, *Cellular Towers Should be Brought Under State and Local Regulations,* PORTLAND PRESS HERALD, Sept. 25, 1997, at 11A ("As we drive on the highways and biways of America today, we see communications towers sprouting like mushrooms after the rain.").

these industries.[10]

While state and local governments generally retain the ability to regulate the placement of such facilities on the basis of considerations such as aesthetics,[11] they cannot promulgate zoning regulations or ordinances based on any potential health risks from the RF emissions from these towers. Moreover, in at least one state, the courts have found that the language in the Telecom Act also precludes individual citizens from presenting evidence about health risks in private litigation.[12]

Industry claims such preemption is necessary in order to enable them to build out their systems, which they say everyone wants and needs. They argue that state and local regulation is both unnecessary and counter-productive because the FCC is already regulating RF exposure.[13] On the other hand, critics complain that the Telecom Act, by preempting state and local regulation in this manner, has created "a serious threat to our health and environment in ways that Congress simply did not understand when they passed the Telecommunications Act of 1996."[14] In ad-

---

10. Authorities are not consistent on the exact number of sites which will be needed. *See* Timothy L. Gustin, Note, *The Perpetual Growth and Controversy of the Cellular Superhighway: Cellular Tower Siting and the Telecommunications Act of 1996,* 23 WM. MITCHELL L. REV. 1001, 1003 (1997) (suggesting that 115,000 sites will be needed by the year 2000—(citing Shawn Steward, *It's a War Out There,* CELLULAR BUS., June 1995, at 78, as a source for "industry figures")). *See also* Dwight H. Merriam, et al., *Dealing With Locally Unwanted Land Uses (LULUs): Wireless Communications Facilities, "Super" Service Stations, "Satellite" Fast Food Restaurants, Etc., in* 10 LAND USE INST. 97, 104 (1997) (reporting that "[w]ireless telephone firms have installed approximately 22,000 transmission sites nationwide during the past fifteen years" and predicting that "[a]nother 100,000 antenna installations, including thousands of towers several hundred feet high, will be needed over the next few years to meet projected demand" (citing Ted & Susan Kreines, *Siting Criteria for Personal Wireless Service Facilities, in* 10 LAND USE INST. 101, 104 (1997)); *see also* Susan Lorde Martin, Comment, *Communications Tower Sitings: The Telecommunications Act of 1996 and the Battle for Community Control,* 12 BERKELY TECH. L.J. 483, 486 (1997) (predicting that there will be 100,000 towers by the year 2002).

11. For a more detailed discussion of this issue, *see infra* notes 48-50, 135-136 and accompanying text.

12. *See infra* notes 80-92 and accompanying text.

13. *See* discussion *infra* Part III.A.

14. B. Blake Levitt, *A Clear Call, at* http://wave~guide.org/clearcall.html (paper presented at the Berkshire-Lichtfield Environmental Council: Environmental Tower Siting Conference on May 10, 1997).

dition, there are a growing number of scientific studies documenting various biologic effects from RF exposure, even at levels that are within the FCC's safety standards.[15]

A considered review of the evidence gives substantial support to the critics of the Telecom Act. There are a number of reasons to be suspicious of industry motives and arguments, as well as reasons to doubt the veracity of some of their claims. Moreover, many of the same biases and problems taint the FCC and its regulatory process.

This Article considers how the Telecom Act came to preempt consideration of the health risks posed by RF emissions, and what the statutory language means as a practical matter. It then evaluates the current FCC standards applicable to RF emissions in light of the growing volume of evidence which suggests that there are potentially profound health risks associated with RF emissions from cellular and PCS towers, even at currently permissible exposure levels.[16] Finally, this Article explains why federal preemption in this instance is an unwise and unwarranted intrusion into a matter better left for state and local governments.

I. THE TELECOMMUNICATIONS ACT OF 1996

A. *How the Telecom Act Came to Preempt State and Local Consideration of Health Risks*

The Telecom Act[17] was the first major revision to federal telecommunications law since 1934, and it contains provisions which address such diverse issues as interstate telephone services, cable rates, obscene or harassing use of telecommunications facilities, and parental choice.[18] It was promoted as legislation which would "eliminat[e] barriers that inhibit or preclude the entry of new competitors into various industry

---

15. *See* discussion *infra* Part II.B.

16. *See infra* note 155 and accompanying text. Current federal guidelines essentially protect against thermal or heating effects. All of the studies of RF exposure considered in this article involve exposure to RF at non thermal levels. *See* discussion *infra* Part II.B.

17. *See supra* note 2.

18. Phillip Rosario & Mark F. Kohler, Commentary, *The Telecommunications Act of 1996: A State Perspective*, 29 CONN. L. REV. 331 (1997) (describing in detail the various aspects of the Act).

sectors"[19] and deregulate the radio, television, cable, and telephone industries.[20] Of course, the Telecom Act does more than promote the deregulation of these industries.

The Telecom Act also amends the old Communications Act of 1934 by adding a new paragraph to the section on "Mobile Services."[21] The new paragraph says that it preserves the authority of state and local governments over decisions regarding the placement, construction, and modification of personal wireless service facilities, with certain exceptions.[22] The exceptions, however, are so broad that at least one commentator has suggested they swallow the general rule, leaving state and local governments with little real power.[23]

The first exception to the reserved rights is that no state or local government regulation shall unreasonably discriminate among providers; the second limitation is that no such regulation may have the effect of prohibiting the provision of personal wireless services.[24] A third requirement is that applications to locate new personal wireless facilities must

---

19. Richard E. Wiley, *The Telecommunications Act of 1996*, ADMIN. & REG. L. NEWS, Spring 1996, at 1.

20. *See* Catherine Cook, *Legislative Summary: The Telecommunications Act of 1996*, 6 DEPAUL J. ART & ENT. L. 237 (1996) (stating that "[t]he motivation for [the Telecommunications Act of 1996] is deregulation"); Michael I. Meyerson, *Ideas of the Marketplace: A Guide to the 1996 Telecommunications Act*, 49 FED. COMM. L.J. 251, 252 (1997) (concluding that Act "represents a vision of a telecommunications marketplace where flexibility and innovation of competition replaces the heavy hand of regulation."); David R. Poe, *Who Should Direct? The FCC's Interpretation of Its New Role Under the 1996 Act Leaves Little Room for State Regulators*, LEGAL TIMES, Nov. 25, 1996, at S36 (describing the Act as "sweeping legislation that purports to lessen the burdens of governmental regulation by enabling competition to emerge and flourish in the marketplace.").

21. The section which was amended was § 332(c) of the Communications Act of 1934, codified at 47 U.S.C. § 332(c) (Supp. IV 1998). Section 704 of the Telecom Act amended this provision by the addition of a new subparagraph 7, which is codified at 47 U.S.C. § 332(c)(7) (Supp. IV 1998).

22. *See id.*

23. *See* Leonard J. Kennedy and Heather A. Purcell, *Section 332 of the Communications Act of 1934: A Federal Regulatory Framework that is "Hog Tight, Horse High, and Bull Strong,"* 50 FED. COMM. L.J. 547, 587-88 (1998) ("In essence, the exceptions [to the "reservation" of rights to states and localities] swallow the grant of authority.").

24. 47 U.S.C. § 332(c)(7)(B)(i) (Supp. IV 1998).

be reviewed within a reasonable time, and decisions which deny the right to locate facilities as requested must be in writing and supported by substantial evidence.[25] The final exception to the general reservation of rights is language which preempts any state or local regulation of the placement, construction or 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 standards.[26]

Of course, most of these exceptions seem designed to foster competition and remove obstacles to the basic provision of wireless services. The last limitation, however, seemingly goes beyond the desire to foster competition between service providers and not only favors industry by making it faster, easier and cheaper for wireless providers to build out their systems, it also prevents state and local governments from considering potentially valid concerns in making siting decisions.

As frequently happens with complicated and controversial federal statutes, there is little legislative history concerning this particular section of the Telecom Act. It is clear that wireless service providers lobbied intensively in an effort to convince Congress that state and local authority to regulate placement of wireless towers and antennas should be completely preempted.[27] In fact, the industry had previously petitioned the FCC in an attempt to convince the regulatory agency that it should preempt state and local regulation without even waiting for Congressional guidance.[28] The FCC refused to exercise its preemptory authority, and left the issue with Congress. The Telecom Act ultimately included language purporting to "preserve" state and local authority, but basically Congress gave in on the issue of whether state and local governments should be able to consider health and safety risks of RF emissions in making siting decisions.[29]

There were two early versions of the Telecom Act: one was considered in the House, and the other in the Senate. The House version in-

25. *Id.* at § 332(c)(7)(B)(iii).

26. *Id.* at § 332(c)(7)(B)(iv).

27. *See* Jill Abeshouse Stern, *Towering Above Us,* 146 N.J. L.J. 1040, 1044 (1996) ("In the hope of simplifying the process [of securing permits and variances needed to build wireless infrastructures], the wireless industry sought to include language in the 1996 act providing for federal pre-emption of state and local regulation of tower siting.").

28. *See id.*

29. *Id.* (noting that "state and local governments successfully lobbied to retain jurisdiction over tower siting for wireless services").

cluded language dealing with the issue of whether the federal government should preempt state and local consideration of RF in connection with cellular siting decisions, although not in the form finally proposed in the Conference Report.[30] The rationale for the original provision was that state and local regulation over tower placement might be inconsistent and difficult for providers to comply with.[31]

When the House of Representatives debated this proposal, some members, although agreeing that local communities should not prohibit access to new communications technology, expressed concern that the legislation might have the undesirable result of keeping local governments from enforcing their zoning and building codes.[32] One member of the House declared that nothing in the Telecom Act should preempt "the ability of local officials to determine the placement and construction of ...new [cellular phone] towers. Land use has always been, and . . . should continue to be, in the domain of the authorities in the areas directly affected."[33] Representative Moran tried to amend the proposal to prohibit "the FCC from undertaking the rulemaking that could preempt local governments from regulating the construction of cellular towers."[34] This particular proposal did not even make it out of Committee, although it was "endorsed by the National Association of Counties, the National League of Cities, the U.S. Conference of Mayors, and the American Planning Association."[35]

The general response to these complaints was that the Telecom Act,

---

30. The original House version of the legislation would have said that "[t]he policy prescribed pursuant to this paragraph shall provide that no State or local government or any instrumentality thereof may regulate the placement, construction, modification, or operation of such facilities on the basis of the environmental effects of radio frequency emissions, to the extent such facilities comply with the [Federal Communications] Commission's regulations concerning such emissions." *See* 141 CONG. REC. H9954, H9989 (1995).

31. *See, e.g.,* Report by. Rep. Bliley, Committee on Commerce, H.R. REP. NO. 204(I), 104th Cong., 1st Sess. 1995, 1995 WL 442502 (Leg. Hist.).

32. 141 CONG. REC. H8269, H8273-74 (statements of Rep. Goss), H8275 (statements of Rep. Moran), H8277 (statements of Rep. Clyburn) (daily ed. Aug. 2, 1995).

33. *Id.* at H8274 (statement of Rep. Goss).

34. *Id.* at H8275 (statement of Rep. Moran) (noting that the committee defeated the amendment by a vote of 5 to 6, preventing it from reaching the House floor).

35. *Id.*

as finally proposed by the House, included language expressly purporting to preserve state and local authority over zoning decisions. Virtually nothing else was said about the need to preempt state and local regulation on the basis of RF emissions.[36]

The original Senate version did not deal with state and local zoning authority or federal preemption of the right consider health effects of RF emissions.[37]

When it was time to reconcile the House and Senate versions, the Conferees proposed a new section 704 to deal with these issues.[38] The new section 704, although still purporting to provide for preservation of state and local zoning authority, clearly specifies that state and local governments have no power to exercise zoning authority to regulate placement of wireless facilities on the basis of RF emissions.[39] Unfortunately, in the rush to deregulate, there was very little discussion of this provision of the Conference Report.

In the limited 90 minute Senate debate on the Conference Report,[40] Senator Hollings expressed concern that "[a]lthough the report says this is not supposed to affect local management of public rights-of-way or local safeguards for the rights of consumers, . . . citizens are rightly concerned that rules designed to protect our environment and health may be preempted by bureaucrats at the FCC who are focused on helping entrants in the telecommunications business."[41] Senator Kerrey was concerned primarily because "the demand for [the legislation] is not coming from the citizens, it is really coming from corporations."[42] Nonetheless, these concerns appear to have been ignored in the rush of positive remarks praising the Telecom Act for its deregulatory, pro-competitive stance.

On the House side, several members expressed concern about the extremely hurried review process which did not allow Representatives

---

36. *See id.*

37. *See* H.R. REP. NO. 104-458, *reprinted in* 142 CONG. REC. H1078, H1134 (1996).

38. 142 CONG. REC. H1078, H1104 (quoting § 704 of the Conference Report), H1134 (describing intent behind the section) (1996).

39. *Id.* at H1134.

40. *See* 142 CONG. REC. S687, S687 (1996) (describing the vote to limit debate to 90 minutes).

41. *Id.* at S695 (statement of Sen. Hollings).

42. *Id.* at S696.

the customary three days in which to review the recommendation before the final vote.[43] Despite a number of objections, the House apparently began consideration of the Conference Report approximately 90 minutes after copies of the lengthy Report were delivered to representatives.[44] Not surprisingly, since most members of the House would not even have had time to read it, nothing was said about the issue of preemption during the floor discussion on the Conference Report.

On this scanty record, both houses passed the Telecom Act by substantial margins,[45] and President Clinton signed the Telecom Act into law on February 8, 1996.[46]

B. *The Preemptive Reach of the Telecom Act*

As mentioned earlier, the Telecom Act includes some very important limitations on the right of state and local governments, and instrumentalities thereof, to regulate the placement of wireless service facilities, such as cellular and PCS towers.[47] Although the portion of the Telecom Act which governs the provision of wireless services expressly states that local zoning authority is to be preserved "[e]xcept as provided" in the statute,[48] the Telecom Act clearly preempts certain types of state action. In particular, state and local authorities are precluded from regulating "the placement, construction, and modification of personal wireless

---

43. *See* 142 CONG. REC. H1078, H1146 (1996) (statements of Rep. Beilenson), H1148 (statements of Rep. Schroeder), H1150 (statements of Rep. Frank), H1152 (statements of Rep. Conyers), H1152 (statements of rep. Jackson-Lee).

44. *See id.* at H1148 (statements of Rep. Schroeder).

45. *See* 142 CONG. REC. S687, S720 (1996). The Act passed the House by a vote of 414 to 16, with 4 representatives not voting. It passed the Senate by a vote of 91 to 5, with 3 not voting.

46. President William J. Clinton, *Remarks on Signing the Telecommunications Act of 1996: February 8, 1996*, 32 WEEKLY COMP. PRES. DOC. 215 (1996).

47. 47 U.S.C. § 332(c)(7)(C)(ii) defines the term "personal wireless service facilities" to mean "facilities for the provision of personal wireless services." 47 U.S.C. § 332 (c)(7)(c)(ii) (Supp. IV 1998).

48. 47 U.S.C. § 332(c)(7)(A) (Supp. IV 1998) ("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.").

service facilities" in any manner which: (1) discriminates among service provides; (2) prohibits the provision of personal wireless services; (3) unreasonably delays approval of facilities used to provide such services; (4) permits a request to locate a tower in a particular location to be denied on the basis of anything less than "substantial evidence"; or (5) regulates the "placement, construction, and modification of personal wireless service facilities on the basis of the environmental effects of radio frequency emissions."[49] It is the last of these limitations on which this Article focuses, although it is not the only restriction of significance.[50]

---

49. In pertinent part, 47 U.S.C. § 332(c)(7)(B) reads as follows:

> (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.
>
> (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.

See 47 U.S.C. § 332 (c)(7)(B) (Supp. IV 1998).

50. The other particularly troublesome restriction arises because of the manner in which federal courts have been construing the requirement that siting decisions be based on "substantial evidence." Some courts have concluded that citizen testimony is not substantial, or that evidence about aesthetics is not relevant, or that "informal" surveys of property valuation are not enough. *See, e.g.*, Cellular Tel. Co. v. Town of Oyster Bay, 166 F.3d 490, 495-96 (2d Cir. 1999) (stating that, under N.Y. law, generalized statements of objection on the basis of aesthetics or property values and affidavits from real estate brokers about effect on property values are insufficient); Omnipoint Communications, Inc. v. Foster Township, 46 F. Supp. 2d 396, 403 (M.D. Pa. 1999) (holding that zoning authority must support siting decisions with "substantial evidence"); Omnipoint Communications, Inc. v. Penn Forest Township, 42 F. Supp. 2d 493, 500 (M.D. Pa. 1999) (rejecting zoning authority's consideration of the risk of falling ice and debris, even though provider offered no evidence that it was not a risk); Primeco Personal Communications v. Village of Fox Lake, 26 F. Supp. 2d 1052, 1063 (N.D. Ill. 1998) (holding constituent

Although couched in terms of "environmental effects," it seems clear that this catch-phrase really means that state and local governments are not allowed to consider the possibility that RF emissions at legal levels may pose a risk to human health when promulgating or enforcing land use regulation.[51] Thus, planning boards and zoning commissions are precluded from making siting decisions based on the potential health risks of RF emissions "to the extent that such facilities comply with the [Federal Communication] Commission's regulations concerning such emissions."[52]

The actual language of the Telecom Act focuses solely on the authority retained by state and local governments to regulate "the placement, construction, and modification" of facilities. It is possible, however, that courts will interpret the preemptive reach of the Telecom Act more broadly, so that the power of private citizens to oppose the placement of such towers on the basis of health risks may also be impaired.

---

testimony opposing a tower is not enough without supporting evidence); Virginia Metronet, Inc. v. Board of Supervisors of James City County, Va., 984 F. Supp. 966 (E.D. Va. 1998) (opining that aesthetic considerations would not be an appropriate basis for rejection of an application).

One of the most objectionable decisions in this regard appears to be *Omnipoint Corp. v. Zoning Hearing Bd. of Pine Grove Township,* 20 F. Supp. 2d 875 (E.D. Pa. 1998). In this case, the court not only found that opponents have a burden of presenting evidence that a tower is undesirable, but also that this burden "requires protestant to establish their objection with a 'high degree of probability,' and [to] 'raise 'specific issues' concerning the proposal's general detrimental effect on the community." *Id.* at 879. Until and unless this is done, the proponent of a tower site has no burden to prove a lack of harmful effect on property values or adverse effect on character of the neighborhood. *See id.* at 878. Moreover, the court also opined that "economic and aesthetic considerations" would not be sufficient to deny the placement anyway. *Id.* at 880.

In any event, none of these cases consider the fact that citizens are generally given very little time to gather information in opposition to a tower before they must appear before a planning or zoning authority. The cases also don't consider that citizens have neither the experience, nor access to relevant data and financial resources, readily available to the telecommunications companies.

51. The FCC's Report and Order adopting new RF exposure guidelines makes it quite clear that the effect of RF emissions on human health has been considered, at least to the satisfaction of the Commission. *See* Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation, 11 F.C.C.R. 15123, 15128-36 (1996) [hereinafter Guidelines] ("We believe that the guidelines we are adopting will protect the public and workers from exposure to potentially harmful RF fields.").

52. 47 U.S.C. § 332(c)(7)(B) (Supp. IV 1998).

For example, private citizens might bring a nuisance action on the basis of the health risks posed by emissions from cellular or PCS towers. Similarly, citizens might oppose the construction of a tower on a particular parcel of land on the basis of one or more restrictive covenants, such as those which preclude "offensive" or "noxious" activities.[53] Even acknowledging that Congress has preempted land use regulation on the basis of such considerations, the question is whether the Telecom Act should preempt state courts from considering evidence of health risks from RF emissions in this type of private lawsuit.

The Supremacy Clause of the United States Constitution provides that "the Laws of the United States . . . shall be the supreme Law of the Land; . . . any Thing in the Constitution or Laws of any State to the Contrary notwithstanding."[54] Congress therefore clearly possesses the power to preempt state law. Current law provides that there are essentially three situations in which federal preemption of state law can occur: (1) express preemption, where Congress expressly preempts state law; (2) field preemption, which occurs where Congress has occupied the entire field; and (3) conflict preemption, where there is an actual conflict between federal and state law.[55] The latter two forms of preemption (field and conflict preemption) are both implied rather than express.[56] Moreover, in the appropriate case it is clear that state tort claims can be within the preemptive reach of a federal statute,[57] even by implication.

In any case where preemption is a possibility, the critical inquiry is whether Congress intended federal law to supersede state law.[58] The general presumption is that preemption "will not lie unless it is the 'clear

53. For an extended discussion of this possibility, see Carol Goforth, *"Not in My Back Yard!": Restrictive Covenants as a Basis for Opposing the Construction of Cellular Towers,* 46 BUFF. L. REV. 705 (1998).

