

**"PROPERTYZING" THE ELECTROMAGNETIC SPECTRUM:
WHY IT'S IMPORTANT, AND HOW TO BEGIN**

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Abstract

The Radio Act of 1927 began a long reign -- 73 years so far -- of all-encompassing federal regulation of the electromagnetic spectrum -- "the airwaves". The Act declared that the spectrum was the property of the entire American people and that it should be managed by the Federal Government "in the public interest".

The reality of that regulation has been a process in which, all too often, the Federal Communications Commission has discouraged competition, favored incumbents over entrants and innovators, delayed the development of new technologies, and generally mismanaged a scarce resource.

There is a better way. That way would involve converting the use of the spectrum to a system of property and property rights, which would function much like the system of property that applies to real estate. The rights, limitations, and boundaries of spectrum ownership could be specified. All spectrum could then be bought and sold, divided or aggregated, put to any legitimate use, much like real estate, subject only to restrictions on interference (with other's use of their property) and to the application of general business laws, such as the antitrust laws. Property owners could use normal legal channels and procedures to protect their property against interference "trespass", just as is true for real estate.

There would still be a role for the Federal Government in this system -- as the registrar of spectrum holdings (similar to land registries), as an owner of some of this property (parallel to the ownership by government of some real estate), and as the administrative agency that would deal with those instances of widespread interference that are not adequately handled through private enforcement (much as the Environmental Protection Agency is designed to deal with widespread "pollution" problems that involve real estate); but the principle of property would be at the center, as is true for real estate.

Though one could design a perfect "starting from scratch" property system, such a starting-over proposal would be unrealistic. But a good start could be made by immediately establishing property rights with respect to current spectrum allocations and then encouraging property owners to rationalize their holdings.

The FCC should continue its current program of auctioning spectrum and easing restrictions on auctioned spectrum and should move aggressively to establish property rights. But Congressional action is ultimately necessary for the "propertyzing" of the spectrum.

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"... spectrum is a national resource and the FCC is its steward, charged with assuring the efficient use of spectrum for the benefit of the American public." Susan Ness, Commissioner, Federal Communications Commission¹

I. Introduction

For the past century the telecommunications sector of the U.S. economy has been an arena of substantial technological change and improvement. In 1900 telephony was in its infancy, and the first over-the-air broadcast of human speech had yet to be made. By the end of the century, telephone, radio, and television were commonplace but highly valued parts of American lives, while both wireline- and spectrum-based telecommunications had become essential to all aspects of the business world.

Despite this cornucopia, however, the telecommunications sector has fallen substantially short of its potential. The advances could have been considerably greater and faster; the benefits to the American economy and its citizens' well being could have been considerably larger.

The reason for this shortfall has been the pervasive, restrictive government regulation of both wireline- and spectrum-based services. This regulation has impeded and delayed entry,

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¹ Ness (1999).

competition, and innovation. The cost to the American economy has been large.

This essay will focus on the regulation of the use of the electromagnetic spectrum.² All-encompassing federal regulation of the use of the spectrum³ has been ongoing since 1927.⁴ The concepts underlying that regulation -- the concept of "stewardship" expressed in the quote that began this paper -- have not changed fundamentally over these past 73 years.

It is time for a change; indeed, the time for a change is long overdue. The rationales for stewardship and for all-encompassing regulation that were offered in 1927 were not strong then;⁵ they have not grown any stronger with age.

There is a better way. I describe it with a new word: "propertyzing".⁶ By that I mean converting the current system of regulatory permits or licenses to use the spectrum into a full-fledged system of property rights -- ownership. The owners (including government owners) would have the complete ability to buy and sell, rent and lease, divide, aggregate, and modify their uses of the spectrum rights that they own, so long as their activities do not significantly impinge physically (i.e., electromagnetically) on others' uses of their spectrum rights (and so long as their activities

² Critiques of wireline regulation, from various perspectives, are numerous; see, for example, Noll (1989), Crandall and Flamm (1989), Crandall (1991, 1997, 2000), Brock (1994), Noll and Owen (1994), Keyworth et al. (1995), MacAvoy (1995, 1996), Crandall and Waverman (1996), Harris and Kraft (1997), Huber (1997), Hausman (1997), Kaserman and Mayo (1997), Kahn et al. (1999), White (1999b, 2000a), and Gordon (2000).

³ Technically, the electromagnetic spectrum encompasses all possible frequencies of electromagnetic waves. The radio spectrum encompasses the range from 30 Hz to 300 GHz. It is this latter range that will be the focus of this paper. For a broader, non-technical discussion of the spectrum and its uses, see Herter (1985).

⁴ Though federal involvement in the use of the spectrum predates 1927, it was in that year that federal regulation became all-encompassing.