54. U.S CONST. art. VI, §1, cl. 2.

55. *See* Gade v. National Solid Wastes Mgt. Ass'n., 505 U.S. 88, 98 (1992).

56. *See id.*

57. *See* Cipollone v. Liggett Group, Inc., 505 U.S. 504, 520-23 (1992) (holding that the preemptive reach of Section 5 [b] of the Public Health Cigarette Smoking Act of 1969, codified at 15 U.S.C. §1334[b], is not limited to positive enactments by legislatures and agencies but may also include certain state law damage actions); CSX Transp., Inc. v. Easterwood, 507 U.S. 658, 664 (1993) (finding that "[l]egal duties imposed on railroads by the common law fall within the scope of" 45 U.S.C. § 434, preempting any state"law, rule, regulation, order, or standard relating to railroad safety.").

58. *See Cipollone,* 505 U.S. at 516.

and manifest purpose of Congress.'"[59] In addition, in considering whether a particular matter has indeed been preempted, courts have been instructed to start with the assumption that subjects which have traditionally been subject to state regulation will not be preempted by federal law unless that is the clear and manifest purpose of Congress.[60]

In considering whether the Telecom Act impliedly preempts private claims based upon state tort and contract law, there is substantial reason to believe that the scope of federal preemption under the Telecom Act should be narrowly construed. First, there is the language of the Telecom Act, which certainly does not include an express preemption of private rights of action under state law.[61] Instead, the new provisions appear very narrowly tailored to focus on the rights of state and local governments to exercise their zoning and land use authority.[62] In fact, the Telecom Act explicitly recognizes congressional policy to generally preserve state and local authority over placement of wireless facilities.[63]

There is substantial authority to the effect that Congress knows how to extend preemption to private causes of action or state court actions when it wishes preemption to extend this far, and failure to include language evidencing this intent is itself evidence that Congress intended only a narrow preemption of state rights.[64]

---

59. *See CSX Transp. Inc.*, 507 U.S. at 664 (quoting Rice v. Santa Fe Elevator Corp., 331 U.S. 218 (1947)).

60. *See Cipollone*, 505 U.S. at 516 (citing Rice v. Santa Fe Elevator Corp., 331 U.S. 218, 230 (1947)). *See also* California Fed. S. & L. Ass'n. v. Guerra, 479 U.S. 272, 280-281 (1987); *CSX Transp., Inc.* 507 U.S. at 663-64 ("In the interest of avoiding unintended encroachment on the authority of the States, however, a court interpreting a federal statute pertaining to a subject traditionally governed by state law will be reluctant to find pre-emption."); Medtronic, Inc. v. Lohr, 518 U.S. 470, 485 (1996) ("[B]ecause the States are independent sovereigns in our federal system, we have long presumed that Congress does not cavalierly pre-empt state-law causes of action.").

61. *See supra* note 2.

62. *See id.*

63. 47 U.S.C. § 332(c)(7)(A) (Supp. IV 1998).

64. If Congress had intended in that clause to preclude state tort claims, it could have easily achieved this result. *See Medtronic*, 518 U.S. at 487 ("[I]f Congress intended to preclude all common-law causes of action, it chose a singularly odd word ['requirement'] with which to do it. The statute [21 U.S.C. § 360k(a)] would have achieved an identical result, for instance, if it had precluded any 'remedy' under state law relating to medical devices."). *See also* Taylor v. General Motors Corp., 875 F.2d 816, 824 (11th

In a recent and highly publicized decision, the United State Supreme Court considered the viability of state-law claims made by and on behalf of former smoker and lung cancer victim Rose Cipollone against various cigarette manufacturers.[65] The manufacturers in *Cipollone v. Liggett Group* had asserted that the Federal Cigarette Labeling and Advertisement Act[66] and its successor, the Public Health Cigarette Smoking Act,[67] protected them from liability based on their conduct after enactment of this legislation. The Court determined that the preemptive scope of these acts was to be governed entirely by the preemption clauses contained in the legislation. The Court explained:

> When Congress has considered the issue of pre-emption and has included in the enacted legislation a provision explicitly addressing that issue, and when that provision provides a "reliable indicium of congressional intent with respect to state authority," . . . "there is no need to infer congressional intent to pre-empt state laws from the substantive provisions" of the legislation. Such reasoning is a variant of the familiar principle of expressio unius est exclusio alterius: Congress' enactment of a provision defining the pre-emptive reach of a statute implies that matters beyond that reach are not pre-empted.[68]

In a later decision the United States Supreme Court clarified *Cipollone*, explaining that the presence of a limited express preemption does not completely preclude the possibility of implied preemption. Rather, "*Cipollone* supports an inference that an express pre-emption clause forecloses implied pre-emption . . . ."[69]

Cir. 1989) ("An additional factor militating against a finding that the language of the Safety Act expressly preempts appellants' claims is that Congress did not make explicit reference to state common law in the Act's preemption clause as it has in the preemption clauses of many other statutes. Congress has long demonstrated an aptitude for expressly barring common law actions when it so desires.").

65. *See Cipollone*, 505 U.S. at 508, 509.

66. Pub. L. 91-222, 84 Stat.87, as amended, 15 U.S.C. §§ 1331-1340.

67. 15 U.S.C. § 1331-1340 (1997).

68. *Cipollone*, 505 U.S. at 517.

69. Freightliner Corp. v. Myrick, 514 U.S. 280, 289 (1995).

In the case of the Telecom Act, not only does the narrowly tailored language of the Act suggest a limited preemptive intent, but an examination of the larger piece of legislation into which the Telecom Act was incorporated, the Communications Act of 1934,[70] supports this interpretation. The Communications Act of 1934 contains language which expressly preserves common law rights and remedies,[71] language which the Telecom Act did not change. In addition, legislative history of the Telecom Act also suggests that Congress did not intend to usurp state and local authority, except to the extent expressly set forth in the statute.[72] Finally, the extent of the preemption should be evaluated in light of the fact that zoning and land use regulation have traditionally been matters left to state and local law.[73] In addition, the federal government has not generally exercised authority over the disputes of private citizens involving such claims as privately negotiated restrictive covenants on land, and the state law of nuisance.[74]

This line of reasoning suggests that the Telecom Act should be narrowly construed. However, trial judges in at least two states have apparently decided that the Telecom Act not only precludes state and local governments from promulgating land use regulations on the basis of health effects of RF emissions from cellular towers, but that it also pre-

---

70. Act of June 19, 1934, c. 652, 48 Stat. 1064, as amended, known as the Federal Communications Act of 1934, classified principally in title 47, Chapter 5 of the U.S. Code, which is subtitled "Wire or Radio Communication." Fed. R. Civ. P. § 1332

71. The Communications Act of 1934 specifies that "[n]othing in this Act contained shall in any way abridge or alter the remedies now existing at common law or by statute, but the provisions of this Act are in addition to such remedies." 47 U.S.C. § 414 1994). This language was not changed or limited by the Telecom Act.

72. As the conference report states: "The conference agreement creates a new section 704 which ... preserves the authority of State and local governments over zoning and land use matters except in the limited circumstances set forth in the conference agreement." *See supra* note 37, at 207-08.

73. *See, e.g.,* ROBERT R. WRIGHT & MORTON GITLEMAN, LAND USE: CASES AND MATERIALS, 955-57 (5th ed. 1997) (offering "A Note on Federal Preemption"—"Normally, we do not think of the federal government setting out to override local land use regulations . . . ."). *See also id.* at 956 n.3 (discussing the Telecom Act).

74. While it is true that the federal rules of civil procedure permit the federal courts to exercise diversity jurisdiction in certain matters involving this kind of claim, the issue of whether particular conduct creates a nuisance or violates a restrictive covenant is a matter of state, not federal law.

cludes state courts from considering evidence of such health risks even in the context of lawsuits brought by individuals to enforce private rights. Moreover, one state Supreme Court has affirmed this result.

The first reported appellate decision to address the issue of preemption of private causes of action under this part of the Telecom Act was *Kapton v. Bell Atlantic Nynex Mobile.*[75] This case apparently involved an appeal from a trial court's determination that a property owner's nuisance claim was preempted by the Telecom Act to the extent that it involved a claim for damages because of health risks posed by RF emissions.[76] It appears that the plaintiff abandoned her claims before the appeal, and despite an erroneous headnote in the reported decision, a majority of the appellate court concluded "we need not determine the preemption issue" because the appellant voluntarily abandoned any claims arising out of the health effects of the electromagnetic radiation.[77]

Unlike the majority of the court, however, Judge Kelley would have reached the issue of preemption. He would have found that:

> . . . to achieve the stated purposes of the Act, the Federal Congress has specifically limited the ability of a state or local government to regulate the placement or construction of personal wireless service facilities, and has afforded providers of such services with a form of redress should a state or local government violate the provisions of the Act. ...However, the Federal Congress has also specifically states that the provisions of the Act do not "[i]n any way abridge or alter the remedies now existing at common law or by statute...." 47 U.S.C.S. § 414. Clearly, the provisions of section 332 of the Act do not eliminate or affect the ability of Appellant to maintain an action sounding in nuisance under the law of Pennsylvania.[78]

This reasoning, however, appears only in a dissent, and if the plaintiff did indeed abandon her claim prior to the appeal, the dissent seems to

---

75. 700 A.2d 581 (1997).

76. *Id.*

77. *Id.* at 583.

78. *Id.* at 587 (Kelley, J., dissenting).

be purely precatory. Moreover, the trial judge in *Kapton* apparently believed that the preemptive scope of the Telecom Act was broad enough to encompass private causes of action such as nuisance claims.[79]

The second reported decision was rendered by the Arkansas Supreme Court in the summer of 1999, and this opinion squarely addressed the question of whether the Telecom Act preempts private causes of action. In *Goforth v. Smith*,[80] a cellular provider sought permission to locate a tower in a rural neighborhood in Northwest Arkansas.[81] The land in question was also subject to a restrictive covenant which precluded any "offensive" or "noxious" activity.[82] Area residents, after unsuccessfully opposing the construction of the tower before the local planning commission, brought suit alleging, among other complaints, that the proposed tower would constitute a nuisance and would violate the restrictive covenant.[83] In support of both of these claims, the plaintiffs wanted to produce evidence relating to the potential health risks posed by RF emissions from the tower.

The trial judge refused to consider these claims, insofar as they were based on the health effects of RF emissions, saying that the Telecom Act preempted any such evidence.[84] On appeal, the Arkansas Supreme Court agreed,[85] citing *Cipollone v. Liggett Group, Inc.* as support for the proposition that the phrase "state law" "include[s] common law as well as statutes and regulations."[86] To further bolster its decision, the court also relied on *Broyde v. Gotham Tower, Inc.*,[87] a Sixth Circuit case involving a nuisance action predicated on radio-frequency interference

---

79. *See id.* at 582.

80. 991 S.W.2d 579 (Ark. 1999). The author of this article was the lead plaintiff in that case.

81. *Id.* at 582.

82. *Id.*

83. *Id.*

84. "[B]efore witnesses were called, the chancellor issued a ruling on the motion to dismiss, finding that issues relating to the environmental effect of radio emissions were preempted by federal law, and ruling that no testimony would be allowed as to that allegation." *Id.* at 582.

85. *See id.* at 585.

86. *See id.* at 584 (quoting Erie R.R. Co. v. Tompkins, 304 U.S. 64 (1938)).

87. 13 F.3d 994 (6th Cir.1994).

(RFI). By treating the RF exposure claims of the *Goforth* plaintiffs as being equivalent to the RFI claims in *Broyde,* the Arkansas court justified an expansive approach to preemption under the Telecom Act.

> [W]e conclude that the trial court correctly found that Congress has exercised its authority under the Supremacy Clause of the Constitution to preempt consideration of the environmental effects of radio emissions by the state. We further conclude that the trial court did not commit error by excluding testimony concerning the environmental effects of such emissions.[88]

In rendering its opinion in *Goforth,* the Arkansas Supreme Court ignored some very significant differences between the issue of preemption in the context of RFI claims which were at issue in *Brodye* and preemption under the Telecom Act. First, in the House Conference Report which accompanied the amendments giving the FCC authority over RFI claims, Congress specified that "*exclusive* jurisdiction over RFI incidents (including preemption of state and local regulation of such phenomena) lies with the FCC."[89] This same report also concluded:

> Such matters [those involving RFI] shall not be regulated by local or state law, nor shall radio transmitting apparatus be subject to local or state regulation as part of any effort to resolve an RFI complaint. The Conferees believe that radio transmitter operators should not be subject to fines, forfeitures or other liability imposed by any local or state authority as a result of interference appearing in home electronic equipment or systems. Rather, the Conferees intend that regulation of RFI phenomena shall be imposed only by the Commission.[90]

In addition, RFI legislation has been found to "fully occup[y] the field."[91] Several courts have concluded that the RFI legislation consti-

88. 991 S.W.2d at 585.

89. H.R. CONF. REP. No. 97-765, *reprinted in* 1982 U.S.C.C.A.N. 2261 (1982) (emphasis added).

90. *Id.* at 2277.

91. Broyde v. Gotham Tower, Inc., 13 F.3d 994, 997 (1994).

tutes a "unified and comprehensive regulatory system" pursuant to which the FCC had been given "statutory authority to regulate the transmission of radio energy *that creates interference.*"[92]

In stark contrast to this, the Telecom Act never purported to be a "unified and comprehensive regulatory system," and no court has so held. Instead, the preemptive language of the Act appears in a section entitled "*Preservation* of Local Zoning Authority."[93] Thus, the Telecom Act's preemptive reach appears to be limited to zoning issues,[94] unlike the broad preemptive reach of the RFI legislation.

In addition, the RFI cases discussed by the Arkansas Supreme Court in *Goforth* involved only the preemption of nuisance claims. In *Goforth*, the plaintiffs also brought claims based on a privately agreed upon restrictive covenant. The only reported decision involving the question of whether RFI preemption extends beyond nuisance claims to attempts to enforce privately negotiated contractual limitations, *Winfield Village Cooperative v. Ruiz*,[95] suggests that even RFI preemption is not absolute. The court in that case recognized unambiguous evidence of Congressional intent to preempt some state law claims, but found that the preemption did not extend to claims founded on private contractual obligations.[96]

There is thus a significant possibility that the Arkansas Supreme Court was wrong in refusing to allow the plaintiffs in *Goforth* to present evidence relating to the health effects of RF emissions from the proposed tower. The fact that the case may have been incorrectly decided, however, does not lessen the impact of the decision. In Arkansas at least, and in any other jurisdiction persuaded by the reasoning of the court in *Goforth*, the preemptive reach of the Telecom Act may be much broader than Congress ever intended. This makes the decision to remove consideration of health risks posed by RF emissions from cellular and PCS towers from state and local governments even more problematical, because claims of private citizens may also be found to be within the pre-

92. *In re* Freeman, 975 F. Supp. 570, 571 (D. Vt. 1997) (emphasis added and citations omitted).

93. 47 U.S.C. § 332(c)(7) (Supp. IV 1998) (emphasis added).

94. *See also supra* notes 70-74 and accompanying text.

95. 537 N.E.2d 331 (1989).

96. *See id.* at 748.

emptive reach of the statute.

The next section of this Article considers the types of emissions produced by these facilities, and evaluates some of the mounting evidence which suggests that there are health risks associated with such emissions.

II. REGULATION OF RF EMISSIONS

A. *Emissions From Cellular and PCS Facilities*

Any discussion of the wireless communications services regulated under the Telecom Act will necessarily include some scientific and relatively technical terms and abbreviations. This section of the Article involves a discussion of radio frequency (RF) emissions produced by personal wireless facilities like cellular and PCS towers, and while every effort has been made to minimize the use of technical jargon, some is essential in order to preserve the meaning of the underlying research.

RF emissions are a form of electromagnetic radiation that have separate electric and magnetic components which are linked together.[97] These separate components are linked together, and the EMF radiation travels as a wave at a frequency which is expressed in Hertz (Hz). Some of the higher frequencies are described in terms of kilohertz (abbreviated as kHz, representing one thousand Hz), megahertz (MHz, or one million Hz) or gigahertz (GHz or one billion Hz).[98] As the following discussion of telecommunications technology will explain, most wireless technology operates at the 800 to 950 MHz or 1850 to1990 MHz frequencies. These frequencies are sometimes referred to as being in the microwave spectrum,[99] or the radio-frequency (RF) spectrum,[100] and are generally

---

97. *See* Charles Tomljanovic, Maxine Wright-Walters and Jules Stephensky, *Anthropogenic Electromagnetic Fields and Cancer: A Perspective,* 8 RISK 287, 289 (1997).

98. One MHz is equal to 1,000,000 Hz. Similarly, 1 kHz equals 1,000 Hz; and 1,000,000,000 Hz equals 1 GHz.

99. *See* BIOLOGIC EFFECTS AND HEALTH HAZARDS OF MICROWAVE RADIATION, PROCEEDINGS OF AN INTERNATIONAL SYMPOSIUM, WARSAW, 15-18 OCTOBER, 1973, at VII (Polish Medical Publishers 1974) [hereinafter WARSAW SYMPOSIUM] (defining anything from 300 to 300,000 MHz as being in the microwave range); *see also* Michael Repacholi, *Radiofrequency Field Exposure and Cancer: What Do the Laboratory Studies Suggest,* 105 ENVTL. HEALTH PERSP. 1565, 1565 (1997).

100. The Telecom Act refers to EMF radiation from such facilities as being in the radio-frequency (RF) range. *See, e.g.,* 47 U.S.C. § 332(c)(7)(B)(iv) (Supp. IV 1998). According to the FCC, this encompasses all frequencies between 300 kHz and 100 GHz.

recognized as being non-ionizing radiation.[101] Generally, this Article refers to the emissions from wireless facilities as being in the RF range.

As mentioned earlier,[102] the Telecom Act speaks in terms of "personal wireless services," a phrase which encompasses a variety of telecommunications technologies. Perhaps the most familiar wireless service involves cellular communications. The FCC has divided the country into hundreds of geographic markets,[103] and a limited number of cellular providers in the 824 to 849 and 869to 894 MHz frequency ranges have been licensed in each of these markets.

Cellular service is primarily intended to provide consumers with mobile communications service over a broad geographic area. A cellular system operates by dividing a large geographic service area into cells. When a cellular telephone customer dials his or her cell phone, an antenna on a nearby tower, "us[ing] a signal in the 800-megahertz range, picks up the call and transfers it, via microwave or land line, to the telephone network."[104] "[E]ach tower has a range of less than 10 miles, which varies according to topography and density," and when the customer moves out of range of the first tower, the signal is transferred to the next.[105] The call is disconnected unless there is a tower in the next calling area to pick up the signal. Thus, as the number of cellular customers increases and there is added pressure to expand the geographic

---

See Procedures for Reviewing Requests for Relief From State and Local Regulations Pursuant to Section 332(c)(7)(B)(v) of the Communications Act, 12 F.C.C.R. 13494, 13501 n.8 (1997) [hereinafter Procedures]. Repacholi says that RF fields have frequencies between 300 Hz and 300 GHz. Repacholi, *supra* note 99, at 1565. In either event, both the cellular and PCS facilities which are the focus of this article operate in the RF frequency range.

101. RF fields are non-ionizing radiation because they are too weak to break the bonds that hold molecules in cells together so as to produce ionization.

102. *See supra* note 22 and accompanying text.

103. 47 C.F.R. § 22.209 (2000).

104. Irene Sege, *Cellular Towers' Foes Rising; Health, Aesthetics Cited in Disputes*, BOSTON GLOBE, July 8, 1991, at 1. *Accord* Tom Morris, *LI's Towers of Controversy; A Necessity or Hazardous Eyesores?*, NEWSDAY, Feb. 2, 1993, at 23. Actually, it is not the tower itself which emits RF radiation, but antennas which are located on the towers. A single tower may have multiple antenna arrays, often from multiple service providers. In order to avoid being overly technical, this article nonetheless speaks in terms of emissions from towers rather than emissions from antennas.

105. Sege, *supra* note 104, at 1.

service areas, more towers (or at least more antennas) are needed to transmit the increasing volume of signals.

The term personal communications services (PCS) encompasses narrowband and broadband service. Narrowband PCS operates in the 901 to 941 MHz frequency range and offers a variety of specialized services, such as messaging and two-way paging. The FCC has granted licenses to a number of nationwide and regional narrowband systems.[106] Broadband PCS is similar to cellular telephone service and is sometimes mistaken as the same wireless communications service. However, PCS operates in a higher frequency band, at the 1850 to 1990 MHz range, which allows broadband PCS to deploy a wider variety of communications services, such as digital, voice, data and paging transmissions, over the same spectrum. The FCC also uses different geographic market areas for licensing purposes,[107] and a limited number of licenses have been sold in each of the defined areas. Moreover, because broadband PCS uses a higher frequency range, PCS providers will require substantially more tower sites than cellular providers have needed in order to provide adequate coverage in their service areas.