⁵ For critiques, see Herzel (1951), Coase (1959, 1962), Hazlett (1990, 1997, 1998a, 1998b), Rand (1996), and Huber (1997).

⁶ The word "property-ized" does appear in De Vany et al. (1969).

conform with the general laws of the U.S. that affect all businesses).

This argument for establishing property rights in spectrum use is not new; it has been advanced for almost fifty years.⁷ It is often described as "privatizing" the spectrum. I have not used that term here because it seems to convey the idea that public ownership of spectrum is not part of the concept. That need not, and ought not, be the case. Public entities should be able to own spectrum, alongside private ownership of spectrum, just as public entities own land, buildings, vehicles, etc., alongside private ownership of the same types of property.⁸ Thus, "propertyzing" seems like a better description.

Throughout this essay I will employ the analogy of real estate and the property rights that attach to real estate; a system of property rights for real estate is generally accepted as a sensible way for our economy to encourage efficient use of a scarce and finite resource: land. This is an analogy that has been used frequently in discussions of the spectrum and its "management" and use.⁹ Its repeated use probably stems from the fact that land is familiar and tangible, while the spectrum is invisible and involves abstruse technical concepts.¹⁰ The repetition of the analogy does

⁷ The first argument in favor of a property rights approach to the use of the spectrum was apparently made by Herzel (1951). Subsequent arguments can be found in, for example, Coase (1959, 1962), De Vany et al. (1969), Minasian (1975), Hazlett (1990, 1998), Keyworth (1995), Thierer (1996a), Huber (1997), Shelanski and Huber (1998), Robinson (1998), Kwerel and Williams (1998), and De Vany (1998a, 1998b).

⁸ Indeed, it is the U.S. Navy that was among the first to realize the importance of spectrum-based communications. Of course, just as is true of other kinds of property, the public sector should be aware of the opportunity costs of the spectrum property that it holds and should behave (e.g., buy, sell, or lease) accordingly. The explicit development of property rights and the parallel development of markets for that property will surely make the opportunity costs of spectrum considerably more transparent.

⁹ It appears most frequently in critiques of FCC regulation. See, for example, Coase (1959), De Vany et al. (1969), Levin (1971), Minasian (1975), Huber (1997), Kwerel and Williams (1998), and Hazlett (1998b).

¹⁰ Chief Justice William Howard Taft is alleged to have explained his desire to have the Supreme Court avoid hearing a case involving the radio spectrum, as follows: "[I]f I'm to write a decision on

not dull its usefulness or validity as a way of thinking about spectrum and its uses.¹¹ Consider the following parallels:

- Land is finite; *the same is true of spectrum.*
- Productive land is "scarce"; *the same is true of spectrum.*
- Different types of land are often inherently better suited for different uses; *the same is true of spectrum.*
- Technological change can improve the efficiency of the use of land; *the same is true of spectrum.*
- Technological change can expand the amount of land that is considered usable and productive; *the same is true of spectrum.*
- Technological change can alter the uses to which land should economically be devoted; *the same is true of spectrum.*
- Changing economic demands (often intertwined with technological change) can alter the efficient uses to which land should be put; *the same is true of spectrum.*
- Some uses of land may interfere with neighboring uses of land; *the same is true of spectrum.*

It is the apparent weakness of this last parallel that marks the departure of spectrum from the real estate model. For real estate, with its centuries-long legal tradition of private ownership rights, potential problems with respect to interference in the use of land (e.g., trespass or pollution) are considered incidental and are handled without fundamental challenges to the notions of

this thing called radio, I'll have to get in touch with the occult." See Krattenmaker and Powe (1994, p. 33) and Barnouw (1966, pp. 257-258).

¹¹ The real estate analogy is criticized in Noam (1997, 1998a, 1998b) and is critiqued in Levin (1971).

property.¹² For spectrum uses, however, transmission interference has been considered fundamental and has provided the tried-and-true justification for the rejection of explicit property rights and for the adoption of a system of federal stewardship and all-encompassing regulation.

But there is another way to approach the interference problems of spectrum use and thus to approach spectrum use itself. It is a way that would be based on a system of ownership or property rights in the radio spectrum. The real estate analogy, as well as the pre-regulation experience, points strongly to the conclusion that a system of property rights in the radio spectrum could resolve interference problems satisfactorily (in the same way that the owners of real estate resolve their potential interference problems) while providing a far more flexible and responsive mechanism for allocating spectrum to its most efficient uses. That is what this paper will be about.

There is a converse way of seeing the advantages of a property rights approach for spectrum: Imagine that all real estate in the U.S. was effectively owned and managed by the Federal Government "in the public interest"; imagine further that the federal Government made land available to private users only through fixed-term leases that narrowly specified the uses to which the land could be put and even the other inputs that could be used. Any realistic assessment of this (fortunately) counter-factual scenario would conclude that, despite its best efforts, the Federal Government could not hope to allocate real estate use and users in a way that would efficiently meet the varied and changing demands of the U.S. economy. The inefficiency of such an effort would be glaringly apparent. Unfortunately, it is just such a system that currently applies to the use of the spectrum.

Recent reforms by the Federal Government, including auctions of under-utilized bands of spectrum and greater flexibility in use that is granted for the winners of these spectrum auctions, are welcome improvements over past rigidities. But the basic legal and philosophical approach to the

¹² In addition, a legal framework to deal with the invisible "air rights" above real estate parcels has also been incorporated into the property system.

spectrum -- that the Federal Government must manage the spectrum "in the public interest" -- has remained unchanged. It is this basic approach that needs a fundamental alteration, so that the new flexibility can be extended throughout the range of spectrum uses and the flexibility and efficiencies that follow from it would have a secure and permanent base.

This paper will proceed as follows: Section II will describe briefly the theory and practice of government regulation of the spectrum and provide a critique of the actual processes of regulation. Section III will describe at greater length the property-rights approach advocated in this paper and its advantages and will offer suggestions for how to move toward a property-rights system. It will also address potential objections to the property rights approach. Section IV will provide a parable that will try to imagine what the U.S. economy would look like if the Federal Government had tried to own and manage all real estate use. Section V will offer a brief conclusion.

II. Regulation of the Spectrum

A. The rationale, and the process.

From the early 1900s to the present day the basic problem of using the spectrum has been seen as that of interference: One party's transmission use of the spectrum at a particular time, in a particular place, and over a particular portion of the spectrum can be easily interfered with by another party's use at the same time, in the same place, of the same spectrum band.¹³ The Congressional response in the Radio Act of 1927¹⁴ was to declare that the spectrum was the property of the entire American people, that any user had to renounce or forswear any ownership claim to the spectrum, and that any use of the spectrum had to be in "the public interest, convenience, or necessity." To administer the granting of rights to use the spectrum, the Act created the Federal Radio Commission (FRC). Seven years later the Communications Act of 1934 kept the same philosophy and approach to spectrum use and management and replaced the FRC with the Federal Communications Commission (FCC).¹⁵

Since the FRC and (subsequently) the FCC assigned spectrum to users at a zero price, excess demand for the bands of the spectrum that were technologically capable of productive use quickly developed and has persisted to the present. This persistent "shortage", "scarcity", or

¹³ Interference can also occur from transmissions originating in neighboring geographical locations, from transmissions in neighboring spectrum bands, and from incidental or accidental sources, such as sun spots and atmospheric disturbances, electrical motors, harmonic band interferences, etc. See Levin (1971).

¹⁴ Even before the Radio Act of 1927, the Congress had enacted the Radio Act of 1912, established a licensing regime and lodged the licensing powers within the Department of Commerce. See, for example, Bensman (2000).

¹⁵ The 1934 Act also added wireline regulatory responsibilities to the FCC's mandate. The FCC is a five-person "independent" agency, whose members are nominated by the president and confirmed by the Senate and who serve fixed (overlapping) terms of five years.

"drought"¹⁶ of productive spectrum¹⁷ has become a second rationale for the regulatory allocation processes,¹⁸ as well as the justification for the Congress's and the FCC's imposition of content obligations on radio and television broadcasters that would otherwise (e.g., if applied to newspapers or other print media) be considered to be violations of the First Amendment.¹⁹

For the past seventy-three years, then, the basic philosophy of the Congress, as expressed through the FRC and then the FCC, has been that the spectrum is and must remain the property of the government (as trustee or steward on behalf of the American people) and that it must be "managed" in the "public interest".

The process of managing the spectrum entails a four-step procedure:²⁰

1. Allocation. The FCC decides what type of use will be allowed on a particular block or band of spectrum.²¹

2. Service rules. The FCC defines the parameters of service -- e.g., transmitter power.

3. Assignment. The FCC grants a license to a specific party to operate a transmitter over a specific frequency band at a specific location at specific times under the conditions that are

¹⁶ See Kennard (2000) and, more generally, FCC (1999, 2000b).

¹⁷ It should not be surprising that the under-pricing of water allocations from federal dam and irrigation projects, combined with the absence of developed and transferable property rights, has led to similar claims of shortages. See, for example, Bain et al. (1966).

¹⁸ See National Broadcasting Company v. United States, 319 U.S. 190 (1943).

¹⁹ See Red Lion Broadcasting Co. v. Federal Communications Commission, 395 U.S. 367 (1969). See also Krattenmaker and Powe (1994) and Powe (2000). For a recent effort by the Chairman of the FCC to "lean on" the broadcasting industry with respect to content obligations, see Kennard (2000b).