"Personal wireless services" also includes specialized mobile radio (SMR) services, if the systems offer interconnected service to the public on a for-profit basis.[108] SMR systems operate in either the 800 MHz frequency range (806 to 821/851 to 866 MHz) or 900 MHz frequency range (896 to 901/935 to 941 MHz).[109]

All of these facilities emit RF radiation which is at the heart of the controversy addressed in this Article, since the Telecom Act expressly preempts consideration of RF effects when states and localities are asked to make decisions about the placement of wireless facilities. This restriction applies so long as the RF levels are in compliance with FCC guidelines.[110]

Regulation of RF emissions has been within the purview of the FCC for quite some time. The Federal Communications Act of 1934 gives the FCC authority over wireless communications because cellular and PCS technology requires the use of radio frequencies which have traditionally

106. 47 C.F.R. § 24.102 (2000) (describing narrowband service areas).

107. 47 C.F.R. § 24.202 (2000) (describing broadband PCS service areas).

108. *See* 47 U.S.C. § 332 (c)(d) (1994).

109. *See id.*

110. *See supra* note 93.

been under the jurisdiction of the FCC.[111] Over the years, the FCC exercised preemptory authority over certain aspects of RF,[112] but it was not until relatively recently that the FCC began to regulate RF emissions on the basis of their effect on human beings and the environment. In fact, the FCC had long denied any expertise in environmental effects, and did not promulgate any standards for human exposure to RF emissions until the National Environmental Policy Act (NEPA) was passed in 1969.[113] This legislation *required* federal agencies to evaluate the effects of their actions on the quality of the human environment. Pursuant to the mandates of NEPA, the FCC finally adopted requirements for evaluating the environmental impact of electromagnetic radiation and RF emissions from televisions, handsets and various antennas.[114]

From 1985 to 1991, the FCC relied on RF exposure guidelines set by the American National Standards Institute (ANSI) in 1982.[115] Then, in 1992, ANSI replaced its exposure guidelines with new standards issued in conjunction with the Institute of Electrical and Electronic Engineers (IEEE).[116] The 1992 standards were more restrictive in terms of the

---

111. 47 U.S.C. § 301 (1991).

112. The FCC assumed such authority over amateur or ham radio, construction of broadcast stations, direct broadcast satellites, technical cable signals, and satellite receive-only antennas. *See* Preemption of State and Local Regulations Pertaining to Amateur Radio Facilities, 101 F.C.C.2d 952, ¶ 25 (1985) (relating to amateur radio); Application of Cherry & Webb Broad. Co., 22 F.C.C. 1082, 1125 n.30 (1956) (broadcast stations); Application of WSAV, Inc., 19 F.C.C. 736, 769-70 (1955) (satellites); Amendment of Part 76 of the Commission's Rules and Regulations Relative to the Advisability of Federal Preemption of Cable Television Technical Preemption of Cable Television Technical Standards or the Imposition of a Moratorium on Non-Federal Standards, 49 F.C.C.2d 470, 477, 480 (1974) (cable signals); and 47 CFR § 25.104 (1996) (satellite receive-only antennas).

113. National Environment Policy Act of 1969, Pub. L. No. 91-190, 83 Stat. 852 (codified at 42 U.S.C. § 4321 (1994)).

114. Currently codified at 47 C.F.R § 1.1301 (1996).

115. *See* Responsibility of FCC to Consider Biological Effects of Radiofrequency Radiation when Authorizing the Use of Radiofrequency Devices, 100 F.C.C.2d 543, 549 ¶ 14 (1985).

116. American National Standards Institute, *Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields,* 3kHz to 300GHz, 1993 INST. ELECTRICAL & ELECTRONIC ENGINEERS 9 [hereinafter ANSI 1993].

permissible levels of environmental RF exposure,[117] and for the first time specified two tiers of exposure criteria, one for "controlled environments" (typically involving workers)[118] and another more stringent tier for "uncontrolled environments" (involving the general public).[119]

In light of these revised guidelines, the FCC initiated proceedings in 1993 to determine whether it should replace the outdated 1982 ANSI guidelines. More than 100 parties including telecommunications organizations, federal government agencies, state and local authorities and individuals submitted comments in response to the Notice.[120] The Environmental Protection Agency (EPA), the Center for Devices and Radiological Health (CDRH) of the Food and Drug Administration (FDA), the National Institute for Occupational Safety and Health (NIOSH), and the Occupational Safety and Health Administration (OSHA) were among the interested parties who filed comments in this proceeding and made specific recommendations.[121]

While this discussion was underway, Congress enacted the Telecom Act, which required the FCC to complete its rulemaking proceeding and have revised RF exposure guidelines in place by August 7, 1996.[122] The FCC complied, adopting a Report and Order on August 1, 1996, which revised the guidelines used to evaluate the environmental effects of transmitters licensed or authorized by the Commission.[123] The new

---

117. Guidelines, *supra* note 51, at 15125 ¶ 3.

118. ANSI 1993, *supra* note 116, at 13. Controlled environments are defined as "locations where there is exposure that may be incurred by persons who are aware of the potential for exposure as a concomitant of employment . . . . " *Id.*

119. *See id.* at 15 (defining uncontrolled environments as "locations where there is the exposure of individuals who have no knowledge or control of their exposure. The exposures may occur in living quarters or workplaces where there are no expectations that the exposure levels may exceed" the allowable amounts prescribed by the guidelines.").

120. Guidelines, *supra* note 51, at 15128 ¶ 11.

121. *Id.*

122. 47 U.S.C. § 332 (2000).

123. *See* Guidelines, *supra* note 51. The standards are codified at 47 C.F.R. § 1.1310 (1969). This section, entitled "Radio-frequency radiation exposure limits," provides the following descriptions to the source of the revised standards:

> These limits are generally based on recommended exposure guidelines published by the National Council on Radiation Protection and Measurements (NCRP) in "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," NCRP Report No. 86,

guidelines governing RF emissions became effective on January 1, 1997,[124] with a phase-in for pre-existing facilities.

The current standards basically provide that exposure to RF emissions is not to exceed certain specific absorption rates (SARs).[125] The 1992 guidelines set an upper limit of 8 watts/kilogram (8 W/kg) for controlled environments (occupational exposure) and 1.6 W/kg for uncontrolled environments (public exposure).[126] These standards apply to all frequencies between 300 kHz and 1 GHz.[127] It has, however, been noted that ANSI, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) and National Council on Radiation Protection (NCRP) "all agree that whole body exposure of the general public should be kept below a whole body SAR of 0.08 W/kg."[128] On the other hand, this "general agreement" is not part of the FCC safety guidelines.

Because SARs are difficult to measure on a routine basis, power density is more frequently measured, both in the field and in research

---

Sections 17.4.1, 17.4.1.1, 17.4.2 and 17.4.3. Copyright NCRP, 1986, Bethesda, Maryland 20814. In the frequency range from 100 MHz to 1500 MHz, exposure limits for field strength and power density are also generally based on guidelines recommended by the American National Standards Institute (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 C95.1-1992, Copyright 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017.

124. One year later, the FCC issued a Second Opinion and Order confirming these standards. Procedures, *supra* note 99.

125. Guidelines, *supra* note 51, at 15127 ¶ 9. An SAR is a measure of the rate of energy absorbed by (or dissipated in) a mass of material such as biological tissue. Usually, SAR is measured in watts per kilogram (W/kg) or milliwatts per kilogram (mW/kg). *Id.* Note that this is not the same as power density, which is the power per unit area in the direction of wave propagation, typically measured in watts per square meter (W/m2d), milliwatts per square centimeter (mW/cm2d) or microwatts per square centimeter (uW/cm2d). The reason for pointing out the distinction is that many of the reported studies evaluate the effect of EMF based on power density rather than SAR. *See infra* Part II.B.

126. *Id.*

127. *Id.*

128. John E. Moulder, Ph.D., *Cellular Phone Antennas and Human Health*, n.17, *at* http://iago.lib.mew.edu/gcrc/cop/cell-phone-health-FAQ/toc.html.

involving the biologic effects of RF radiation.[129] A major problem caused by this discrepancy is that the various groups which have promulgated standards for RF exposure, such as ANSI, ICNIRP, and the NCRP "disagree about the specific relationship of SAR to power-density."[130] They also disagree, to some extent, on the appropriate power density levels. The ICNIRP standard is 0.40 milliWatts per centimeter squared (mW/cm2d) for cellular phone frequencies and 0.90 mW/cm2d for PCS frequencies.[131] The NCRP guideline is 0.57 mW/cm2d for cellular phone frequencies and 1.00 mW/cm2d for PCS frequencies.[132] The 1992 ANSI/IEEE standard is 0.57 mW/cm2d for cellular frequencies, and 1.2 mW/cm2d for PCS frequencies.[133] The FCC essentially adopted the 1992 ANSI/IEEE suggestions, but for PCS frequencies went with the slightly lower densities recommended by NCRP.[134]

B. *Do RF Emissions at Legal Levels Pose a Health Risk?*

The question of whether RF emissions at these levels or power densities are safe is at the heart of the controversy over the Telecom Act's preemption of state and local authority to regulate the placement of cellular and PCS facilities on the basis of health risks. While it is true that various citizens' groups and commentators have also objected to the aesthetics of cellular and PCS towers,[135] state and local governments

---

129. *Id.* at n.8.

130. *Id.* at n.17 (noting that the relationship is determined from a combination of dosimetry and biophysical modeling). *See also* M.A. Stuchly, *Biological Concerns in Wireless Communications,* 26 CRIT. REV. BIOMED. ENG. 117 (1998).

131. Moulder, *supra* note 128, at n.10 (citing the International Commission on Non-Ionizing Radiation Protection, *Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic and Electromagnetic Fields,* 74 HEALTH PHYSICS 494 (1998)). The reason that the power density standards are stricter for cellular frequencies is that human beings absorb RF emissions at 860 MHz more readily than at 1800 MHz. *Id.*

132. Moulder, *supra* note 128, at n.10.

133. ANSI, *Standards For Safety Levels With Respect To Human Exposure To Radio Frequency Electromagnetic Fields, 3kHz To 300 GHz,* 1992 INST. ELECTRICAL & ELECTRONIC ENGINEERS 13, 15 [hereinafter ANSI 1992].

134. Specifically, the FCC standards are 0.57 mW/cm2d for cellular phone frequencies and 1.0 mW/cm2d for PCS frequencies. Guidelines, *supra* note 51.

135. *See, e.g.*, Nancy M. Palermo, Comment, *Progress Before Pleasure: Balancing the Competing Interests of Telecommunications Companies and Landowners in*

retain authority to consider aesthetics in adopting appropriate zoning and other land use regulations. It is only where the health effects of RF emissions are at issue that state and local governments are powerless to act, and this is widely cited as the *primary* objection to placement of cellular and PCS facilities in and near residential areas.[136]

The debate over the impact of RF emissions on human health is not new. The modern controversy seems to have originated in the 1960s when reports emerged from the Soviet Union about a connection between electromagnetic frequencies (EMF) of power lines and human health in workers in high-voltage switchyards.[137] The Soviet studies

---

Cell Site Construction, 16 TEMP. ENVTL. L. & TECH. J. 245, 248 (1998) (commenting on citizens' "fear that installation of a cellular facility will result in depreciation of property values as cell sites generally are regarded as aesthetically displeasing visual nuisances."); Dean J. Donatelli, Note, *Locating Cellular Telephone Facilities: How Should Communities Answer When Cellular Telephone Companies Call?* 27 RUTGERS L.J. 447, 448 (1996) ("Those opposing the installation of cell sites in their community are concerned with the aesthetics of their neighborhood, the health of local residents, and property values; very often, their goal is to have the cell site located elsewhere."). *Accord* Tom Morris, *LI's Towers of Controversy; A Necessity or Hazardous Eyesores?,* NEWSDAY, Feb. 2, 1993, at 23; Irene Sege, *Cellular Towers' Foes Rising; Health, Aesthetics Cited in Disputes,* BOSTON GLOBE, July 8, 1991, at 1.

136. Malcolm J. Tuesley, Note, *Not in My Backyard: The Siting of Wireless Communications Facilities,* 51 FED. COMM. L.J. 887, 902 (1999) (stating that "[h]ealth and environmental concerns are atop the list of justifications community groups offer in opposition to towers."); Jeneba Jalloh, Comment, *Local Tower Siting Preemption: FCC Radio Frequency Guidelines ar Solution for Removing Barriers to PCS Expansion,* 5 COMM. L. CONSPECTUS 113 (1997) ("A national opinion poll by a telecommunication project planning and management firm found that an overwhelming majority of those polled cited health fears as the cause of their opposition to cellular tower in their neighborhoods.") (citing Anthony Crowell, *Local Government and the Telecommunications Act of 1996,* PUBLIC MGMT., June 1996, at 6); Palermo, *supra* note 135, at 255 ("The most significant negative factor cited by property owners in opposition of cell sites is that sites endanger the public health, safety and welfare of the community as a result of the EMFs which they emit."); David W. Hughes, *When NIMBYS Attack: The Heights to Which Communities will Climb to Prevent the Siting of Wireless Towers,* 23 J. CORP. L. 469, 492 (1998) (noting that the "primary argument against the siting of wireless towers, especially in residential neighborhoods, apparently is that wireless towers emit RF from their antennas, which is harmful to human health.").

137. Margo R. Stoffel, Comment, *Electromagnetic Fields and Cancer: A Legitimate Cause of Action of a Result of Media-influenced Fear?* 21 OHIO N.U. L. REV. 551, 557 (1994) (citing Harold R. Piety, *What We Don't Know About EMF,* PUB. UTIL. FORT., Nov. 15, 1991, at 15).

"suggested a link between exposure to electric fields and certain chronic afflictions such as headaches, fatigue and nausea."[138]

In 1973, the first international symposium on the health effects of exposure to microwave radiation was held in Warsaw, Poland (Warsaw Symposium).[139] The Symposium was described as "the culmination of a two-year exploratory and planning effort to bring together, for the first time, scientists and scientific program directors from nations known to have research interests in the effects on health of exposure to microwave radiation."[140] A number of studies presented at this conference indicated substantial reason to be concerned about the health impact of microwave radiation (defined for the purposes of the conference as frequencies from 300 to 300,000 MHz).[141] In fact, the summaries and recommendation of the session on general effects of such radiation included a specific recommendation for additional "bio-physical investigations," and called for specific "investigations of the effects of low microwave intensities" at various frequencies.[142] The final statement was that the international scientific community needs further research on "(a) cumulative effects [of RF exposure], (b) delayed effects, (c) differential radiation sensitivity . . . (d) effects related to cellular transformations, [and] (e) carefully controlled human epidemiological studies."[143]

Since then, there has been a growing volume of evidence pointing to a link between EMF (including RF) exposure and human health. The studies generally fall into one of three categories: laboratory studies at the cellular level; whole animal studies; and epidemiological studies. However, each of these kinds of studies are subject to criticisms when they are offered as evidence that RF emissions pose significant risks to human health.

Laboratory studies, for example, examine the biological impact of RFs at the cellular level by analyzing the effects of various types of exposure on animal or human tissues. Speaking generally, these studies tend to show that exposure to low levels of RF emissions can produce

---

138. Roy W. Krieger, *On the Line,* A.B.A. J., Jan. 1994, at 40, 41.

139. WARSAW SYMPOSIUM, *supra* note 99.

140. *Id.*

141. *Id.*

142. Z. V. Gordon, et al., *Summaries of Discussions, Session Reports and Recommendations, in* WARSAW SYMPOSIUM, *supra* note 99, at 319.

143. *Id.* at 320.

changes in the cell membrane under certain conditions.[144] However, cellular level studies are inconclusive because the "[r]esults observed under these [artificial] conditions may not be duplicated under comparable exposure of the whole organism, and the effect on humans, if any, will be even less predictable."[145]

The next category of research used to evaluate the health effects of low-level exposure to RFs are "whole animal experiments." These studies involve the scientific observation of living animals (and sometimes human beings) exposed to low levels of RF radiation. Whole animal experiments also tend to show that RFs interact with, and produce changes in, certain animal biological systems, such as the central nervous system.[146] However, these studies are conducted under artificial conditions, have not always been replicated in different laboratories, involve RF exposure that may not be comparable to emissions from cellular and PCS facilities (either in terms of frequencies or the level of exposure), and do not provide clear evidence as to the long-term effect of low-level RF exposure in humans in the real world.

The final category of research involves epidemiological studies.[147] This kind of research analyzes the incidence of cancer and other adverse

---

144. Dean J. Donatelli, Note, *Locating Cellular Telephone Facilities: How Should Communities Answer When Cellular Telephone Companies Call?* 27 RUTGERS L.J. 447, 474 (1996).

145. Sherry Young, *Regulatory and Judicial Responses to the Possibility of Biological Hazards from Electromagnetic Fields Generated by Power Lines*, 36 VILL. L. REV. 129, 139 n.37 (1991).

146. Donatelli, *supra* note 135.

147. Many of the most-frequently cited epidemiological studies involve consideration of frequencies other than those at issue in the case of cellular and PCS facilities. These studies do, however, add to the weight of evidence supporting a link between EMF exposure and a variety of human health concerns. *See* B. Hocking, et al., *Cancer Incidence and Mortality and Proximity to TV Towers,* 165 MED. J. AUSTL. 601, 605 (1996) (indicating increased leukemia and childhood leukemia rates among groups in Australia living closer to TV towers).

In fact, most of these studies "focus on possible adverse health effects association with environmental exposure to extremely low frequency (0-300 Hz) non-ionizing radiation . . . ." Helen Dolk, et al., *Cancer Incidence near Radio and Television Transmitters in Great Britain*, 145 AM. J. EPIDEMIOLOGY 1, 1 (1997). Very few studies have focused on RF exposure, especially at frequencies generally used by cellular and PCS systems in this country. *See id.* at 2.

health effects in persons working or living in areas of high exposure to various RFs. The epidemiological studies also tend to show a link between RF exposure and various adverse health effects. However, even a significant statistical relationship does not establish causation, and these studies are also subject to a number of other criticisms. First, by their very nature, it is extremely difficult to establish any meaningful control group. Thus there is no way to show whether adverse impacts on human health exist because of RF exposure or some other environmental condition. In fact, much of the raw data may also be suspect because there is no way to tell whether the populations being studied in fact received the same kinds of exposure to RF. In addition, virtually all of the epidemiological studies involve consideration of exposure at frequencies or power densities which are distinguishable from the RF radiation emitted by cellular and PCS systems.[148]

All of these criticisms are, to at least some extent, valid. Moreover, it is also possible that the reports of RF exposure are exaggerated because of media bias. For example, it has been suggested by some that even scientific journals under-report negative findings because editors may base their research selection criteria on the assumption "that their readers are captivated more by a finding that magnetic fields are teratogenic than by yet another report of a study which could find no such consequence."[149] The popular media is regarded even more critically by

148. Most of the early studies in fact involved consideration of high-voltage power lines or other types of EMF exposure that are not necessarily like the emissions produced from Cellular or PCS facilities. *See, e.g.*, Stephanie J. London, et al., *Exposure to Residential Electric and Magnetic Fields and Risk of Childhood Leukemia*, 134 AM. J. EPIDEMIOLOGY 923, 937 (1991) ("Our results, along with most previous data, support an association between wiring configuration [exposure, including all overhead electrical transmission and distribution facilities within 150 feet,] and childhood leukemia risk."); David A. Savitz, et al., *Case-Control Study of Childhood Cancer and Exposure to 60-Hz Magnetic Fields*, 128 AM. J. EPIDEMIOLOGY 21, 34 (1988) (calculating that children living in homes near distribution lines are 1.5 times more likely to develop cancer); Nancy Wertheimer & Ed Leeper, *Adult Cancer Related to Electrical Wires Near the Home*, 11 INT'L J. EPIDEMIOLOGY 345, 352 (1982) (showing an increased cancer risk for adults living near electrical transformers); Nancy Wertheimer & Ed Leeper, *Electrical Wiring Configurations and Childhood Cancer*, 109 AM. J. EPIDEMIOLOGY 273, 283 (1979) (discussing the first study on the effects of EMF exposure and finding that children living near high-current electrical configurations were 2 or 3 times more likely to develop cancer).