²⁰ See Hatfield (1999) for a recent explication of this four-step process; see also Jackson (1989).

²¹ The National Telecommunications and Information Agency (NTIA) periodically publishes a "U.S. Frequency Allocation Chart", which graphically shows the use allocations of the various spectrum frequency (or wave length) bands.

specified in the service rules.²² The license lasts for a specified time (e.g., television station licenses currently have eight-year terms), with the possibility of indefinite renewals. The FCC may refuse to renew the license if it determines that such renewal is not in the public interest; it rarely does. The FCC may also refuse to allow the assignment or transfer of control of a license if it determines that such assignment or transfer of control is not in the public interest; it rarely does.²³

4. Enforcement. The FCC enforces its allocations, service rules, and assignments, so as to ensure that its management is effective, including the prevention or minimization of interference among transmitters.

Though all four steps are crucial to the management process, it is the assignment step that has often received the most public attention. Until the early 1980s the FCC made its initial assignments (where there was more than one claimant) on the basis of comparative hearings, in which the suitability of the parties to use the spectrum "in the public interest" was supposed to be the deciding factor. Once a license was granted, an incumbent's renewal was usually automatic, although exceptions did arise. Licenses were always granted at a zero price.

This process collapsed of its own weight in the early 1980s, as the FCC prepared to assign licenses for cellular telephone service. The FCC was swamped with applicants and realized that the traditional comparative hearing process would greatly delay the assignments. The Congress came to the FCC's rescue by authorizing lotteries for the licenses, which could be conducted rapidly (after quick determinations of minimum qualifications by applicants).

The lotteries were duly conducted. The subsequent realization that the lottery process was

²² Also, sizable amounts of some spectrum bands have been set aside for government use. The NTIA, which is part of the Department of Commerce, is charged with coordinating spectrum use within the federal government.

²³ However, it is increasingly common for the FCC to extract "voluntary" concessions from license holders that wish to assign or transfer their licenses in a merger context. See May (2000).

arbitrary (or, expressed less charitably, even more arbitrary than the comparative hearings) and that many lottery winners simply "flipped" their licenses and earned large profits on the licenses' scarcity values caused the FCC and the Congress seriously to begin considering auctions of spectrum assignments as yet another method of assignment.²⁴

In 1993, spurred at least partly by the prospects that spectrum auctions could yield substantial revenues for the Federal Government at a time when budgetary deficits were still a major concern, the Congress authorized the FCC to hold spectrum auctions. As of August 1, 2000, the FCC had held 28 auctions that had yielded almost \$24 billion in revenues.²⁵ More auctions are planned.

B. A critique of the current regime.

In a perfect world, with an omniscient government, the processes described above would work quickly, smoothly, and efficiently. The FCC would identify the best uses, best technologies, and best users, and would make the appropriate allocations, service rules, and assignments. New and better uses, technologies, and users would be identified and accommodated quickly. The spectrum would be put to its best use at all times.

That is the ideal. The reality has been something else. All too often the FCC has discouraged competition, favored incumbents over entrants and innovators, and been slow to

²⁴ Proposals for spectrum auctions date from the 1950s, and legislation was introduced (but not passed) in the late 1970s. But incumbent holders of spectrum licenses, who received their allocations for free, fiercely opposed the idea of auctions.

²⁵ These results are calculated from the data that can be found on the FCC website at www.fcc.gov/wtb/auctions/. As Hazlett (1998a) correctly cautions, the sums generated from auctions ought not to be the measure of the success of a spectrum auction. If a sufficient amount of spectrum were auctioned to multiple winning bidders so that there was little scarcity value that attached to an auctioned spectrum license, the revenues gained from the auction might be quite small; but social surplus from the widespread use of that spectrum could be quite high.

embrace new technology -- all the while claiming that its decisions and actions were "in the public interest". Its decision processes have sometimes stretched for years; court appeals have extended decision periods even longer. Competing claimants have spent large sums trying to convince the FCC and/or the Congress of the wisdom of their positions.

In this process, the general public has been the loser. For example, in the early 1950s, in the name of encouraging a local orientation for television channels, the FCC assigned channels in a way that made nearly impossible the formation of more national networks beyond the three incumbent national networks. In the 1960s and 1970s, again in the name of localism (i.e., the protection of incumbent local television stations), the FCC impeded the expansion of cable television as a means of bringing more programming to local areas. In the 1980s and 1990s the FCC and the Congress impeded the expansion of locally based ("wireless cable") and satellite-based ("direct broadcast satellite") alternatives to incumbent local cable companies.