149. Margo R. Stoffel, Comment, *Electromagnetic Fields and Cancer: A Legitimate Cause of Action of a Result of Media-influenced Fear?*, 21 OHIO N.U. L. REV. 551, 589 (1994) (citing Edward A. Dauer, *Scientific Uncertainty Requires Building Intelli-*

those who doubt the existence of any link between RF exposure and health risks.[150]

Upon a closer examination, however, it often appears that those who are the most willing to cast aspersions upon those with health and safety concerns are affiliated with the telecommunications industry.[151] In addition, the fact that the telecommunications industry provides a significant amount of the financial support necessary to fund this type of research also suggests that the evidence may not be completely neutral.[152] One should wonder just how one-sided the media attention is, given that in addition to supporting research, the telecommunications industry initiated a multi-million dollar media blitz in 1993 to counter the public's

---

gence and Consensus, 11 PREVENTIVE L. REP. 21, 22 (1992)). Other commentators have also been highly suspicious of the independence or neutrality of the media in this regard. *See, e.g.*, Harold R. Piety, *What We Don't Know About EMF*, PUB. UTIL. FORT., Nov. 15, 1991, at 15.

150. Stoffel, *supra* note 149, at 589.

151. For example, telecommunications industry representatives often denigrate citizen concerns by referring to persons who object to the placement of towers as NIMBYs. *See, e.g.*, Hughes, *supra* note 136. David Hughes, who not incidentally happens to be the real estate administrator for the Midwest Region of the United State Cellular Corporations, claims that opponents of cell towers use "half-truths" to alarm others, and foster a "climate of anxiety" by disseminating information so that "emotion overrides reason." *Id.* at 483. Concern about RF exposure is translated as "technophobia." *Id.* at 495. Citizens who express worries are characterized as having given in to "hysteria and misinformation." *Id.* Other industry sources call critics of EMF exposure "fearmongers." Harold R. Piety, *What we Don't Know About EMF,* PUB. UTIL. FORT., Nov. 15, 1991, at 14. Harold Piety is director of an organization of investor-owned utilities, and heads the PUBLIC UTILITIES FORTNIGHTLY, an industry publication.

152. The Edison Electric Institute reported in late 1994 that electric utility companies had contributed close to $80 million for EMF research since the early 1970's. *See* Bruce W. Radford, *Enlightened on EMF*, PUBLIC UTIL. FORT., Feb. 1, 1995, at 4, 5.

To make this point more clearly, one has only to recall the example set by the tobacco industry. For years after the evidence should have been clear, industry-sponsored research purported to deny a link between tobacco smoking and health. Perhaps the clearest analysis of this phenomenon was provided by Deborah Barnes and Lisa Bero. They conducted a review of tobacco research and concluded that industry funded research was poorly designed, subject to bias, and in at least one case, involved a "dramatic" alteration of data to support the industry side. Deborah E. Barnes & Lisa A. Bero, *Industry-Funded Research and Conflict of Interest: An Analysis of Research Sponsored by the Tobacco Industry Through the Center For Indoor Air Research*, 21 J. HEALTH POL. POL'Y & L. 515, 532 (1996).

concerns about the health risks posed by RF emissions.[153]

It actually appears that valid concerns can be raised by both sides, in that there is some data which suggests that RF exposure may be more dangerous than we have previously anticipated or understood, while other data is less supportive of this position. It therefore makes sense to take a closer look at some of the studies which have fueled the debate. The studies which are described here do not generally include studies involving RF exposure at power densities or SARs higher than current legal limits.[154] The rationale behind excluding high-exposure studies is that the current legal limits were specifically promulgated with potentially adverse thermal effects in mind,[155] and that there is general agreement that the existing safety standards adequately protect the public against such exposure. For this reason, only studies of RF exposure which is non-thermal in nature are examined here.[156]

In addition, studies of power-line emissions, which are generally at

---

153. Palermo, *supra* note 135, at 255 ("In response to this community concern, the Cellular Telecommunications Industry Association launched a multi-million dollar campaign in 1993 to 'assure users of cellular technology that there is no evidence electromagnetic frequencies emitted by cellular devices cause cancer.'") (citing Jon Hilkevitch, *Cellular Plan Faces Hangups in Wilmette*, CHI. TRIB., Mar. 12, 1993, at 3)).

154. EMF radiation, as sufficient power densities, can cause thermal, or heating effects, which are adverse to biologic functions. At power densities above 10 mW/cm2d "distinct thermal effects predominate." WARSAW SYMPOSIUM, *supra* note 99 at 334.

155. Dr. John Moulder, Ph.D., a professor of radiation oncology at the Medical College of Wisconsin maintains a web site which contains an extensive discussion of the potential health effects of RF emissions. As of July 13, 1999, his website included the following excerpt from an April 30, 1999 letter to the FCC from Robert Brenner, the EPA's Acting Deputy Assistance Administrator for Air and Radiation:

> The FCC guidelines expressly take into account thermal effects of RF energy, but do not directly address postulated non-thermal effects, such as those due to chronic exposure. That is the case largely because of the paucity of scientific research on chronic, non-thermal effects. The information base on non-thermal health effects has not changed significantly since the EPA's original comments in 1993 and 1996.

Moulder, *supra* note 128.

156. Note that some of the studies do not clearly identify the power densities under consideration. For studies discussed in the following materials where neither the SAR nor power density is clearly provided in the original source, specific notations of this fact will be made.

the 50 to 60 Hz level in the U.S., are not included here.[157] The telecommunications industry has argued vigorously that such studies are inapplicable in the context of cellular and PCS facilities.[158] Because it is at least plausible that this distinction is valid, this Article focuses on research which is more clearly relevant, involving EMF exposure in the RF range. In addition, studies which focus specifically on the frequencies used by PCS and cellular systems are emphasized, although references to other studies in the RF range are also included.[159] Even with a number of studies excluded, there is a significant body of research which suggests that RF exposure may be dangerous, even at non-thermal levels.[160] It amounts to an impressive body of relevant research, which is not always accessible to the non-scientist.

---

157. Such studies are excluded because they do not necessarily prove that RF exposure at frequencies used by cellular and PCS facilities is dangerous, not because the studies do suggest that EMF exposure is safe. For example, the following studies suggest a link between exposure to RF radiation at 60 Hz or similar frequencies and a variety of adverse health effects, including leukemia (particularly acute myeloid and childhood leukemia), brain cancer, male breast cancer, skin and eye melanoma, and Alzheimer's. *See* M. Feychting, et al., *Magnetic Fields and Cancer in Children Residing Near Swedish High-Voltage Power Lines*, 138 AM. J. EPIDEMIOLOGY 467, 481 (1993); P. Guenel et al., *Incidence of cancer in Persons with Occupational Exposure to electromagnetic Fields in Denmark*, 50 BR. J. IND. MED. 758, 764 (1993); G.P. Theriault, *Health Effects of Electromagnetic Radiation on Workers: Epidemiological Studies, in* P.J. Bierbaum, et al., PROCEEDINGS OF THE SCIENTIFIC WORKSHOP ON THE HEALTH EFFECTS OF ELECTRIC AND MAGNETIC FIELDS ON WORKERS 91 (1991); MARIA FEYCHTING & ANDERS AHLBOM, INSTITUTE FOR MILJOMEDICIN, KAROLINSKA INSTITUTET, MAGNETIC FIELDS AND CANCER IN PEOPLE RESIDING NEAR SWEDISH HIGH-VOLTAGE POWER LINES (1992); S.K. Dutta et al., *Radiofrequency Radiation-Induced Calcium Ion Efflux Enhancement from Human and Other Neuroblastoma Cells in Culture,* 10 BIOELECTROMAGNETICS 197, 202 (1989); David Savitz et al., *Case-Control Study of Childhood Cancer and Exposure to 60-Hz Magnetic Fields*, 128 AM. J. EPIDEMIOLOGY 21 (1988); Nancy Wertheimer & Ed. Leeper, *Electrical Wiring Configurations and Childhood Cancer*, 109 AM. J. EPIDEMIOLOGY 273, 284 (1979).

158. *See* Hughes, *supra* note 135, at 493-94 (citing a "lack of connection between the human health effects from exposure to EMF's from electrical power lines and the human health effects from exposure to Rf from wireless towers" and arguing that the studies "are not comparable.").

159. Dr. John Moulder has explained that the "[b]iological effects of radiowaves depend on the rate of energy absorption, and within a broad range of frequencies (1 to 10,000 MHz), the frequency matters very little." Moulder, *supra* note 128.

160. *See infra* notes 161-253 and accompanying text.

There are a number of ways to organize the studies. For example, the research could be organized according to the level of RF exposure; by the type of effect observed; by the type of study; or by the date of the study. The following discussion divides the research by the type of effect observed. Thus, all of the studies suggesting a possible link to the same kind of health effects are grouped together. However, only studies which tend to show some risk are reviewed here. In many cases there are other studies involving similar exposure levels where the potentially adverse results were either not observed or not present at statistically significant levels. Nonetheless, in evaluating whether there is enough evidence to create a genuine basis for concern, it makes sense to start with the data supporting that conclusion.

One of the most troubling potential health effects of RF exposure is the risk of cancer. A number of studies suggest a possible connection between low-level RF exposure and either an increased incidence of particular cancers, or a change in cellular behaviors which are associated with cancer.[161] Among the research suggesting this type of association are a number of epidemiological studies. For example, a 1997 study from Great Britain[162] indicated an excess of adult leukemia in persons exposed to RF emissions from radio and television towers.[163] Moreover, the incidence of these conditions decreased with distance from the transmitters.[164] The study involved data gathered from 1974 to 1986.[165]

---

161. Some studies suggesting a link between RF exposure and cancers contain relatively little information, although at least some suggestion of an association between RF exposure and cancer is provided. *See* Ron Winslow, *Magnetic Fields Linked to Leukemia,* WALL ST. J., March 31, 1994, at B7. *See also* CANCER INCIDENCE IN CENSUS TRACTS WITH BROADCASTING TOWERS IN HONOLULU, STATE OF HAW. DEP'T OF HEALTH (1986); NAT'L INST. OCCUPATIONAL HEALTH, OCCUPATIONAL EXPOSURE TO ELECTROMAGNETIC FIELDS IN RELATION TO LEUKEMIA AND BRAIN TUMORS: A CASE CONTROL STUDY (1992) (studies which may involve frequencies analogous to those used by some PCS systems). In fact, one of the Environmental Protection Agency's own studies documented a link between FM radiation and leukemia. W.E. MORTON & D.S. PHILLIPS, RADIOEMISSION DENSITY AND CANCER EPIDEMIOLOGY IN THE PORTLAND METRO AREA (EPA Grant # R-805832).

162. Winslow, *supra* note 161, at 1-9.

163. *Id.*

164. *Id.*

165. *Id.*

Similarly, a 1996 report[166] examined the effect of a variety of RF exposures[167] at low intensities[168] on Polish military personnel during a period of 15 years. About 3,700 people were exposed each year and thereafter included in the subject pool. The study revealed higher morbidity rates due to "neoplasms of the alimentary tract," "brain tumours," and "malignancies of the haemopoietic system and lymphatic organs."[169] The largest differences were a morbidity rate for chronic myelocytic leukemia nearly 14 times what was expected and for acute myeloblastic leukemia more than 8 times what was expected.[170] In addition, 1995 research by an Israeli epidemiologist suggested that low-level RF exposure may be associated with cancer as well as mutations and birth defects.[171]

Whole animal studies have also suggested a possible correlation between RF exposure and cancer. One 1997 study[172] reported a 100% increase in lymphoma cancer incidence associated with RF exposures of no more than 35% of the FCC's hazard threshold. This study, however, involved mice that were genetically predisposed to cancer.[173] While human beings may be genetically predisposed towards some forms of cancer, it is not at all clear that human beings will react to RF exposure in the same manner as did these experimental animals.

A 1992 study[174] of rats exposed to 2450 MHz RF at levels sufficient

---

166. Stanislaw Szmigielski, Cancer Morbidity in Subjects Occupationally Exposed to High Frequency (Radiofrequency and Microwave) Electromagnetic Radiation, 180 SCI. TOTAL ENV'T 9, 12 (1996).

167. The research describes the exposure as being "mostly pulse-modulated RF/MWs at 150-3500 MHz." *Id.* at 12.

168. The intensity of exposure for 80 -85% of positions did not exceed 2 W/m2d (or 0.2 mW/cm2d), while some experience intensities at 2-6 W/m2d and a few experienced incidental exposure at up to 6 W/m2d. *See id.*

169. *Id.* at 9.

170. *Id.*

171. J.R. Goldsmith, Epidemiologic Evidence of Radiofrequency (microwave) effects in Military, Broadcasting, and Occupational Studies, 1 INT. J. OCCUPATIONAL ENVT'L HEALTH 47, 57 (1995).

172. Michael Repacholi, et al., *Lymphomas in Em-pim1 Transgenic Mice Exposed to Pulsed 900 MHz Electromagnetic Fields*, 147 RADIATION RES. 631 (1997).

173. *See id.*

174. C. K. Chou, et al., *Long-Term, Low-Level Microwave Irradiation of Rats,* 13 BIOELECTROMAGNETICS 469 (1992).

to induce between 0.15 W/kg to 0.4 W/kg SAR[175] revealed a "provocative" excess in primary malignancies,[176] although the authors also concluded that there were no definitive biologic effects from the exposure.[177] In 1982, a study of mice exposed to 5 mW/cm2d of RF radiation indicated that although the animals experienced no increase in body temperature, they exhibited an "acceleration in the appearance of the tumors and of lowering of the natural antineoplastic resistance."[178]

Finally, cellular studies have also suggested that RF exposure can cause changes in cellular activity which are often associated with cancer. For example, in 1997, a study presented at the Second World Congress for Electricity and Magnetism[179] indicated that exposure of human epithelial amnion cells to 960 MHz radiation had a significant impact on cell proliferation.[180] "It was found that cell growth in the exposed cells differed from that in the control and sham exposed cells and a decrease in cell growth was seen."[181] Although the abstract does not specifically detail the SARs that were studied, secondary sources suggest that the study involved an extremely low SAR, well below legal limits.[182] Similarly, at limits reported to be no higher than 63% of the FCC's hazard threshold, and at 835 MHz with certain modulation patterns, one study showed a 40% increase in ornithine decarboxylase activity.[183] These results are consistent with additional research showing that at 2% of the FCC's hazard threshold, there were significant increases in ornithine de-

175. *Id.* at 469.

176. *Id.* at 493.

177. *Id.* The authors note that the lack of a statistically significant correlation to general health, serum chemistry, longevity, lesions, etc., meant that the "single finding" of an excess of malignancies would support only a conjectural biological influence.

178. Stanislaw Szmigleiski, et al., *Accelerated Development of Spontaneous and Benzopyrene-Induced Skin Cancer in Mice Exposed to 2450-MHz Microwave Radiation*, 3 BIOELECTROMAGNETICS 179, 191 (1982).

179. S. Kwee & P. Rasmark, *The Biologic Effects of Microwave Radiation, in* PROCEEDINGS OF THE SECOND WORLD CONGRESS FOR ELECTRICITY AND MAGNETISM IN BIOLOGY AND MEDICINE 58 (1997).

180. *See id.*

181. *Id.*

182. *See* Waveguide, *Studies by Increasing Power Density* at http://wave~guide.-org/ccwti/studies.html (reporting that the Kwee study involved SARs of 0.000021 to 0.0021 W/Kg).

183. L. Penafiel et al., *Role of Modulation on the Effect of Microwaves on Ornithine Decarboxylase Activity in L929 Cells*,18 BIOELECTROMAGNETICS 132, 132 (1997).

carboxylase activity.[184] The significance of these results stems from the role which ornithine decarboxylase has in regulating normal cell growth and in potential links to an increased incidence of cancer.[185]

Another very serious health risk is the potential for an adverse impact of RF emissions on DNA. This type of effect has also been observed in a number of studies, some of which are quite recent. For example, in 1998, a group of researchers examined the effect of low level RF exposure at cellular telephone frequencies on Molt-4 cells.[186] The SARs were considerably below the legal thresholds set by the FCC.[187] The study showed that the exposure of cells to the various signals had a significant effect on the rate of DNA damage which was highly specific to the frequency, the exposure levels and time of exposure.[188] Under some conditions the damage increased and under others it decreased.[189] The researchers could not explain these results, except to suggest that cells react to RF exposure in very complex ways.

A 1995 study of rat brain cells[190] indicated that exposure to 2450

---

184. This study also found that exposures to RF emissions at this level produced significant decreases in the rate at which cell interiors were able to discharge putrescine. This, in turn, affects normal cellular activity, particularly repair functions. *See* C. Byus and L. Hawell III, *Additional Considerations About the Bioeffects of Mobile Communications, in* MOBILE COMMUNICATIONS SAFETY, 133, 145 (N. Kuster, et al. eds., 1997).

185. *See id.*

186. Jerry L. Phillips et al., *DNA Damage in Molt-4 T-Lymphoblastoid Cells Exposed to Cellular Telephone Radiofrequency in Vitro,* 45 BIOELECTROCHEMISTRY & BIOENERGETICS 103, 103 (1998). The study evaluated the impact of 813.5625 MHz and 836.55 MHz signals. *Id.* The SARs averaged 2.4 and 24 microWatts per gram for the 813.5625 frequency and 2.6 and 26 microWatts per gram for the 836.55 frequency. *Id.*

187. *See supra* Part II.A for a discussion of current legal standards.

188. The study concludes that exposure of the cells to "two different RF signals under athermal conditions altered the amount of DNA single-strand breaks." Phillips, *supra* note 186, at 109. However, the experimenters were very careful to point out that their study did not provide enough information to enable the researchers to understand the underlying mechanisms for the changes. *Id.*

189. It is interesting to note that these observable impacts were reported even though the research was specifically supported by Motorola, a very significant player in the telecommunications industry. *Id.* at 109.

190. Henry Lai & Narendra P. Singh, *Acute Low-Intensity Microwave Exposure Increases DNA Single-Strand Breaks in Rat-Brain Cells*, 16 BIOELECTROMAGNETICS 207 (1995).

MHz pulsed waves at average power densities of 1 or 2 mW/cm2d[191] for two hours resulted in increases in DNA single-strand breaks.[192] This was reported as being consistent with earlier Chinese research showing that acute (i.e. 15 to 60 minute) exposure to 7.7 GHz microwaves at 0.5mW/cm2d "caused higher incidence of chromosome aberrations in Chinese hamster fibroblasts."[193]

Further, an Israeli epidemiologist suggested in 1995 that low-level RF exposure is generally associated with mutations and birth defects.[194] As early as 1978, there were reports of fetal anomalies were associated with RF exposure at 50% of the applicable power density standards.[195]

Other studies have assessed the potential impact of RF exposure on behavior or various mental functions. For example, a 1996 study[196] involved school children exposed to a Latvian radar station operating at frequencies of 154 to 162 MHz. The radar station had been in operation for 25 years, and the report studied 966 children who lived with chronic RF exposure from this source.[197] In general, the study concluded that "children living in front of the [station] have less developed memory and attention, slower reaction times and decreased endurance of neuromuscular apparatus" than children who did not live in front of the station.[198] The children performed even more poorly when compared with control subjects who did not live anywhere in proximity to the facility.[199] No other environmental explanation for the difference could be found, but the researchers cautiously refused to rule out the possibility of some other causal factor or factors.

---

191. The study reports that this created a whole-body SAR in the animals of between 0.6 and 1.2 W/kg. *Id.* at 208.

192. *Id.* at 209.

193. *Id.* (citing V. Garaj-Vrhovac at al., *The Relationship Between Colony-Forming Ability, Chromosome Aberrations and Incidence of Micronuclei in V79 Chinese Hamster Cells Exposed to Microwave Radiation*, 263 MUTAT. RES. 143 (1991)).

194. Goldsmith, *supra* note 171.

195. Ezra Berman, et al., *Observations of Mouse Fetuses After Irradiation with 2.45 GHz Microwaves*, 35 HEALTH PHYSICS, 791, 791 (1978).

196. A.A. Kolodynski & V. V. Kodynska, *Motor and Psychological Functions of School Children Living in the Area of Skrunda Radio Location Station in Latvia*, 180 THE SCI. TOTAL ENV'T 87, 87 (1996).

197. *Id.* at 87.

198. *Id.* at 91.

199. *Id.*

Another 1996 study[200] of human exposure to a very low density RF field[201] at 900 MHz[202] showed a significant decrease in the percentage of REM sleep.[203] These researchers also reported a qualitative difference in REM sleep of the test subjects.[204]

A 1989 Chinese study[205] tested more than a thousand individuals who had been exposed to RF radiation from radio antennae and radar installations.[206] Human beings exposed to RF radiation at levels above 10 microWatts per centimeter squared scored lower in memory function.[207] In addition, exposure to this level of RF emissions also impaired white blood cell (WBC) phagocytosis while exposure to levels under 4 microWatts per centimeter squared actually had significantly increased WBC phagocytosis.[208] While the exact meaning of the experimental data is uncertain, the researchers concluded that "chronic exposure to EMFs are associated with significant changes in some physiological parameters."[209]

In 1994, the Los Angeles Times reported an unpublished study conducted by Dr. Eugene Sobel indicating that people with high occupational EMF exposure are at least three times as likely to develop Alz-

---

200. Klaus Mann and Joachim Roschke, *Effects of Pulsed High-Frequency Electromagnetic Fields on Human Sleep*, 33 NEUROPSYCHOBIOLOGY 41(1996).

201. The studied power density was 0.05 mW/cm2d, a level which the report noted "is below the permissible limit by a factor of about 20." *Id.* at 42.

202. The experiment involved the placement of a digital mobile radio phone from Motorola 40 cm from the subject's head. *Id.* at 42.

203. REM stands for Rapid Eye Movement, a type of sleep generally regarded as essential for psychological health. ENCYLCOPEDIA OF MENTAL HEALTH 511 (Howard S. Friedman, ed. 1998).

204. *Id.* at 44.

205. H. Chiang et al., *Health Effects of Environmental Electromagnetic Fields*, 8 J. OF BIOELECTRICITY 127 (1989).

206. No specific mention of the wave frequency is given in this study, and it is reported here only because one of the primary criticisms of RF research is that we do not generally know if the data can be extrapolated to human beings. Here, the experimental subjects were human and the exposure was at low levels.

207. Chiang, *supra* note 205, at 129.

208. *Id.*

209. *Id.* at 131.

heimer's disease as those without significant exposure.[210]

Some animal studies also suggest that behavioral changes may accompany even low levels of RF exposure. For example, a 1977 study showed behavioral disruption and anomalies of the cortex at exposure levels reported to be 58% of the FCC's power density standards.[211]

There are also studies purporting to demonstrate a link between RF exposure and a variety of health impacts which are not easily classified. Some of these studies involved assessment of general indicators of health or a variety of specific factors. For example, a very recent study involved real-world observation of mice near an actual antenna-park in Greece.[212] The mice were subjected to RF levels which were "very low and well below the ... IEEE relevant standards,"[213] although the researchers did note that they are higher than those which are likely to be observed in U.S. residential areas.[214] The study showed a progressive decrease in the size of litters, and the male animals' physiological condition also deteriorated over time.[215] Ultimately, the researchers observed that "there is evidence that chronic exposure to low-intensity RF radiation may be associated with health effects ...."[216] While the article does not detail the frequencies of RF radiation to which the animals were exposed, the fact that the emissions came from a large antenna park probably means the animals would have been exposed to multiple wavelengths, and the researchers do report that they measured RF from 80 to 900 MHz.[217] The researchers also specifically cited earlier research

---

210. Thomas H. Maugh, *Studies Link EMF Exposure to Higher Risk of Alzheimer's*, L.A. TIMES, July 31, 1994, at A36.

211. Walter G. Switzer and Daniel S. Mitchell, *Long Term Effects of 2.45 GHz Radiation on the Ultrastructure of the Cerebral Cortex and on the Hematologic Profiles of Rats*, 12 RADIO SCI., 287, 288 (1977).

212. Ioannis N. Magras & Thomas D. Xenos, *RF Radiation-Induced Changes in the Prenatal Development of Mice,* 18 BIOELECTROMAGNETICS 455 (1997).

213. *Id.* at 459.

214. *Id.* at 457. The maximum RF level for the experiment was measured at 1.053 microWatts/cm2d, with lower exposures of 168 nanoWatts/cm2d also being tested. *Id.*

215. *Id.* at 459.

216. *Id.* at 460 (citing Leif G. Salford et al., *Development of Rat Brain Tumours during Exposure to Continuous and Pulsed 915 MHz Electromagnetic Radiation*, FIRST WORLD CONGRESS FOR ELECTRICITY IN BIOLOGY AND MEDICINE (1992) (meeting abstract)).

217. Magras and Xenos, *supra* note 212, at 457.

dealing with the 915 MHz frequency as being relevant to their investigation.[218]

There have also been studies showing a variety of physiological responses in the brains of rodents exposed to RF at levels reported to be no more than 0.15 to 0.25% of currently legal exposure limits for human beings.[219] As far back as 1973, studies from the former Soviet Union showed changes in the brain activity of experimental animals. At the Warsaw Symposium,[220] Soviet researchers reported[221] that even very low power densities[222] of high frequency microwaves[223] could have a profound impact on experimental animals. The reported data showed significant changes in the brain cortexes of exposed rabbits, even at very low power densities;[224] changes in the metabolic processes in rats, also at extremely low power levels;[225] and a variety of other physiological changes.[226]

---

218. *Id.*

219. *See* V.S. Belokrinitskiy, *Destructive and Reparative Processes in Hippocampus with Long Term Exposure to Nonionizing Radiation,* in EFFECTS OF NONIONIZING ELECTROMAGNETIC RADIATION 15-20 (1982) (reporting changes in the structure of the brain at 0.15% of the IEEE exposure limits); K. Oscar et al., *Microwave Alteration of the Blood-Brain-Barrier System of Rats,* 126 BRAIN RES., 281, 289 (1977) (reporting a variety of negative impacts on the brain at exposure levels equal to 0.25% of the IEEE maximums).

220. *See* J.D. Dumanskij and M.G. Sandala, *The Biologic Action and Hygenic Significance of Electromagnetic fields of Superhigh and Ultrahigh Frequencies in Densely Populated Areas, in* WARSAW SYMPOSIUM, *supra* note 99, at 289.

221. *See id.*

222. The power densities under consideration ranged from 10 to 0.0006 microWatts/cm2d. *See id.*

223. The wavelengths studied ranged from 3 centimeters to 6 meters, which translate to a range of a few GHz for the 3 cm wavelength and a frequency of around 180 MHz for the 6 meter wavelength. *See id.*

224. *Id.* at 290, Table 1.

225. *Id.* at 291, Table 2.

226. *Id.* at 292 (describing increased weight in adrenals, reduction in ascorbic acid content, and increased secretion of 17-ketosteroids in the urine of experimental animals). *See also* P. Czerski et al., *Influence of Microwave Radiation on the Hematopoietic System, in* WARSAW SYMPOSIUM, *supra* note 99, at 67, 67 (rabbits exposed to power density of 3 mW/cm2d at 2450 MHz showed "easily demonstrable and easily quantified microwave effects on the lymphocyte and the lymphocytic system.").

A variety of studies involving broad ranges of RF exposure were also reported at the Warsaw Symposium.[227] One of the Soviet studies assessed the health of workers "engaged in the regulation, tuning and testing of diverse radio-equipment emitting radiation in the microwave range."[228] This study indicated that prolonged, very low-intensity[229] exposure to microwaves led to changes in "the functions of the nervous, cardiovascular and other systems."[230] A study from Czechoslovakia[231] evaluated workers who had been exposed at a number of different frequencies, including 300 to 800 MHz.[232] This research showed "significant clinical and electrobiologic changes in exposed persons as compared with controls."[233] In particular, workers in the 30 to 800 MHz range showed elevated serum protein and cholesterol levels.[234] A Polish study[235] found that workers exposed to microwaves at a power density of between 0.1 and 1 mW/cm2d over periods of 1 to 15 years experienced significantly increased problems with lens translucency.[236] While these studies can all be easily criticized because they do not clearly delineate the frequency of RF radiation to which the workers were exposed, it is also true that most RF exposure in the real world will be in a range of frequencies at a combination of densities.[237]

Finally, some studies show an impact on specific cellular functions which are related to biologic systems in ways which are not fully understood or documented. Such evidence does, however, indicate that RF exposure has a potential impact on biologic systems.

---

227. WARSAW SYMPOSIUM, *supra* note 99.

228. M.N. Sadcikova, *Clinical Manifestations of Reactions to Microwave Irradiation in Various Occupational Groups*, WARSAW SYMPOSIUM, *supra* note 99, at 261-67.

229. Workers, "as a rule" were exposed to intensities which "did not exceed several hundredths of a mW/cm2d." *Id.* at 262.

230. *Id.* at 261.

231. E. Klimkova-Deutschova, *Neurologic Findings in Persons Exposed to Microwaves, in* WARSAW SYMPOSIUM, *supra* note 99, at 268.

232. *Id.* at 269.

233. *Id.* at 268.

234. *Id.* at 270.

235. S. Zydecki, *Assessment of Lens Translucency in Juveniles, Microwave Workers and Age-Matched Groups, in* WARSAW SYMPOSIUM, *supra* note 99, at 306.

236. *Id.* at 307.

237. Human beings typically live with significant ambient levels of a wide variety of EMF radiation.

For example, a 1996 study[238] indicated that male mice exposed to very low levels[239] of 2450 MHz radiation experienced an elevated spleen-index and higher levels of antibody-producing cells.[240] How this data would translate to a human health impact is not certain.

A 1993 Swedish study[241] evaluated the effect of RF exposure at 915 MHz on the blood-brain barrier in rats.[242] The SARs for the animals ranged from 3.3 W/kg to .33 W/kg.[243] The brains of the experimental animals showed significantly increased albumin leakage, suggesting that the RF emissions were able to open the barrier.[244] The researchers concluded that their data showed "a non-thermic type of interaction with the electromagnetic field" which "demands" further investigation.[245]

Similarly, a 1992 study[246] indicated that exposure to 915 MHz fields had a highly exposure-dependent effect on cellular activity. In this study, exposures at SARs of 0.05 W/kg and 0.02 W/kg resulted in significant increases in acetylcholinesterase (AChE) activity while exposures at 0.01 W/kg resulted in AChE activity being significantly impaired.[247] An earlier study by the same researchers showed that such ex-

---

238. Erzsebet Elekes et al., *Effect on the Immune System of Mice Exposed Chronically to 50 Hz Amplitude-Modulated 2.45 GHz Microwaves*, 17 BIOELECTROMAGNETICS 246, 246 (1996).

239. The power density of the exposure in this study was 0.1 mW/cm2d. *Id.* at 246.

240. The study did not reveal similar effects on female mice. *Id.* at 247.

241. Leif G. Salford et al., *Permeability of the Blood-Brain Barrier induced by 915 MHz Electromagnetic Radiation, Continuous Wave and Modulated at 8, 16, 50 and 200 Hz*, 30 BIOELECTROCHEMISTRY AND BIOENERGETICS 293, 293 (1993).

242. The blood-brain barrier is "a selectively permeable hydrophobic barrier" which serves to protect the normal brain from potentially harmful compounds in the blood.

243. *Id.* at 297, Fig. 1 and accompanying notes.

244. *Id.* at 293.

245. *Id.* at 300.

246. S.K. Dutta et al., *Dose Dependence of Acetylcholinesterase Activity in Neuroblastoma Cells exposed to Modulated Radio-Frequency Electromagnetic Radiation*, 13 BIOELECTROMAGNETICS 317 (1992).

247. *Id.*

posures had a similar impact on calcium release.[248] These studies are particularly significant because of the non-linear nature of the cellular response,[249] which makes it difficult to establish safe exposure levels without extensive testing at all sorts of power densities.

Another 1992 study[250] examined the potential for RF exposure to interact with ophthalmic drugs in non-human primates. In this study, monkeys whose eyes were treated with timolol, a specific ophthalmic drug,[251] were 10 times more sensitive to RF exposure. Although untreated eyes showed an ocular effect at 10 mW/cm2d, pretreated eyes showed induced corneal endothelial lesions and increased vascular permeability of the iris at 1 mW/cm2d of RF exposure, or an average SAR of 0.26 W/kg.[252] The researchers conclude that "with timolol pretreatment, a microwave-ocular damage threshold lies between 0.2 and 1 mW/cm2d (SAR of 0.05 to 0.26 W/kg)."[253]

Regrettably, scientists do not agree on the proper interpretation of studies such as these. The response of Dr. Michael Repacholi, who is associated with the World Health Organization, is somewhat typical. In 1997, he collected and reviewed a variety of studies dealing with RF exposure and cancer.[254] He collected laboratory studies involving live animals and cell cultures, as well as epidemiological data. He concluded

---

248. S.K. Dutta et al., *Radiofrequency Radiation-Induced Calcium Ion Efflux Enhancement from Human and other Neuroblastoma Cells in Culture*, 10 BIOELECTROMAGNETICS 197, 197-98 (1989).

249. A non-linear response means that safety models based on extrapolations down from proven harmful levels, which may be perfectly appropriate when evaluating exposure to chemical toxins, may not be appropriate when evaluating the safety of RF exposure. These studies, which cannot be readily explained by any known model, also make it quite clear that we simply do not understand the way that RF radiation interacts with biological systems.

250. Henry A. Kues, et al., *Increased Sensitivity of the Non-human Primate Eye to Microwave Radiation Following Ophthalmic Drug Pretreatment*, 13 BIOELECTROMAGNETICS 379 (1992).

251. *Id.* at 379. The study originally tested exposure to two drugs: timolol maleate and Pilocarpine. However, when results came back indicating a significantly reduced exposure threshold, the researchers attempted to discover how much the drugs actually reduced the safety thresholds. The expanded study continued only with timolol. Pilocarpine was only tested at the higher exposures.

252. *Id.* The frequency range of this experiment was 2450 MHz.

253. *Id.* at 385.

254. Repacholi, *supra* note 99, at 1565.

that the "evidence falls short of the strength and consistency of evidence that is required to come to a reasonable conclusion that RF emissions are a likely cause of one or more types of human cancer."[255]

In reaching this conclusion, Dr. Repacholi acknowledged that there were a number of studies which were at least suggestive of a possible link between low level RF exposure and adverse health impacts. For example, among the results which he reported was a mouse study showing a genomic rearrangement in the brain and tests cells of mice exposed to 2450 MHz fields at an SAR of 1.18 SAR for 2 hours per day.[256] However, he ultimately considered these results to be insufficient because the study had not yet been replicated.[257] He also cited a number of reports suggesting that "RF fields may be capable of affecting ion fluxes" in human blood cells,[258] may cause athermal effects on gross transcription by glioma cells,[259] and may result in increased activity of the enzyme ornithine decarboxylase,[260] "levels of which are often elevated during cell growth and tumor promotion."[261] He questioned the relevance of these studies because changes in enzyme production and other cell behavior do not necessarily translate to increased incidence of cancer,[262] and because he believed that certain of the cells studied may have had an atypical response to RF exposure.

Dr. Repacholi's final assessment was that the evidence is "suggestive but not substantive. The few studies conducted to date are sufficiently

---

255. *Id.*

256. *Id.* at 1566 (citing S. Sarker et al., *Effect of Low Power Microwave on the Mouse Genome: A Direct DNA Analysis*, 320 MUTAT. RES. 141 (1994)).

257. Repacholi, *supra* note 99, at 1566.

258. *Id.* (citing J.W. Allis, *Temperature-Specific Inhibition of Human Red Cell NA+/K+ATPase by 2450 MHz Microwave Radiation*, 8 BIOELECTROMAGNETICS 203 (1987); D.S. Liu, *Activation of Na+ and K+ Pumping Modes of Na,K0-ATPase by an Oscillating Electric Fields*, 265 J. BIOL. CHEM. 7260 (1990)).

259. Repacholi, *supra* note 99, at 1566 (citing S.F. Cleary, et al., *Glioma proliferation Modulated in Vitro by Isothermal Radiofrequency Radiation Exposure* 121 RADIAT. RES. 38-45 (1990)).

260. Repacholi, *supra* note 99, at 1566 (citing L.M. Penafield et al., *Role of Modulation on the Effect of Microwaves on Ornithine Decarboxylase Activity in L929 Cells*, 18 BIOELECTROMAGNETICS 132 (1997)).

261. Repacholi, *supra* note 99, at 1566.

262. *Id.*

indicative to merit further investigation."[263] This conclusion is completely defensible, so long as one starts from the premise that exposure is safe unless proven harmful. Such a premise may make sense in some contexts, but the presumption of harmlessness in the face of significant indications of potential problems can also lead to significant human suffering.[264] It is therefore not surprising that other commentators have reached precisely the opposite conclusion: that low level RF exposure has not been shown to be safe, and we should therefore proceed very cautiously with the proliferation of these technologies.

The lack of consensus has not gone unnoticed in the legal literature. One law review article states: "The potential health effects of electrical and magnetic fields (EMFs) have been a cause for debate since the 1960's. It is still difficult to predict what effect, if any, such fields have on the overall health of an organism."[265] Another legal commentator has explained that while exposure to low levels of EMF "was once believed to be harmless," "[t]hat view is no longer the consensus among experts, especially among epidemiologists."[266]

In 1995, the National Council on Radiation Protection surveyed a number of scientific studies and reports, and concluded that: "Although incomplete, available epidemiological and laboratory data share certain consistencies that would link extremely low frequency environmental EMFs (ELFs) with increased health risks."[267] Moreover, even though ANSI/IEEE had promulgated guidelines for RF exposure, the report also notes that these "guidelines proceed on the basis that adverse human health effects from exposure to ELF electric fields . . . have not been established," and so "it is apparent that they are not intended to provide protection against any adverse health effects that may be caused by such

263. *Id.* at 1567.

264. *See infra* notes 353-360 and accompanying text.

265. John F. Cahill, *An Introduction to the Indoor Pollution Problem,* 40 PRAC. LAW. 27, 50 (1994). Cahill reported that even when he was writing his article, "[n]umerous studies have associated exposure to elevated EMF levels with a variety of illness including birth defects, miscarriage, and central nervous system illness. Several well publicized studies have linked EMF exposure with certain forms of cancer, including childhood leukemia." *Id.* at 51.

266. Rufus Young et al., *1996 Update: Electromagnetic Fields and their Land Use Implications, in* SB06 ALI-ABA 393 (August 15, 1996).

267. NCRP Scientific Committee 89-3, *Draft Report on Extremely Low Frequency Electric and Magnetic Fields, at* http://www.microwavenews.com/ncrp1.html [hereinafter *Draft Report*].

exposure, and *they would not do so.*"[268]

C. *The Relationship Between The Scientific Data and Current Exposure Levels as Promulgated by the FCC*

It seems clear that existing studies fall short of providing a conclusive demonstration of a cause-and-effect relationship between adverse health effects and RF exposure, at any frequency or level involving power densities where thermal effects are not a consideration.[269] However, the data does suggest that something is going on—something that we do not fully understand and something that the FCC has refused to consider in setting its safety standards.[270] Therefore, a legitimate basis for concern exists, notwithstanding the presumption that exposure is perfectly safe until harmful effects have been proven.

On the other hand, ANSI and IEEE promulgate standards only once specific risks have been conclusively demonstrated, and existing standards are based on the fact that the only *known* adverse effects from RF exposure are thermal in nature. Because non-thermal health risks have not yet been conclusively established, the 1992 ANSI/IEEE standards do not even *attempt* to set levels at which such adverse effects will not occur.[271] In essence, by adopting these standards as its own, the FCC has also started with the proposition that health effects have not been clearly established, and therefore need not be protected against.[272]

In addition to the fact that our current RF safety standards assume that RF exposure is safe when we simply do not yet know whether this is the case, there are several other criticisms that have been made about the standards. For example, some commentators have claimed that not all of the IEEE 1991 standards were developed with sufficient scientific

---

268. *Id.* (emphasis added).

269. The FCC, for example, has said that this type of data suggesting a link between RF exposure and non-thermal effects is "controversial," and that it would be impracticable for the FCC to promulgate standards based on these effects. *See* Procedures, *supra* note 100, at ¶ 31.

270. *Id.*

271. *See supra* note 267.

272. *See Draft Report, supra* note 267.

rigor.[273] Some of these criticisms have been confirmed by various participants in the process by the which the IEEE adopted these standards.[274] Significantly, two of the three balloting committee members from federal health agencies who voted to reject the IEEE 1991 standards gave the reasons that the standards or process: (i) were "not balanced in representing government, industry, and the general public"; (ii) lacked "agency review and comment" of the draft recommendations; (iii) had "very weak justifications" for exposure increases; and (iv) "brushed aside" important papers showing "pulsed microwaves may give responses at lower average levels than continuous waves."[275] In addition, claims that the IEEE 1991 limits are "safe for all," have been objected to by representatives from the EPA, the NIOSH, and the FDA.[276] Finally, it is clear that the IEEE set its exposure limits in disregard of at least some studies showing potential adverse effects at exposure levels lower than the thresholds adopted as safety standards which were available prior to the adoption of the IEEE standards.[277]

With regard to the contention that the ANSI/IEEE standards repre-

---

273. *Biological Effects of Nonionizing Electromagnetic Radiation (BENER, reprinted in* BIOLOGICAL EFFECTS OF ELECTROPOLLUTION 188 (S.Dutta and R. Millis eds., 1986). This criticism was reported in the Petition for Reconsideration filed before the Federal Communications Commission in Guidelines, *supra* note 51, at 5 [hereinafter Petition].