In the arena of cellular telephone the FCC delayed the initial roll-out of cellular telephone service by 10-15 years, and then licensed only two carriers per region. Further, the FCC also insisted that one of the two carriers in the large metropolitan areas (where the service was finally initiated in the early 1980s) be the local wireline telephone company, which reduced the competitive pressures that cellular telephone would be likely to bring on the local wireline carrier. This delay of cellular roll-out has been estimated to have reduced U.S. economic welfare by at least \$86 billion (measured in 1990 dollars).²⁶ And FCC's national allocation patterns of spectrum for mobile radio uses have meant, for example, that forestry communications allocations have lain idle in New York City, while its allocations of spectrum for taxicab communications have been idle in Idaho.²⁷

²⁶ See Rohlfs et al. (1991). Of the total, about 3/4 is reduced consumer satisfaction; the remainder is reduced producer profits.

²⁷ As another example, a large swath of "high-quality" spectrum is assigned to the nation's public schools and has largely lain idle. See Wigfield (2000).

These errors have not been caused by clumsiness or stupidity. The FCC has been, is, and will continue to be staffed by knowledgeable, able, hard-working individuals, with capable leadership.²⁸ But the task is impossible. Gathering all of the necessary information, processing it, and making the right decisions, expeditiously -- and then doing it again and again, as technology and/or economic conditions change -- is simply not possible for any organization with respect to any efforts to "manage" something as extensive and technologically complex as the spectrum. Further, a cautious, bureaucratic environment with constant political pressures is not one that would generally encourage innovation and pioneering.

Extensive lobbying -- of the FCC and the Congress -- has compounded these problems. With licenses distributed for free, incumbent license holders often have an extremely valuable privilege that they are understandably reluctant to see undermined. Hence, they are prepared to lobby vigorously to preserve the status quo and defeat, or at least delay, competitive change. Proponents of change, of course, also engage in extensive lobbying. But they usually have less to gain than the incumbents have to lose.²⁹ Often, the mutual lobbying effort is just a substantial waste of companies' money and talented individuals' time. But when the incumbents have achieved delay or defeat of the challengers, the true losers have been the American public, which has been denied the more rapid enjoyment of improved telecommunications services at lower prices.³⁰

²⁸ Part of the inspiration for the current system of auctions and of the greater flexibility of the FCC in some areas came from the research and writing of FCC employees. See, for example, Kwerel and Felker (1985), Webbink (1987), Kwerel and Williams (1992, 1993), Rosston and Steinberg (1997), and Kwerel and Rosston (2000).

²⁹ It is a well-understood antitrust concept that a monopolist that faces potential challengers should be willing to spend more to deter the challengers, so as to protect its monopoly profits, than the challengers should be willing to spend to gain entry, since the challengers would expect a more competitive environment and thus a lower level of profits.

³⁰ Similarly, when technological change has allowed new bands of spectrum to be devoted to productive uses, contending parties for the spectrum have created lobbying battles.

The irony -- indeed, the tragedy -- in all of this is that it need not have happened. At the time that the Radio Act of 1927 was being considered, an Illinois court had adjudicated the issue of interference.³¹ The court recognized a broadcaster's property right in using the spectrum, and the decision used established principles of tort law to protect that right.³² It seems quite likely that courts -- perhaps aided with some clarifying federal legislation³³ -- could have satisfactorily developed principles and precedents that would have recognized property rights in spectrum use, including the protections against interference that would naturally attach to a property right. The Radio Act of 1927 preempted this development, substituting the federal stewardship model and all-encompassing regulation. The rest is history.

Finally, the claim that the FRC/FCC stewardship has meant that there have been no private ownership rights with respect to the spectrum is at best only a half-truth.³⁴ The companies that have been granted the FCC's licenses have clearly possessed something of substantial value. Though spectrum itself, or even the FCC's licenses, could generally not be bought or sold,³⁵ the companies that had the licenses could themselves be bought and sold.³⁶ It has been estimated, for example, that

³¹ That decision was Tribune Co. v. Oak Leaves Broadcasting Station (Circuit Court of Cook County, Ill), reprinted in the Congressional Record, December 10, 1926, pp. 215-219.

³² See Hazlett (1990).

³³ See Krattenmaker and Powe (1994, pp. 16-17).

³⁴ Section 301 of the Communications Act provides that "It is the purpose of this Act... to maintain control of radio transmission; and to provide for the use of such channels, but not the ownership thereof, by persons for limited periods of time, under licenses granted by Federal authority, and no license shall be construed to create any right beyond the terms, conditions, and period of the license."

³⁵ For a discussion, see Fishman (1997).