274. *See* Note of Dr. Mays Swicord, FDA Center For Device and Radiological Health, member of the balloting committee for IEEE C95.1-1991, (April 1991) (which he attaches to his ballot and in which explains why he voted against this standard). *See also* note of Dr. M. Altman (FDA) (April 1991) (concurring with Dr. Swicord) (cited in *Petition for Reconsideration,* 5 and n.13).

275. *See supra* note 274; *see also IEEE ballot committee SCC-28 results on project C95.1,* May 14, 1991 (discussed in *Petition for Reconsideration,* 5 & n.19).

276. The Environmental Protection Agency comments appear in a letter from Margo Oge of the Environmental Protection Agency to the Federal Communications Commission, dated November 9, 1993; the NIOSH comments appear in a letter from R. W. Niemier of the National Institute of Occupational Safety and Health (NIOSH) to the FCC, dated November 1, 1993; and the FDA comments are contained in a letter from L.J.Gill of the Food and Drug Administration, Center for Device and Radiological Health, to the FCC, dated November 10, 1993. Each of these letters [hereinafter *Ex Parte Comments*] is discussed in the Petition for Reconsideration filed before the Federal Communications Commission in Guidelines, *supra* note 51. The EPA criticisms appear in the *Ex Parte Comments* § 4.1 - 4.3; the NIOSH comments are discussed at § 4.4.1; the FDA comments appear at § 4.4.2.

277. Several of the studies described were conducted prior to 1992, when the standards were voted on and adopted.

sent a consensus, there is in fact very substantial disagreement about the adequacy of these guidelines in protecting against non-thermal effects. Among those with varying levels of concern are representatives of federal agencies more typically charged with protecting human health. For example, as early as 1993, some of the EPA's representatives questioned whether the standards adequately protected public health.[278] This concern stemmed from the fact that the hazard standards were designed only to protect against thermal effects of the radiation rather than other possible adverse effects. In connection with this criticism, the EPA expressly commented on studies purporting to show a link between RF radiation and cancer.[279] Similarly, Dr. G.P. Schulte of NIOSH complained that the FCC's exposure standards are based on preventing "adverse health effects from body heating."[280] The FDA told the FCC in 1993 that "it is unclear what types of biological effects and exposure conditions are addressed by the standard."[281] The FDA criticized the standards because so few research studies of long-term, low-level exposures of RF were included in the scientific rationale for the standards, despite the existence of studies that did suggest an association between chronic low level exposure and adverse health effects such as the acceleration of cancer. The FDA has also suggested that new studies have been published since the standards were promulgated which strengthen this concern.[282] In addition, the FDA has criticized the lack of available research and evidence concerning human response to long term RF exposure.[283]

This evidence would seem to provide a reasonable basis for concern on the part of citizens worried about whether the FCC "safety" standards are sufficient to protect them from potentially adverse effects of exposure to RF radiation. As summarized by two researchers, "[t]here are persistent indications . . . that these [electromagnetic] fields have biologic activity, and consequently, there may be a deleterious component to their

278. *Ex Parte Comments, supra* note 276, at § 4.1.

279. *Id.*

280. *Ex Parte Comments, supra* note 276, at §4.4.1.

281. *Id.* at §4.4.2 (quoting letter from L.J. Gill, FDA, Center for Device and Radiological Health, to the FCC, dated November 10, 1993 (regarding ET Docket 93-62)).

282. *Id.*

283. *Id.* at § 4.4.2.

action, possibly in the presence of other factors."[284] It is true that the data is inconsistent, inconclusive, and difficult to interpret. However, the bottom line is that there is a plethora of evidence suggesting an association between long-term, low-level RF exposure and a variety of potentially adverse health effects. The fact that some scientists have concluded that "the data cannot be considered sufficient to recommend a threshold for human tolerance" of chronic low-level RF emissions[285] means only that we do not know for certain whether RF exposure is safe, or even what level of protection is appropriate.

Why, then, is the FCC, which has long denied any expertise in environmental or human safety issues, the appropriate agency to set standards for RF emissions from cellular and PCS facilities across the country, and why should compliance with these standards be enough to prevent state and local governments from considering safety and health risks from RF emissions in making facilities placement decisions?

III. THE NEED FOR STATE AND LOCAL GOVERNMENT INVOLVEMENT

A. *State's Rights and the Need for Federal Preemption*

It seems quite clear that Congress possesses the Constitutional authority to preempt state and local regulation over the placement of cellular and PCS facilities based on the effects of RF emissions from those facilities. The Supremacy Clause of the Constitution[286] grants the federal government broad authority to preempt state laws as reasonably necessary to achieve legitimate federal purposes. Case law clearly supports this proposition.[287]

---

284. T. E. Aldritch & C. E. Easterly, *Electromagnetic Fields and Public Health*, 75 ENVTL. HEALTH PERSPECTIVES 159, 159 (1987).

285. R. P. Blackwell & R. D. Saunders, *The Effects of Low-Level Radiofrequency and Microwave Radiation on Brain Tissue and Animal Behavior*, 50 INT'L J. RADIATION, BIOLOGY, RELATED STUD., PHYSICS, CHEMISTRY & MEDICINE 761, 770 (1986).

286. "The laws of the United States which shall be made in Pursuance thereof... shall be the Supreme law of the land." U.S. CONST. art. VI, § 1, cl. 2.

287. *See* Louisiana Pub. Serv. Comm'n v. FCC, 476 U.S. 355, 368 (1986). The Court stated:

> Preemption occurs when Congress in enacting a federal statute expresses a clear intent to preempt state law, Jones v. Rath Packing Co., 430 U.S. 519, 525 (1977), when there is an outright or actual conflict between federal and state law, e.g., Free v. Bland, 369 U.S. 663, 669

In the telecommunications arena, the Communications Act of 1934 states that the FCC's subject matter jurisdiction includes "all instrumentalities, facilities, apparatus and services ... incidental to [interstate] transmission" by wire.[288] When facilities used for interstate and local communications overlap, state regulation must give way to federal rules.[289]

In *Louisiana Public Service Commission v. FCC*,[290] the U.S. Supreme Court held that the FCC may preempt state regulation of an intrastate matter when: (1) the matter has interstate aspects that cannot be separated from any intrastate components of the asserted FCC regulation;[291] (2) preemption is necessary to protect a valid federal regulatory objective;[292] and (3) state regulation would prevent the FCC from properly exercising lawful authority.[293] Under these rules, the FCC might have had considerable difficulty in proving a need to preempt state and local authority to make siting decisions based on the health effects of RF emissions. However, the enactment of the Telecom Act made it unnecessary for the FCC to exercise any such preemptory authority, since

---

(1962), where compliance with both federal and state law is in effect physically impossible, Florida Lime & Avocado Growers, Inc. v. Paul, 373 U.S. 132, 142-43 (1963), where there is implicit in federal law a barrier to state regulation, Shaw v. Delta Air Lines, Inc., 463 U.S. 85, 94 (1983), where Congress has legislated comprehensively, thus occupying an entire field of regulation and leaving no room for the States to supplement federal law, Rice v. Santa Fe Elevator, 331 U.S. 218, 230 (1947), or where the state law stands as an obstacle to the accomplishments and execution of the full objectives of Congress. Hines v. Davidowitz, 312 U.S. 52, 67 (1941).

288. *See* North Carolina Util. Comm'n v. FCC, 552 F.2d 1036, 1046 (1977).

289. *Id.* at 1049.

290. 476 U.S. 355, 375 n4.

291. *See, e.g.*, Public Serv. Comm'n of Md. v. FCC, 909 F.2d 1510 (D.C. Cir. 1990); *see also* Illinois Bell Tel. Co. v. FCC, 883 F.2d 104, 131-33 (D.C. Cir. 1989); California v. FCC, 905 F.2d 1217, 1243 (9th Cir. 1990). The FCC must show that its order is narrowly tailored to preempt only those state regulations which would negate valid FCC regulatory goals.

292. *E.g.*, NARUC v. FCC, 880 F.2d 422, 431 (DC Cir. 1989).

293. *Id. See also* Public Util. Comm'n of Tex. v. FCC, 886 F.2d 1325, 1331- 33 (D.C. Cir. 1989); California v. FCC, 905 F.2d 1217, 1243 (9th Cir. 1990).

Congress itself declared the necessity for such preemption.[294]

The public interest allegedly served by this choice is the proliferation of telecommunications services. As Congress has declared, "[i]t shall be the policy of the United States to encourage the provision of new technologies and services to the public."[295] Given the potential benefits of these technologies, this appears to be a viable federal interest, and Congress clearly decided to exercise its preemptive authority over state and local regulation of cellular towers, to the extent that such regulation might be based on the effects of RF emissions. Thus, while there may be issues as to how broadly to interpret this federal preemption,[296] the real question is whether this is a wise use of Congressional authority. In order to answer this question it is imperative that federal interests be weighed against competing state and local concerns.

What are the federal interests involved? One could say that there is a federal interest in protecting the health and safety of private citizens, and in fact the FCC, in its Report and Order adopting new guidelines for RF exposure, specifically observed that "[w]e believe that the regulations we are adopting herein represent the best scientific thought and are sufficient to protect the public health."[297] However, this provides no basis for federal preemption of more stringent safety and health regulations.

Rather, the federal interest in preemption most obviously lies in a desire to promote cellular, PCS and other wireless services. As stated by FCC Chairman William Kennard: "[T]he overarching goal should be—first and foremost—doing everything we can to foster an environment wherein wireless can become a full-fledged substitute for wireline service."[298] The assumption that the primary federal goal is to support and promote the wireless industry is borne out by a consideration of recent pronouncements from the FCC on the subject. In testimony before a House Subcommittee, FCC Chairman William Kennard stated that the "imperative" mission of the FCC is "to promote the widest deployment

294. 47 U.S.C. § 332(c)(7)(B)(iv) (Supp. IV 1998).

295. 47 U.S.C. § 157(a) (Supp. II 1996).

296. *See supra* Part I.B.

297. Guidelines, *supra* note 51, at 168.

298. *A Year into Office, Kennard Hard to Label,* RCR RADIO COMM. REP., Sept. 21, 1998, at 1.

of communications services."[299] This was immediately followed by the adoption of "several measures. . .to enable competitive providers of advanced services . . . to deploy new technologies on a faster, more cost-effective basis to consumers."[300] The FCC order, which was announced the day after Chairman Kennard's testimony, was "intended to create marketplace conditions conducive to nationwide deployment of advanced telecommunications services . . . ."[301]

In his most recent remarks, Chairman Kennard continues to be an advocate for industry.[302] In testimony before the Senate Commerce Committee in late May of 1999, he credited the Telecom Act and actions of the FCC with "putting into place conditions that allowed the unprecedented economic growth . . . [which is] in large part due to the thriving telecommunications industry."[303] He credited the FCC with having taken "definitive steps to make sure that this growth continues."[304] In fact, as of July 1999, the official FCC homepage includes a greeting from Chairman Kennard which states the goals of the FCC as follows:

> [W]e must ensure that the tools of the Information Age reach all Americans from the business districts to the barrio; from those which every advantage to those with

299. Testimony of William Kennard, FCC Chairman, before the House Subcommittee on Telecommunications, Trade and Consumer Protection on Reauthorization of the FCC, on March 17, 1999. *See also*, William E. Kennard, *A New Federal Communications Commission for the 21st Century, at* http://www.fcc.gov/Reports/fcc21.html; *Chairman Kennard Calls for Change, But Not Chaos, in Outlining FCC's Pro-Consumer, Pro-Competition Agenda at House Reauthorization Hearing,* FCC NEWS, Mar. 17, 1999, *at* http://www.fcc.gov/Bureaus/Miscellaneous/News_Releases/1999/nrmc9011.html.

300. *See FCC Adopts Rules to Promote Deployment of Advanced Telecommunications Services*, FCC NEWS, Mar. 18, 1999, *at* http://www.fcc.gov/Bureaus/Common_Carrier/News_Releases/1999/nrcc9019.html.

301. *Id.*

302. This is perfectly consistent with a long-standing tendency for FCC chairmen to regularly "use their position of authority to make pronouncement about policy objectives . . . ." Stuart N. Brotman, *Communications Policy-Making at the FCC: Past Practices, Future Direction,* 7 CARDOZO ARTS & ENT. L.J. 55, 63 (1988).

303. *FCC Chairman Kennard Sees 1996 Telecom Act Working; Notes FCC Contributions to Its Success,* FCC NEWS, May 26, 1999, *at* http://www.fcc.gov/Bureaus/Miscellaneous/News_Releases/1999/nrmc9033.html.

304. *Id.*

> disabilities; from the young to the old; and from suburban homes to our rural heartland.[305]

It is not that these are not valid goals or objectives. Rather, the question is whether the FCC is competent to decide that industry access to every site across the country is essential, notwithstanding the fact that some communities might want to more carefully regulate the location of certain facilities.

The theoretical justification for the FCC having this authority is that, if it were left to state and local governments, a patchwork of inconsistent regulations would result. Further, compliance would be difficult and time-consuming for the telecommunications industry.[306] The reality, however, is that state and local governments need not be given the authority to set differing RF exposure standards. The dispute is over whether communities should be able to consider health and safety factors as a basis for adopting siting regulations. This might have a very significant impact, for example, on set-back requirements, or approval procedures when the industry wants to locate a facility in a residential neighborhood or next to a school. The question is thus whether there are valid state interests in adopting siting regulations which outweigh the federal interests in supporting the industry.

Of all of the potential interests of state and local governments in regulating the placement and location of cellular and PCS facilities, first and foremost is the protection of the safety and welfare of citizens. Citizens generally agree that health and safety are the most important objectives to them in opposing the construction of such facilities,[307] and recent court decisions make it clear that at least some zoning authorities are still trying to focus on this concern, despite the preemptory language of the Telecom Act.[308]

---

305. *Chairman Kennard's Greeting,* FCC NEWS, June 28, 1999, *at* http://www.fcc.gov/greetcontinued.html.

306. It is ironic that zoning authorities are generally allowed to regulate on the basis of how towers look, but not because of health and safety considerations.

307. *See supra* note 136 and accompanying text.

308. *See, e.g.,* Omnipoint Communications, Inc. v. Penn Forest Township., 42 F. Supp. 2d 493 (M.D. Pa. 1999) (overturning a decision to deny placement of a tower after listening to several residents who questioned the health effects of emissions), *aff'd* 181 F.3d 403 (3d Cir. 1999); Cellular Tel. Co. v. Town of Oyster Bay, 166 F.3d 490 (2d Cir. 1999) (reversing town's decision as an illegal consideration of the health effects of RF, and noting that even a decline in property values is potentially impermissible if used as a

Closely related to the question of safety is a desire to protect property values, which deflate when towers are placed close to residential areas.[309] Regardless of the validity of scientific studies showing health risks, people are concerned that proximity to a tower will lower their property values.[310] The manager of one New York real estate brokerage office called towers "the kiss of death," claiming that a home with a tower in its backyard can sell for 25% less than a comparable home without a tower.[311] Case law dealing with the effect of power lines sup-

---

proxy for environmental effects of RF emissions); AT&T Wireless PCS, Inc. v. City Council of City of Va. Beach, 155 F.3d 423 (4th Cir. 1998) (reiterating that the Telecom Act precludes consideration of health risks posed by RF emissions); PrimeCo Personal Communications, L.P. v. Village of Fox Lake, 26 F. Supp. 2d 1052, 1060 (N.D. Ill. 1998) (rejecting denial of company's tower proposal where the "opposing evidence consisted of local property owners' objections based on health concerns."); Illinois RSA No. 3, Inc. v. County of Peoria, 963 F. Supp. 732, 745 (C.D. Ill. 1997) (zoning board improperly considered citizen survey showing opposition to a proposed tower because of potential adverse effects); Sprint Spectrum v. Town of Farmington, 1997 WL 631104 (D.Conn. 1997) (holding that the planning and zoning commission had improperly based its decision on the effects of RF emissions); Smart SMR of N.Y., Inc. v. Borough of Fair Lawn Bd. of Adjustment, 704 A.2d 1271 (N.J. 1997) (over-turning zoning decision which gave credence to the perception of neighborhood of a proposed tower that RF emissions might have long-term health effects); BellSouth Mobility, Inc. v. Gwinnett County, 944 F. Supp. 923 (N.D. Ga. 1996) (reversing zoning board decision which had considered residents' concerns that the RF emissions of a proposed tower would pose a safety risk and adversely affect property values).

Note that not all courts reject consideration of health risks, so long as this is not the sole basis for the zoning authority's decision. *See* Iowa Wireless Serv. v. City of Moline, 29 F. Supp.2d 915 (C.D. Ill. 1998); Smart SMR of N.Y., Inc v. Zoning Comm'n, 995 F. Supp. 52 (D. Conn. 1998); AWACS, Inc. v. Zoning Hearing Bd., 702 A.2d 604 (Pa. 1997).

309. It is true that industry has had the time and money to pay for studies which purport to show that there is no impact on property values. On the other hand, there is considerable reason to believe that there is a detrimental effect. *See infra* notes 310-312 and accompanying text.

310. *See* Joe Catalano, *Similar Houses, Different Prices? It's Time to Look at the Externals*, NEWSDAY, Mar. 14, 1997, at D2; *see also* Susan Lorde Martin, *Communities and Telecommunications Corporations: Rethinking the Rules for Zoning Variances*, 33 AM. BUS. L.J. 235, n.59 and accompanying text (1995). As another legal commentator has noted, "the public perception of the EMF risk can itself significantly affect the value of property." *See* John F. Cahill, *An Introduction to the Indoor Pollution Problem*, 40 PRAC. LAW. 27, 52 (1994) (citing Criscuola v. Power Auth. of N.Y., 621 N.E.2d 1195 (N.Y. 1993); San Diego Gas v. Daley, 253 Cal. Rptr. 144, 151 (Cal. Ct. App. 1988).

311. Catalano, *supra* note 310.

ports the notion that proximity to sources of electromagnetic radiation can have a significant adverse impact on property values.[312] This is also a valid concern for local zoning authorities, since it has long been recognized that "[z]oning is inextricably related to property values."[313] It also seems clear that "the general welfare is served by the promotion of prosperity and the conservation of [property] values."[314]

Yet another interest of state and local governments, and again one which is closely related to the potential safety risks posed by RF emissions from cellular and PCS towers, is to prevent one person's property use from infringing on the rights of neighboring landowners.[315] A landowner must consider the impact of his land use on others and if a particular use injures other, it has long given rise to a legal action for nuisance.[316] "'[N]uisance' includes everything that endangers life or health, or obstructs reasonable and comfortable use of property."[317] State and local governments, through the exercise of their police powers, can protect citizens by prohibiting nuisances,[318] and it seems particularly appropriate that state and local governments should step in where the law would otherwise create an uneven playing field. It has been noted elsewhere that "[t]he playing field is not level when local citizens, attempting

312. In *Daley*, 253 Cal. Rptr. 144, the court discussed the scientific controversy about health risks associated with EMF. The court pointed out that "[s]everal jurisdictions, perhaps a majority, have recognized that buyer fear of the potential dangers associated with power lines, electromagnetic radiation in particular, have a depressing effect on the market value of adjacent properties." *Id.* at 151. The opinion lists literally dozens of cases which follow this rule. *Id.* at 151-53.

313. Alice J. Schwartz, *Federal Preemption of Amateur Radio Antenna Height Regulation: Should the Sky be the Limit?* 9 CARDOZO L. REV. 1501, 1514 (1988).

314. Connor v. City of Univ. Park, 142 S.W.2d 706, 712 (Tex. Civ. App. 1940).

315. ROBERT M. ANDERSON, AMERICAN LAW OF ZONING 35 § 2.03 (3d ed. 1986).

316. *Id.*

317. National Energy Corp. v. O'Quinn, 286 S.E.2d 181, 182 (Va. 1982) (quoting Barnes v. Graham Va. Quarries Inc., 132 S.E.2d 395, 397 (Va. 1963)). The court noted that:

> A nuisance may diminish [the] value of realty. The condition also may interfere with some right incident to the ownership or possession of real property. Such interference may be accomplished by substantially impairing the occupant's comfort, convenience, and enjoyment of the property, causing a material disturbance or annoyance in use of the realty.

Id. (citing Virginia Ry. v. London, 76 S.E. 306, 307-08 (1912)).