³⁶ Formally, FCC approval has been necessary for such transfers; it has almost always been granted, although it is increasingly common for the FCC to use its authority under the (vague) public interest authority to extract "voluntary" concessions from license holders that wish to assign or transfer licenses in a merger context. See May (2000).

over 70% of the current owners of television stations are not the entities that originally received the licenses from the FCC.³⁷

The sales prices of spectrum-license-rich companies have largely reflected the scarcity value of those licenses. During the 1980s and 1990s the three large broadcasting networks were bought (and two of them were bought a second time): NBC was bought by General Electric; CBS was bought by Westinghouse, and again by Viacom; ABC was bought by Capital Cities and again by Disney. The purchase prices in each case ran to tens of billions of dollars. These prices were largely reflections of the scarcity values of the TV and radio stations owned directly by these networks plus the value of the network affiliation systems -- themselves much the product of artificial scarcity.³⁸

Similarly, during the 1980s and 1990s, cellular "properties", largely consisting of the FCC licenses, were sold and resold for large sums. Craig McCaw accumulated a cellular empire in this fashion; he then sold it in August 1993 (for \$12.6 billion) to AT&T.³⁹ The Nextel Corporation (in its earlier guise as Fleet Call) was able to build a cellular network by buying others' properties, including companies with different licenses that could (with special FCC permission) be converted to cellular service.

In essence, the recipients of licenses have possessed zero-price leases, with near-automatic renewals, for the use of a valuable resource. Though the possession of a long-term, transferable lease is not the same thing as outright ownership, these leases have had great value. The possessor of a lease could take advantage of this value directly (i.e., by engaging in the allowed services), or could capitalize this value by selling the lease or the entity (the company) that was the nominal

³⁷ See De Vany (1998a, 1998b).

³⁸ More recently, the News Corp. agreed to buy Chris-Craft Industries, whose primary assets were ten television stations, for \$3.5 billion. See Fabrikant (2000).

³⁹ See Corr (2000).

possessor of the lease. The recipient of a lease "owns" "something" that could be (and has been) sold, indirectly and imperfectly, for large sums; the possession of the lease is a form of property, with specified rights.⁴⁰ From the time of the first sale of a radio station in the 1920s, there has been and continues to be a secondary "market", albeit indirect and imperfect, in access to the spectrum.⁴¹

A system of making the ownership rights explicit would be far preferable, as will be discussed in Section III.

C. Recent reforms.

The 1990s have seen reforms in the FCC management approach. The most notable of these were the spectrum auctions that began in 1994. These have been widely acclaimed as an improvement over the comparative hearings and lotteries that preceded them.⁴² Especially in the area of personal communications services (PCS), the auctions have clearly been instrumental in expanding mobile (i.e., cellular and PCS) telephone service; by mid 1999 the number of mobile telephone subscribers was over 76 million.⁴³

The winners of the auctions have been granted considerable flexibility in the types of uses to which they can put their licenses, as well as in their ability to aggregate licenses into larger

⁴⁰ These ideas are expanded in Shelanski and Huber (1998) and Robinson (1998).

⁴¹ Consistent with its view that the license confers no ownership rights in the spectrum, the FCC for many years has maintained policies that prohibit the sale of a "bare" license (for example, a license for a yet-to-be-constructed station); to allow such sales would be to acknowledge more directly that the license itself is an asset that could be bought or sold like any other. See Fishman (1997).

⁴² For discussions, see McMillan (1994, 1995), McAfee and McMillan (1996), Kummel (1996), Cramton (1997, 1998), Ausubel et al. (1997), Cramton et al. (1998), Moreton and Spiller (1998), Bykowsky et al. (2000), Cramton and Schwartz (2000), Kwerel and Rosston (2000), and Salant (2000); for a more personalized account, see Hundt (2000).

⁴³ See FCC (2000a).

systems or networks. Further, the FCC has tolerated rudimentary secondary markets in spectrum use and has been more inclined to grant flexibility to licensees.⁴⁴

Nevertheless, despite the auctions and the new-found flexibility, the approach and mindset of the FCC and of the Congress is still one of managing the use of the spectrum.⁴⁵ The new tools are being used to help the FCC manage the spectrum a little better; but FCC management is still the fundamental concept. Current applicants for new services and the use of new technologies are still experiencing delays and frustrations with the FCC's processes.⁴⁶ The vast amounts of past allocations and assignments of spectrum use by the FCC remain tightly bound within the FCC's management framework. Incumbent holders of valuable FCC licenses greatly benefit from the present system and generally resist change.

That the current Chairman of the FCC could recently speak of a spectrum "drought" and simultaneously embrace secondary markets for spectrum and improved management of the spectrum by the FCC speaks mountains as to the current mindset of the leadership of the FCC.⁴⁷

There is a better way. It is a system based on property rights in spectrum use. We now turn to a description of that system.

⁴⁴ Discussions of this recent flexibility can be found in Rosston and Steinberg (1997), Kwerel and Williams (1998), Shelanski and Huber (1998), Robinson (1998), Labaton (2000), and FCC (1999, 2000b).

⁴⁵ This is true of the Executive Branch as well. When President Clinton ordered federal agencies to review their spectrum uses and to release idle swaths for auction, it was still in the context of the Federal Government's management of the spectrum. See Labaton (2000).

⁴⁶ See FCC (1999) and FCC (2000b).

⁴⁷ See Kennard (2000a).

III. A System of Property Rights for Use of the Spectrum

This section will describe a system of property rights in spectrum use that would replace the current system of FCC management. I will first describe an ideal or "clean slate" version that would be the one to implement if we were starting with no previous assignments or incumbents; it is useful as a benchmark and as the goal toward which any property rights system should aim. I will then describe a more practical alternative, which starts with the current system of FCC assignments but redefines them as property rights and eventually reaches the same (or close to the same) outcome as the clean slate system. The advantages of a property-rights system for spectrum use, as compared to the current system, will be discussed. Potential objections to a property rights system will be addressed. And the real estate analogy will be revisited and extended.

A. An ideal system of property rights in spectrum use.⁴⁸

The property right to the use of the spectrum should be defined in terms of a specified spectrum frequency band, a specified geographic area, a specified permitted maximum strength of the signal beyond the boundaries of the geographic area, and a specified time period. The property right (in perpetuity) would be expressed as the right to transmit over the specified spectrum band, so long as the signals do not exceed a specified strength (expressed in volts/meter) beyond the specified geographic boundaries during the specified time period (which could be the full 8,760 hours in a year or any sub-division of those 8,760 hours).⁴⁹ As part of that property right, the owners of such spectrum-band/area/beyond-perimeter-signal-strength-limit/time-period "parcels"

⁴⁸ This section draws heavily on De Vany et al. (1969); see also Minasian (1975) and Kwerel and Williams (1998).

⁴⁹ The source of the transmission need not be specified; it could be fixed or moving, from a ground-level transmitter or from a tower or from a satellite.

would have the right to be free from others' transmissions that interfered (i.e., exceeded the specified beyond-the-boundary signal strength) with the reception of their own spectrum transmissions within their own specified area during their specified time. Owners (which would include government agencies) of parcels would be free to sub-divide and to buy and sell parcels so as to create aggregations over areas, spectrum bands, or time periods, so long as they did not thereby create interference for owners of other parcels and so long as their actions were otherwise consistent with the other laws that affect business transactions, such as the antitrust laws.⁵⁰

In a "clean slate" approach, an interim "expert" agency would initially determine the entire set of spectrum-band/area/beyond-perimeter-signal-strength-limit/time-period "parcels", which would then be distributed to their user-owners in some fashion. Auctions would achieve the quickest movement of the parcels into the hands of those who were most likely to put them to the highest value uses. But, so long as owners of the parcels were free to buy and sell, etc., almost any distribution system would eventually achieve the desired goal.⁵¹ Auctions would tend to reduce the extent of subsequent negotiations and transactions, thereby reducing transactions costs and time delays and improving the initial efficiency of the distribution system.

The expert agency could well decide that the initial parcels might not be uniform but could have different spectrum bandwidths, geographic areas, and beyond-boundary signal-strength limits, so as to make the best use of the differing properties of the various portions of the spectrum. Fortunately, with private ownership rights attached to these parcels, the owners could reconfigure

⁵⁰ Owners would have the right not to use their parcels, as is true for owners of real estate. Non-use of a spectrum parcel would make sense if, for example, spectrum use requires investment in complementary facilities and the owner expects that technological change or uncertainty concerning technological standards could render current investments obsolete.

⁵¹ However, any distribution system that is not fee-based would involve financial windfalls for the recipients. In that sense, the auction system would be fairer; the windfalls instead would accrue to the general population (via the federal government).

the parcels and renegotiate beyond-boundary signal-strength limits among themselves.⁵² And, of course, as new technologies opened new possibilities and/or as economic demands for spectrum-use changed, the owners of parcels would be free continually to reconfigure the parameters of their parcels. Formal and/or informal spectrum markets, with brokers and other intermediaries, would surely develop rapidly to help owners buy, sell, lease, etc.