318. Schwartz, *supra* note 313, at 1517.

to protect their physical, emotional and economic health, are required to battle in court against large telecommunications corporations with vast financial resources and experience in litigating these kinds of cases."[319]

Similarly, state and local governments have an interest in protecting the ability of citizens to enforce their private agreements. This interest is implicated to the extent that the preemptory language of the Telecom Act might be read by the courts as preempting private citizens' rights to maintain such actions.[320] It is also important for states to protect the rights of their citizens when the resources which individuals are likely to have cannot match the resources available to those on the other side of the issue.[321]

Having set out these issues and relative interests, how should they be balanced? This requires consideration of the extent to which federal preemption is necessary to promote federal policy, and then an evaluation of the extent to which this preemption interferes with state and local interests.

With regard to the extent to which preemption of the right to evaluate health risks posed by RF emissions is necessary to promote the wireless industry, it is important to remember that the Telecom Act does more than preempt state and local regulation over the placement of towers based upon RF emissions. State and local governments are also precluded from unreasonably discriminating among providers of wireless service or from adopting any regulation which would have the effect of prohibiting the provision of personal wireless services.[322] In addition, the Telecom Act requires that applications to locate new personal wireless facilities be reviewed within a reasonable time and any denial of a request to build facilities must be justified by substantial evidence.[323] Taken together, these provisions offer substantial protection to the wire-

---

319. Susan Lorde Martin, *Communications Tower Sitings: The Telecommunications Act of 1996 and the Battle for Community Control*, 12 BERKELEY TECH. L.J. 483, 488 (1997).

320. *Goforth v. Smith*, 991 S.W.2d 579 (1999), involved precisely this scenario. For a more detailed consideration of this case and the issue in general, see *supra* notes 80-92 and accompanying text.

321. *See supra* note 319 and accompanying text.

322. 47 U.S.C. §332(c)(7)(B)(i) (Supp. IV 1998).

323. *Id.* at § 332(c)(7)(B)(iii).

less industry.

If the goal of the Telecom Act is to facilitate reasonable access to wireless technologies, rather than assisting the industry in locating their facilities in the fastest, easiest and cheapest way, the provision of the Telecom Act which preempts any state and local regulation which would have the effect of prohibiting such service should suffice. Where is the need to preempt consideration of RF effects? Clearly it speeds the way for industry if state and local governments are denied the ability to regulate the placement of wireless facilities on the basis of health effects. But at what cost does this speed come?

As noted earlier, most of the state and local interests are tied in one way or another to the protection of the health and safety of individuals. Does federal preemption of state and local consideration of health and safety significantly interfere with these interests?

Obviously, the position of the FCC is that there is no conflict. When it passed its guidelines for RF exposure, the FCC optimistically commented that "[o]nce states and localities have had an opportunity to review and analyze the guidelines we are adopting, we expect they will agree that no further state or local regulation is warranted."[324] At the same time, however, the FCC noted that research in this area related to human health and safety is ongoing and that changes to recommended exposure limits are possible in the future.[325] Moreover, the FCC has also admitted that it does not even seek to regulate non-thermal effects, since those have still not been proven.[326]

With this admitted uncertainty, is it reasonable to limit what states and local governments may do to protect their residents? Certainly not everyone agrees that the FCC standards are adequate.

"[B]ecause there are such wide disparities within the worldwide scientific community about the effects of electromagnetic fields (even at low levels) on human health, it should be up to local communities to decide how much risk they are willing to undertake."[327]

Despite enthusiastic endorsement of the wireless revolution by politicians and federal regulators, not everyone wants a cell phone regardless of cost. "Although cellular phones have become very popular, and people

---

324. Guidelines, *supra* note 51, at 15184 ¶ 168.

325. Guidelines, *supra* note 51, at 15125 ¶ 4; *see also supra* Part II.B.

326. *See supra* note 155 and accompanying text.

327. Martin, *supra* note 319, at 500.

want service with good sound quality, most are unwilling to obtain it if the price is living next to, or within viewing distance of, a tower."[328]

When it comes to trusting standards which have been adopted because scientific studies have not yet proven something to be harmful, cynics can point to numerous examples from other industries over the past decades that suggest this is not the necessarily wisest approach. Our

---

328. Martin, *supra* note 319, at 486 n.15:

Lisa Buie, *Cellular Towers Bedevil Board,* HERNANDO TIMES, Dec. 3, 1996, at 1 (Hernando County, Florida); Lisa Frederick, *Towers Raise Ire as Cellular Phone Structures Spring Up, Some Residents Are Voicing Concerns,* ATLANTA J. CONST., Jan. 2, 1997, at 1 (Covington, Georgia); Joe Gose, *Cities in Search of Ways to Regulate Cellular Towers - Johnson Countians Want to Limit Construction, Fearing the Impact on Property Values,* KANSAS CITY STAR, Nov. 20, 1996, at B3 (Johnson County, Kansas); Helen Bennett Harvey, *Plans for Tower Anger Residents,* NEW HAVEN REGISTER, Sept. 20, 1996 (Orange, Connecticut); Mark Larson, *And Takes on Phone Towers,* BUS. J. - SACRAMENTO, Sept. 9, 1996, at 2 (Sacramento County, California); Mike Maller, *Cell-Site Doesn't Ring Well with Neighbors,* IDAHO STATESMAN, July 17, 1996 (Cloverdale, Idaho); Jonathan Marshall, *Where's the Antenna?,* THE COLUMBIAN, Dec. 18, 1996, at E1 (San Francisco, California); *Medina Applies Another Hold on Cell Towers,* SEATTLE TIMES, Oct. 29, 1996 (Medina, Washington); James A. Merolla, *Zoning Board Gets an Earful from Tower Opponents,* PROVIDENCE J. BULL., Oct. 30, 1996, at 3C (Richmond, Rhode Island); Barbara Miller, *57 Residents Sign a Petition Opposing Cell Telephone Tower,* HARRISBURG PATRIOT, Jan. 28, 1997, at 7 (Palmyra, Pennsylvania); Doug Nurse, *Towers Loom as Upcoming Problem,* TAMPA TRIB., Jan. 5, 1997, at 1 (Lakeland, Florida); Tom O'Neill, *Here's the Church, Here's the (Fake) Steeple - It's a Cell Tower, and Much Debated,* CINCINNATI ENQUIRER, Jan. 20, 1997, at B1 (Cincinnati, Ohio); Paul Rogers, *Emerson Considers Cell Tower Ordinance Law Would Limit Height, Placement,* THE RECORD, Jan. 14, 1997, at L01 (Emerson, New Jersey); Shaun Sutner, *Towers Loom Large - Cell Service Riles Neighbors,* SUNDAY TELEGRAM, Dec. 29, 1996, at B1 (Worcester, Massachusetts); *Towers of Power,* KNOXVILLE NEWS-SENTINEL, June 16, 1996 (Knoxville, Tennessee); Pat Wiedenkeller, *In Hempstead: Bloc Aims to Trim Plan for Tower,* NEWSDAY, Sept. 15, 1996 (Malverne, New York).

A computer database search of WESTLAW on July 16, 1999 indicated that in the two years since this partial listing of articles was complied, hundreds of additional reports have appeared in the print media indicating citizen opposition to placement of cell towers in residential or other areas.

history as a nation is replete with examples of things which were once promoted by industry and/or our government as safe, because there was no proof that they were not. Only later were they discovered to be harmful to human health. The examples of atomic radiation, asbestos, benzene, the Dalkon shield, DES (diethylstilbestrol), thalidomide, and tobacco all come readily to mind. In each of these cases, industry and/or the U.S. government sanctioned a technology and products, providing assurances of safety that only later were proven to be false.[329]

Consider the history of asbestos in this country. We now know that "asbestos manufacturers began learning of the direct linkage between their workplace conditions and their employees' adverse health conditions in the 1920s but refused to alert the workers, the government, or the public until forced to do so in the 1970's."[330] Asbestos manufacturers and marketers "engaged in a massive cover-up which kept potential victims behind a veil of ignorance."[331] As a result, hundreds of thousands of Americans died prematurely, because of exposure to something that was once regarded as benign, and turned out to be deadly.[332]

Consider also, that in the case of atomic radiation and fallout, the U.S. government once assumed that no harm would come from exposing U.S. military personnel and private citizens to fallout from a variety of atomic bomb tests. In Bikini Atoll, islanders were misled about the extent of the risks, and thousands of U.S. service men were exposed to potentially fatal levels of radiation.[333] The true impact of the Bikini Atoll tests were classified for years, and the press was consistently mislead about the amount of radioactivity produced.[334] If one also considers the impact of the more recent nuclear tests in Nevada, it becomes clear that hundreds of thousands of soldiers and civilians were exposed to pro-

---

329. *See infra* notes 328-334 and accompanying text.

330. John Bell, *Asbestos Companies Try to Eliminate Their Liability,* 35 TRIAL 10, 10 (1999).

331. Joseph A. Page, *1987 Survey of Books Relating to the Law,* 85 MICH. L. REV. 1324 (1987) (reviewing PAUL BRODEUR, OUTRAGEOUS MISCONDUCT: THE ASBESTOS INDUSTRY ON TRIAL (1985)).

332. One source blames more than 400,000 premature deaths on the industry's refusal to alert workers, the public and the government. Bell, *supra* note 330.

333. Major Timothy J. Saviano, *Operation Crossroads the Atomic Tests at Bikini Atoll,* 145 MIL. L. REV. 193, 194 (1994) (reviewing JONATHON M. WEISGALL, OPERATION CROSSROADS—THE ATOMIC TESTS AT BIKINI ATOLL (1994)).

334. *See id.* at 195.

longed, unsafe levels of radiation by the U.S. government.[335] The public was mislead in these cases by official statements assuring them that there was no danger.[336] At best, the U.S. government assurances were unrealistically optimistic, since there was no scientific basis for predicting that the fallout to which the public was exposed was at levels that were, in fact, safe.

Even where the harmful effects are known, industry is often reluctant to give up profits to protect human health. For example, since the turn of the century, benzene, which has been widely used to manufacture items such as detergents, pesticide, solvents and paint removers,[337] has been associated with acute and chronic effects such as blood disorders.[338] In 1978, the EPA published a study linking it to leukemia,[339] and subsequently reported that there was no level of a known carcinogen which it believed to be safe.[340] OSHA promulgated regulations treating the substance as a known carcinogen, but industry objected to the standards as being too stringent. Even though benzene was a known carcinogen, the courts sided with industry and found that OSHA's regulations were too stringent.[341]

---

335. William A. Fletcher, *Atomic Bomb Testing and the Warner Amendment: A Violation of The Separation of Powers*, 65 WASH. L. REV. 285 (1990).

336. *Id.* at 293 (describing a 1953 test in Nevada which created significant fallout at a time that the public was being informed the radioactivity was "not in the range of being harmful.").

337. 42 Fed. Reg. 22516, at 22517 (1977).

338. *See* Susan Ross, *Second-Hand Smoke: The Asbestos and Benzene of the Nineties,* 25 ARIZ. ST. L.J. 713, 721 (1993) (citing ENVIRONMENTAL PROTECTION AGENCY, ASSESSMENT OF HEALTH EFFECTS OF BENZENE GERMANE TO LOW-LEVEL EXPOSURE (1978)).

339. EPA ASSESSMENT, *supra* note 338, at 1.

340. 42 FED. REG. 22526, at 22517.

341. After OSHA responded to mounting evidence showing that benzene exposure could have carcinogenic and chromosomal effects at very low levels by setting a very low exposure standard, a "coalition of benzene produces and users promptly challenged the benzene standard." Comment, *Supreme Court's Divided Benzene Decision Preserves Uncertainty Over Regulation and Environmental Carcinogens,* 10 ENVTL. L. REP. 10192 (1980). They challenged the standard because OSHA had failed to prepare a cost-benefit analysis. Industrial Union Dep't v. American Petroleum Institute, 448 U.S. 607 (1980) (a highly divided Supreme Court issued a plurality opinion invalidating the OSHA limits).

In other cases, industries have acted without knowing whether or not their products are safe. Consider the Dalkon shield, a contraceptive device "which subjected users to the risk of extensive harm to their reproductive systems as well as spontaneous abortions," and which was "associated with serious birth defects in children born to mothers who conceived while wearing it."[342] In this case, A.H. Robins Company bought the rights to the device from a small firm and then "aggressively market[ed] it without testing for safety or efficacy."[343] Then, to compound matters, the company used questionable tactics in defending products liability suits and in delaying a product recall for ten years.[344]

The "use it now; find out if it is harmful later" mentality also surfaced in the case of diethylstilbestrol (DES), a synthetic hormone which "was prescribed widely to pregnant women from the 1940s through 1971 to prevent miscarriage."[345] Twenty years later researchers began to document a startling increase in a rare form of vaginal cancer among the daughters of women who had taken the drug.[346] "By that time, at least 1.5 million offspring had been exposed . . . ."[347] It turns out that the health studies which had been performed earlier were inadequate, and millions of women took a drug which was believed to be safe because there was insufficient evidence to prove that it was not.[348]

Even the thalidomide story, which is the one great instance where U.S. regulators drew the line and saved the American public from untold suffering, provides no strong basis for confidence in either industry or the U.S. regulatory regime in general. Thalidomide is "a drug that from 1957 to 1961 caused gruesome birth defects around the world, and would have wreaked disaster in the United States if the FDA had not refused to approve it."[349] The reason thalidomide was not approved in the U.S. has

---

342. Joseph A. Page, *1987 Survey of Books Relating to the Law,* 85 MICH. L. REV. 1324, 1326 (1987) (surveying MORTON MINTZ, AT ANY COST: CORPORATE GREED, WOMEN, AND THE DALKON SHIELD (1985)).

343. Page, *supra* note 342, at 1326.

344. *Id.* at 1327.

345. Anna C. Mastroianni, *HIV, Women, and Access to Clinical Trials: Tort Liability and Lesson from DES,* 5 DUKE J. GENDER L. & POL'Y 167, 177 (1998).

346. *See id.*

347. *Id.*

348. *See id.*

349. Anita Bernstein, *Formed by Thalidomide: Mass Torts as a False Cure for Toxic Exposure,* 97 COLUM. L. REV. 2153, 2153 (1997).

less to do with stringent regulatory oversight, and more to do with the extraordinary efforts of a single person. Frances Oldham Kelsey was new to the FDA when she was assigned to review the thalidomide application.[350] She refused to approve the new drug, a decision which "enraged the American manufacturer," Merrell.[351] The manufacturer pressured Kelsey "relentlessly, even accusing her of libel," and when research data from Europe finally emerged to prove a link between the drug and birth defects "a reluctant Merrell barely cooperated" in the cessation of U.S. clinical trials.[352]

The same lessons might be learned by considering the more recent and even more highly publicized example of tobacco. In this case, a multi-billion dollar industry[353] did everything it could to hide the truth. Using oppressive tactics whenever a cancer victim sought recompense,[354] the industry also funded misleading and inaccurate "research,"[355] and engaged in out-and-out fraud. The fraud is detailed convincingly in a number of reports.[356] The fraud first came to light when

---

350. *See id.* at n.66 (reporting that this was her very first application).

351. *Id.*

352. *Id.* (citing Cindy Pearson, *Doctor Who Stopped Thalidomide Celebrates 80th Birthday,* NAT'L WOMEN'S HEALTH NETWORK NEWS, Sept. 1994, at 1.

353. *See* Susan Ross, *Second-Hand Smoke: The Asbestos and Benzene of the Nineties,* 25 ARIZ. ST. J.L. 713, 713 (1993) (citing Allen R. Myerson, *Philip Morris Cuts Cigarette Price, Stunning Market,* N.Y. TIMES, Apr. 3, 1993, at 1).

354. *See, e.g.,* Richard L. Cupp, Jr., *A Morality Play's Third Act: Revisiting Addiction, Fraud and Consumer Choice in "Third Wave" Tobacco Litigation,* 46 U. KAN. L. REV. 465, 472 (1998) (commenting that tobacco companies had developed a reputation for aggressively defending claims, depleting plaintiffs' resources).

355. Deborah E. Barnes & Lisa A. Bero, *Industry-Funded Research and Conflict of Interest: An Analysis of Research Sponsored by the Tobacco Industry Through the Center for Indoor Air Research,* 21 J. POL. POL'Y & L. 515, 531-32 (1996). The industry funded studies suffered from a lack of peer review, poor study design, a high potential for bias, conflict of interest in the actual researchers, and, in at least one case, actual alteration of data. *Id.* at 532.

356. *See, i.e.,* Paul A. Lebel, *Of Deaths Put on By Cunning and Forced Cause: Reality Bites the Tobacco Industry,* 38 WM. & MARY L. REV. 605 (1997) (reviewing STANTON A. GLANTZ, ET AL., THE CIGARETTE PAPERS (1996), PHILIP J. HILTS, SMOKESCREEN: THE TRUTH BEHIND THE TOBACCO INDUSTRY COVER-UP (1996), and ALFRED A. KNOPF, ASHES TO ASHES: AMERICA'S HUNDRED-YEAR CIGARETTE WAR, THE PUBLIC HEALTH AND THE UNABASHED TRIUMPH OF PHILIP MORRIS (1996)). *Accord* Erin

several thousands of pages of confidential industry documents were anonymously shipped to a professor at the University of California, San Diego.[357] These pages began to document the industry's suppression of scientific research and the level of industry knowledge.[358] Industry-wide fraud was confirmed when the Liggett Group broke ranks with the rest of the industry to work with the Attorneys General.[359] Federal Judge H. Lee Sarokin, who presided over ten years of tobacco litigation, described the tobacco industry thus: "All too often in the choice between the physical health of consumers and the financial well-being of business, concealment is chosen over disclosure, sales over safety, and money over morality."[360]

The parallels between the telecommunications and tobacco industries are worrisome. Big money is at stake; industry supports most of the research; research suggesting the presence of health risks is vigorously denied; huge sums are spent trying to convince consumers that the product is safe; and opponents are sharply criticized. Of course, there is no evidence that the telecommunications industry has engaged in the sort of fraud and deception practiced by the tobacco industry.[361] Nonetheless, history would suggest that it is not appropriate to impose safety standards based on the presumption that something financially advantageous to industry is safe just because industry says it is or because no one has yet proven it to be harmful. It is not fair to insist that citizens be the guinea pigs to demonstrate whether wireless technology is in fact safe. Let those who do not object have the towers in their communities, or better yet, let state and local governments require towers to be placed in non-residential areas, away from schools, hospitals and similar facilities.

Surely the right to have expanded cellular phone or PCS service is no more important to citizens or local communities than having the freedom to decide what health risks are acceptable. Moreover, if Congress leaves in place that portion of the Telecommunications Act which preempts any

---

Myers, *The Manipulation of Public Opinion by the Tobacco Industry: Past, Present, and Future*, 2 J. HEALTH CAR L. & POL'Y 79, 100 (1998).

357. Tucker S. Player, Note, *After the Fall: The Cigarette Papers, The Global Settlement, and the Future of Tobacco Litigation*, 49 S. C. L. REV. 311, 322 (1998).

358. *Id.*

359. *Id.* at 330.

360. Haines v. Liggett Group, Inc., 140 F.R.D. 681, 683 (D. N.J.), *vacated*, 975 F.2d 81 (3d Cir. 1992).

361. *See supra* note 356.

rule or regulation which would amount to a prohibition of wireless service, this would place the burden where it belongs. State and local governments would be free to regulate the placement of the towers based on the potential effects of RF emissions, so long as their regulations do not amount to a prohibition of services.[362] If the providers could show an absolute need for a particular location, as opposed to a simple preference because a particular cite is cheaper or more convenient for the provider, a request to locate a tower or other facility in a particular location might have to be approved. Otherwise, state and local governments would be free to make their own decisions, based on the health and safety concerns of local citizens, about where facilities should be placed.

Certainly this is not what the industry wants, since it will potentially slow down the proliferation of towers if the industry has to respond to safety and health concerns.[363] On the other hand, citizens have a right

---

362. *Cf.* AT & T Wireless PCS, Inc. v. City Council of Va. Beach, 155 F.3d 423, 428-29 (4th Cir. 1998), holding that individual zoning decisions are not affected by this particular limitation, and that only general prohibitions or bans on cellular facilities would be prohibited.

363. Note that it is not clear how much this will slow down the process. Legislative history of the Telecommunications Act indicates that at least some supporters were concerned about the difficulty for the industry in complying with the "patchwork" of state regulation. *See supra* note 31 and accompanying text. However, that patchwork still exists. Every locality has its own planning or zoning board or commission, its own approval process, and its own requirements. The difference is that state and local governments are currently prevented from considering safety and health issues posed by RF emissions in their siting decisions; thus, set-backs are more concerned with fall-zones or the possibility of wind-blown debris from the tower (such as ice) rather than requiring placement of towers away from homes because of RF exposure concerns.

One land-use expert has disseminated a model ordinance or by-law which might be useful in considering how the process works. Dwight H. Merriam, *Dealing with Locally Unwanted Land Uses (LULUs): Wireless Communications Facilities, "Super" Service Stations, "Satellite" Fast Food Restaurants, Etc., in* 10 LAND USE INST. 97, 154 (1997) (crediting a team of planners and draftsmen for coming up with what they call a "Model Bylaw for Personal Wireless Service Facilities."). For example, the suggested regulation would cover the following aesthetic considerations: height limitations, setback, design requirements, camouflage, vegetation, color, lighting, signage, and specific considerations relating to scenic landscapes and vistas. *Id.* at 162-70.

There are also other models available for comparison, but generally speaking they also address a wide variety of issues. For comparison purposes, see *Model Wireless Communications Ordinance Framework*, a model presented by various telecommunications providers, including AT&T, GT Wireless, Nextel, & Sprint. *See* Lisa Verner, *Model*

not to be used as human guinea pigs in a grand experiment to determine the effects of long-term, low-level exposure to RF emissions in the cellular and PCS spectra.

B. *The Lack of FCC Independence*

In addition to the difficulty in supporting any conclusion that the national interests in this case outweigh the concerns of states and localities, there is another problem. Congress has established a regulatory regime where all of the state and local interests are to be protected by the actions of the FCC in establishing safety guidelines for RF exposure. There are substantial indications that this is somewhat akin to the fox guarding the henhouse.

The FCC makes no real secret of its pro-industry position. Long before most private citizens had any understanding of what "cellular" or "PCS" communications meant, the FCC had already made its own determination that "there is a nationwide need for cellular telephones."[364] In fact, the FCC clearly expressed its pro-industry position in the early 1980's:

> We expect cellular to become an important communications tool, the extensive use of which can be of significant benefit to the American economy and to the more general public interest, and we are accordingly anxious to have it implemented as quickly as possible .... We believe that cellular is important enough to the public interest to warrant special attention to avoid delays.[365]

Wireless Communications Ordinance Framework, at http://mrsc.org/mrsc/legal/te- lecomm/wireless.htm; *Wireless Ordinance Checklist, at* http://www.atconf.org/telecom/checklist.html (a model presented by the Appalachian Trial Conference, a non-profit organization that helps maintain the Appalachian trails). For another list of suggested criteria for localities to use in making siting decisions under the Telecom Act, see Kevin O'Neill, *Wireless Facilities are a Towering Problem: How Can Local Zoning Boards Make the Call without Violating Section 704 of the Telecommunications Act of 1996?*, 40 WM & MARY L. REV. 975, 1004 (1999). With this much complexity, it is easy to understand why there is so much variation from jurisdiction to jurisdiction.

364. Jaymes D. Littlejohn, *The Impact of Land Use Regulation on Cellular Communications: Is Federal Preemption Warranted?*, 45 FED. COMM. L.J. 247, 259 (1993).

365. Public Mobile Radio Serv., 47 FED. REG. 10018, 10033 (1982).

The motivation for the FCC's pro-industry stance is not difficult to ascertain. Billions of dollars are at stake. Although it seems impossible to confirm precise numbers,[366] billions of dollars have been raised by the sale of licenses to the telecommunications industry.[367] In the past few years, the FCC has conducted a series of auctions, each involving a different segment of the RF spectrum and/or geographic markets.[368] Each raised substantial sums, which the FCC estimated at more than $11.8 billion, early in the process.[369] The FCC continues to raise such funds, most recently reporting revenue of more than $45 million from a Local

366. One of the major problems is that several purchasers have subsequently declared bankruptcy, and a major bail-out by the FCC has been approved so that original purchase calculations will not be reliable. *See* Paul Davidson, *Wireless Bidders Get New Payment Options,* USA TODAY, March 25, 1998, at 2B (reporting that "dozens of companies . . . can't afford to pay for the billions of dollars of wireless phone licenses" which they had previously committed to purchase).

367. The FCC's Wireless Bureau Chief estimated that over $11.8 billion dollars had already been collected in 1997, and that was before many of the auctions were conducted. *Wireless Bureau Chief Daniel Phythyon Hails Success of Market-Based Spectrum Policies,* FCC NEWS, Sept. 11, 1997, *at* http://www.fcc.gov/Bureaus/Wireless/News_Releases/1997/nrw17037.html. Other sources peg the amount raised at varying amounts—mostly in excess of this estimate. *See, e.g.,* Jill Abeshouse Stern, *Towering Above Us,* 146 N.J.L.J. 1040, 1040 (1996) ("In the past two years, the [FCC] has raised an astounding $27 billion for the U.S. Treasury from the auction of spectrum licenses for wireless telecommunications services."); Harold McCombs, *Mixed Signals: How the Telecommunications Act Affects You,* AM. CITY & COUNTY, Aug. 1997, at 30 (reporting that FCC raised $23 billion in PCS auctions); Glen O. Robinson, *The "New" Communications Act: A Second Opinion,* 29 CONN. L. REV. 289, 295 (1996) (reporting that in first two years of auctions $20 billion was raised for U.S. Treasury); Jeffrey Silva, *Several Wireless Initiatives Caught Up in Legislative Standstill,* RCR RADIO COMM. REP., Apr. 14, 1997, at 5 (reporting that $22 billion was raised by FCC from wireless license auctions held over the past three years); Rhonda L. Wickham, *Playing for All of the Marbles,* CELLULAR BUS., Dec. 1996, at 28 (reporting that FCC "C-block" auction bids alone reached a total of $10 billion).

368. The FCC conducted separate auctions for the 800 MHz SMR upper 200: Broadcast PCS Block A & B; Broadcast PCS Block C; Broadcast PCS Block C reauction; Broadcast PCS Block D, E & F; CDEF Block Broadband PCS; Cellular Unserved; Phase II 220 MHz Services; Phase II 220 MHz Services Spectrum; and the Specialized Mobile Radio Block A-T. *See FCC Auctions,* at http://uls-gis.fcc.gov/cgi-win/auction.exe.

369. *See supra* note 367.

Multipoint Distribution Service Auction.[370]

And if the financial incentive for the FCC is not impressive enough, consider what was (and is) at stake for the industry. The Chairman of the FCC recently reported that the "communications sector of our economy has grown by $140 billion" since the enactment of the Telecom Act.[371] While only part of that is attributable to the cellular and wireless services, the exponential growth in wireless services makes it abundantly clear that the industry stake in this issue is very, very large. One industry source claimed $20 billion dollars in sales by the wireless communications industry in 1996, and the industry has grown appreciably since then.[372]

Moreover, it is quite clear that the industry is willing to demand special consideration in return for the money it has expended. For example, the President of the Cellular Telecommunications Industry Association (CTIA), which describes itself as "the international association for the wireless telecommunications industry," recently insisted that "[a]fter receiving billions in wireless auction revenues, it is incumbent upon the Federal government to exercise its preemptive authority to assure that the provision of wireless service to consumers is not hamstrung by local politics."[373]

There are, of course, a number of responses to the suggestion that this bias can be overcome by allowing individual states and communities to separately address the issue of appropriate siting policy given the potential for adverse health effects of RF. If the bias stems from money, the telecommunications industry might throw money at local regulators

---

370. *Auction of Wireless Communications Licenses Raises, $45,064,450,* FCC NEWS, May 12, 1999, *at* http://www.fcc.gov/Bureaus/Wireless/News_Releases/1999/nrwl19015.html.

371. William Kennard, *The Telecom Act at Three: Seeing the Face of the Future,* 7 MEDIA L. & POL'Y (1999) (citing testimony of William E. Kennard, Chairman, FCC before the Committee on the Judiciary Subcommittee on Antitrust, Business Rights and Competition, 106th Cong. (1999)).

372. Press Release, Cellular Telecommunications Industry Association, *Wireless Growth Sets New Annual Records: 10 Million New Customers, Over $20 Billion in Revenues, Monthly Bills fall Below $50,* Sept. 19, 1986, *at* http://www.wow-com.com/news/ctiapress/body.cfm?record_id=75.

373. Press Release, Cellular Telecommunications Industry Association, *CTIA Asks FCC to Issue Advisory Opinion Defining the Scope of Local and State Regulatory Authority over Sites and Fees,* July 20, 1999, *at* http://www.wow-com.com/news/ctiapress/body.cfm?record_id=87.

as well. Moreover, not all local citizens will feel comfortable in attempting to question the positions taken by a large, experienced, and wealthy industry. This may leave certain localities under-regulated. The result may be the uneven patchwork of regulations which industry claims to have feared all along.[374]

In response to these reservations, it is worth noting that state and local governments are not starting from the same pro-industry bias that has long permeated the FCC. Moreover, there is no evidence that money alone would be effective in convincing state and local regulators that there is no valid safety concern, since they have to live among their constituents and are often quite responsive to the preferences of those they represent. If they are not responsive, and citizens are sufficiently concerned, citizens are far more able to effect change on local boards and commissions that in the composition of the FCC. Finally, an uneven regulatory regime is arguably preferable to one which is even—but unsafe or unsatisfactory to everyone except industry.

C. *The Ability to Respond to Technological Developments*

A final justification for returning authority to state and local governments is that the FCC has not shown any ability to respond efficiently to technical developments in the area. The clearest example of this comes from the FCC's reaction when ANSI and IEEE changed their safety standards in 1992.[375] At that time, the FCC's guidelines were based on the ANSI 1982 standards.[376] As described earlier, the new 1992 ANSI/IEEE standards were more restrictive in terms of permissible exposure levels and for the first time considered the issue of appropriate guidelines for exposing the public separately from occupational exposure standards.[377]

---

374. On the other hand, as noted elsewhere, industry seems to be coping just fine with the uneven patchwork of regulations which admittedly continues to exist. *See supra* note 363 and accompanying text.

375. *See supra* notes 120-121 and accompanying text.

376. *See* Responsibility of FCC to Consider Biological Effects of Radiofrequency Radiation when Authorizing the Use of Radiofrequency Devices, Report and Order, 100 F.C.C.2d 543, 549 ¶ 14 (1985) (adopting 1982 ANSI standards).

377. *See supra* notes 116-119 and accompanying text.

The FCC initiated proceedings in 1993 to determine whether to amend its standards.[378] It was still hearing testimony three years later, in 1996, when Congress passed the Telecom Act.[379] The Telecom Act gave the FCC an absolute deadline of 180 days to promulgate final regulations, and the FCC met that deadline with only a handful of days to spare.[380] Moreover, the new guidelines were not applicable to industry until the following year. No one knows how long it would have taken the FCC to make a final decision if Congress had not set a deadline. Even with the Congressional mandate, it took four years for the FCC to accept the industry standards, even though the FCC disclaims any expertise of its own which would justify setting lower safety standards than the industry itself would recommend.[381]

Part of the problem is inherent in the nature of federal administrative rulemaking. The Administrative Procedures Act (APA)[382] governs the manner in which federal administrative agencies make decisions. Under the APA, the FCC basically has a limited number of options when it comes to establishing guidelines for RF exposure.[383] It can follow the formal rulemaking process,[384] or it can opt for informal rulemaking.[385] While both of these processes begin with public notice,[386] formal rulemaking requires an evidentiary hearing at which persons with opposing viewpoints are free to cross-examine any witness for the other side.[387] The agency then makes findings and conclusions based solely on the re-

---

378. *See supra* note 120 and accompanying text.

379. *See supra* note 122.

380. *See supra* notes 122-123 and accompanying text.

381. *See supra* note 113 and accompanying text.

382. 5 U.S.C. §§ 551 (originally enacted as the Administrative Procedures Act, Pub. L. No. 79-404, 60 Stat. 237 (1946)).

383. The APA allows both formal and informal rulemaking. *See infra* notes 384-385 and accompanying text. The APA also governs regulatory adjudications. *See* 5 U.S.C. §§ 554-557. However, these provisions essentially cover the situation where there is a particularized dispute, and do not seem relevant in the context of FCC authority over RF guidelines. In addition, a negotiated regulation is also allowed. *See infra* note 395 and accompanying text. *See also* Stuart N. Brotman, *Communications Policy-Making at the FCC: Past Practices, Future Direction,* 7 CARDOZO ARTS & ENT. L.J. 55 (1988).

384. 5 U.S.C. §553(c), incorporating §§ 556 & 557 requirements.

385. 5 U.S.C. § 553(b)(B).

386. 5 U.S.C. § 553(b).

387. *See* Richard J. Pierce et al., ADMINISTRATIVE LAW AND PROCESS §6.4.5, at 315 (1985).

cord.[388] An informal procedure skips the trial-like hearing, and instead gathers public comment in the form of written reactions on the proposal.[389]

It is generally agreed that formal hearings "perform poorly" when the issue being considered involves "broad, complicated policy issues,"[390] like those which would be implicated in any decision about RF exposure limits. It has been suggested that "it is simply impossible for an agency to result many controversies concerning general rules within a reasonable time if it must use trial-type procedures."[391]

Given the problems associated with formal rulemaking, it is perhaps not surprising that most of the FCC's broad policy decisions are the product of informal Rule Making which is carried out through an informal notice-and-comment proceeding.[392] Regrettably, informal rulemaking is also subject to a number of criticisms. Some observers have criticized the fact that there is no opportunity to challenge evidence put on by opposing parties in this process.[393] Others have suggested that the staffing requirements, the resources and time required to complete such a proceeding, plus the possibility of a judicial appeal "represents a formidable barrier to meaningful policy formulation . . . ."[394]

Another approach would be for the FCC to try a negotiated regulation, where the FCC essentially encourages "interested parties to resolve disputes among themselves."[395] However, this assumes that the interests of the parties can be reconciled, and that assumption may not be accurate in the context of trying to resolve a difference of opinion concerning disputed scientific studies and the concept of acceptable risk. In addition, a negotiation is only practicable if it is possible to clearly identify all of the

388. *Id.*

389. *Id.*

390. *Id.*

391. *Id.* at 316.

392. Brotman, *supra* note 383, at 56.

393. PIERCE, *supra* note 387, § 6.4.9, at 330 ("Many lawyers and judges believed, however, that informal notice and comment rulemaking was an unsatisfactory procedure for formulating rules whose wisdom or necessity was premised on contested facts.").

394. Brotman, *supra* note 383, at 58 (criticizing both formal and informal procedures as being inefficient).

395. *See id.*

interested parties and select appropriate representatives for the various constituencies. While the interests of most of the telecommunications industry might be relatively uniform, state and local governments might have a significant interest in the subject, as would private citizens. Moreover, it is highly unlikely that the interests of all of these persons would ever converge, meaning that negotiation would be a time-consuming exercise in futility.

As a result, no matter which process the FCC chooses, there will be a lengthy, involved process with an ultimate outcome which is unlikely to adequately protect all of the relevant interests.[396] This is especially true with regard to evaluating the effects of RF exposure on human health because the FCC admits that it has no special expertise.[397] The FCC has repeatedly stated that it has no particular background in setting environmental standards,[398] or in evaluating the type of scientific data relevant to establishing such guidelines. This lack of expertise is reflected in the way the FCC approaches the problem of RF regulation. Industry guidelines are presumed to be acceptable, even if there is widespread agreement that the data is not complete and future amendments to the regulations are likely to be needed.[399] In a joint statement issued at the conclusion of the Report and Order, FCC Commissioners Quello and Chong specifically praised industry participation in setting the standards.[400] Moreover, the FCC's reaction to the uncertainty is a promise that the Commission will "be working with the wireless industry to ensure that the guidelines continue to be appropriate and scientifically valid."[401]

---

396. Certainly if the FCC starts and ends with a particular bias, the results are not likely to be satisfactory. *See supra* Part III.B.

397. For an extremely critical evaluation of the FCC's performance with regard to spectrum auctions, a process which was unfamiliar to the FCC, see *A "Ringy-Dingy" Circus, EE Times-Communications Unplugged*, describing the result as "chaos," *at* http://www.eet.com/column1/communications/comm3.html.

398. Jeneba Jalloh, Comment, *Local Tower Siting Preemption: FCC Radio Frequency Guidelines and Solution for Removing Barriers to PCS Expansion*, 5 COMM. LAW CONSPECTUS 113, 117 (1997) ("The Commission never considered itself an authority on environmental regulations and did not promulgate any such standards prior to 1969. That is the year that the National Environmental Policy Act (NEPA) was passed requiring federal agencies of the government to evaluate the effects of their actions on the quality of the human environment.").

399. Guidelines, *supra* note 51, at 15125 ¶ 4; *see also* 47 C.F.R. § 1.1307(b) (1996).

400. Guidelines, *supra* note 51 (Joint Statement dated Aug. 1, 1996).

The FCC continues to downplay the possibility that industry may be biased, or that there are other viewpoints which need to be considered.

In addition to bias and lack of expertise, inefficiencies at the FCC level have much to do with the national scope of the problem. The telecommunications industry is huge, and the number of persons and groups with special concerns on a national level is simply overwhelming. When the 1992 ANSI/IEEE guidelines were being proposed, the FCC received more than 100 separate comments, and many of those involved extremely technical information.[402] The complexity is probably unavoidable, since the number of RF studies is staggering and growing evermore voluminous each year, and the number of interested parties on a national level is overwhelming. Allowing state and local governments to consider health and safety effects in making siting decisions will not be a panacea for these problems. State and local governments are likewise bound by administrative procedures which must satisfy the requirements of due process for concerned participants.[403]

But when the concerns are boiled down to the specifics of each locality, the problem becomes more manageable. The FCC does not and reasonably can not be expected to know specifics about each community. The FCC does not know about the local zoning or other planning requirements for local communities; it does not know the nature of existing developments; it does not know local topography. State and local governments do have such knowledge. The fact that local governments in particular are set up to deal with this type of information provides a significant reason to return siting authority to state and local authorities. This is an example of a decision which "require[s] for [its] proper solution, thorough consideration of the particular area and surroundings."[404] Because "local zoning authorities are in the best position to determine how to effectuate the needs and concerns of their citizens," federal preemption of zoning is a poor choice.[405] There is every reason for the telecommunications industry to want the advantage of being able to expand

401. Jalloh, *supra* note 136, at 119 (citing Guidelines, *supra* note 51, at 15125 ¶ 4).

402. *See supra* note 120 and accompanying text.

403. *See* AM. JUR. 2d § 198 (1994).

404. Donatelli, *supra* note 144, at 467.

405. Palermo, *supra* note 135, at 260.

facilities in the fastest, cheapest and easiest manner, but quality of life issues for localities should not be forgotten. The industry's "desire to maximize profits and minimize costs in choosing a site and the dimensions of their facility should be balances against the community's interest in health, safety and property value concerns, with the community's interest receiving a presumption of validity."[406] Since the FCC has no understanding of these issues, and cannot be expected to, local zoning authority in this area should be reinstated by Congress.

IV. CONCLUSION

In some regards, the Telecommunications Act of 1996 has been a success. The wireless industry is thriving. This is not, however, a success which comes without a cost.

The Telecom Act preempted state and local authority to regulate the placement of wireless facilities such as cellular and PCS towers on the basis of the potential health risks posed by RF emissions.[407] The rationale behind this decision was that the industry wanted to be able to take the fastest, easiest and cheapest paths in building out their new wireless systems. While the FCC regulates RF emissions only on the basis of the potential heating or thermal effects of exposure, a growing body of scientific evidence points to poorly understood non-thermal effects.[408] Epidemiological research, though scanty, is particularly frightening.[409]

Nonetheless, a pro-industry regulatory regime exists from the FCC down, a regime in which there currently seems to be no room for state and local governments to make siting decisions on the basis of health risks. It is undoubtedly true that the Telecom Act speeds the way for industry. But at what cost? Why should a community not have the right to decide against new cell towers in residential areas if that is the price of new and improved coverage?

State and local governments, and particularly local zoning authorities, have always been the closest to land use problems, and the problem of cellular and PCS towers is exactly that. Local zoning authorities have

---

406. Susan Lorde Martin, *Communities and Telecommunications Corporations: Rethinking the Rules for Zoning Variances*, 33 AM. BUS. L.J. 235, 256 (1995).

407. *See supra* notes 122-124 and accompanying text.

408. *See supra* notes 137-146 and accompanying text.

409. *See supra* notes 147-148 and accompanying text.

a strong interest in protecting their constituents from risks which they deem to be unacceptable. Basic issues such as this surely outweigh the interest of the telecommunications industry in placing their towers wherever they please.

It was a mistake for Congress to remove this authority from states and localities, and it is past time for Congress to act to remedy this error. Certainly courts, when they are called upon to interpret the scope of federal preemption under the Telecom Act, should be sensitive to these issues, and should narrowly construe the preemptory language contained within this legislation.