Claims that another transmitter was encroaching on (interfering with) the transmission rights of a parcel holder could be settled through private negotiations among the parties and then, if negotiations failed to settle the dispute, be adjudicated in the courts.⁵³ In instances where the numbers of interferers and/or the numbers of encroached-upon parcel holders were large enough that private enforcement through the courts was considered too costly and burdensome, alternative mechanisms -- government enforcement of the private transmission rights, administrative methods for dealing with "polluting" transmissions from multiple incidental sources (such as high voltage lines, motors, etc.), perhaps even "zoning" of bands or areas -- might be developed. In instances where a governmental administrative agency is involved, the agency's goals and methods should be clearly articulated: the goal should be that of promoting economic efficiency (as exemplified through benefit-cost tests), and its methods wherever possible should have a market orientation, such as the effluent fees and tradable permits that can be used for dealing with pollution problems generally.⁵⁴

As was mentioned above, government agencies would be expected to be among the parties that would bid for and become owners of spectrum. Thus current government/public uses of

⁵² Again, the closer that the expert agency initially came to the end result, the less would be the interim transactions costs of the parcel owners in re-configuring their parcels.

⁵³ Because problems of interference would often extend across state lines, the adjudications would best be handled by the federal court system. See Krattenmaker and Powe (1994, p. 17).

⁵⁴ See Hahn (1989).

spectrum -- public radio and TV broadcasting, defense and public safety communications, emergency communications channels, open forum (e.g., "citizen's band") channels, radio astronomy, etc. -- would continue, so long as taxpayers found these uses sufficiently worthwhile that they were willing to fund the programs that would be necessary to purchase and maintain the spectrum facilities (just as they make decisions with respect to the maintenance of schools, parks, police and fire protection services, etc.).

To facilitate transactions and to assist in the enforcement of property rights, a national registry of spectrum ownership would be maintained, comparable to local land registries. This registry would help buyers and sellers identify potential counterparts and would aid in the identification of interferers.⁵⁵

In sum, this ideal system would look much like the current system of property rights that apply to real estate.

Under this property rights approach, the owners of spectrum could flexibly adapt their uses - - for broadcasting, telephone, data transmission, Internet, mobile radio, and any new uses that might arise -- to new technologies and new economic demands, as they arose. The concept of a spectrum "drought" would be an impossibility. Artificial scarcities could not exist.⁵⁶

There is no guarantee that the system of property rights and markets for spectrum use would always reach the outcomes that, in retrospect, could be seen to be the most efficient. Entrepreneurs do make mistakes; markets are not perfect. But a system of property rights and markets for spectrum would be far less likely to have the sluggishness and bias toward incumbency and

⁵⁵ An argument against a registry would be the claim that spectrum should be considered more in the category of printing presses than of land.

⁵⁶ This would eliminate the justification for the First Amendment restrictions that have been imposed on broadcasting. See Red Lion Broadcasting Co. v. Federal Communications Commission, 395 U.S. 367 (1969). See also Krattenmaker and Powe (1994) and Powe (2000).

discouragement of innovation that has characterized the FCC's seven decades of stewardship and all-encompassing regulation of the spectrum. The gains from the replacement of regulation with a greater reliance on market decisions for a number of industries between the mid 1970s and the late 1980s were sizable.⁵⁷ The same would surely be true for the use of the spectrum.

With the FCC (and the Congress) removed from the processes of spectrum allocation, radio and television over-the-air broadcasting, cable transmission, local microwave (wireless cable) transmission, and satellite-based transmission would be unleashed to compete, with beneficial results for the American public. Similarly, cellular telephone and other mobile communication services would be freed from regulatory shackles; an even greater cornucopia of competitive innovations would surely follow. The American public would be the beneficiary.

There would still be a role for a national spectrum agency,⁵⁸ even after the interim expert agency had completed its task of the initial allocation of spectrum parcels. The national spectrum agency would be the maintainer of the national registry; would be the administrator of any national enforcement efforts to deal with the interference problems that are not adequately handled through individualized enforcement (similar to the role of the Environmental Protection Agency in limiting pollution, albeit with a limiting benefit-cost mandate); would be the coordinator of the Federal Government's holdings of spectrum; would be the negotiator for the United States in international negotiations with respect to spectrum use (e.g., in dealing with coordination and interference issues in the International Telecommunication Union [ITU] and in dealing with trade issues, along with the U.S. Trade Representative, in the World Trade Organization); and could serve as a vehicle for

⁵⁷ See Winston (1993, 1998). In one instance, the deregulation of the savings and loan industry, social losses were substantial. But the economic deregulation in that case failed to strengthen -- and even weakened -- the safety regulation that was necessary; see White (1991, 1993).

⁵⁸ It might be the case that these responsibilities would be too diverse to be housed within a single agency.

encouraging the coordination on technical standards that is often desirable in network industries.⁵⁹

B. How to Start.⁶⁰

It would be virtually impossible to impose the above-described ideal system on the current spectrum system. The FCC has assigned tens of thousands of licenses. Many current license holders bought their licenses through the imperfect "secondary market" mechanisms described in Section II. There are many tens of billions of dollars of investments in facilities, equipment, personnel, and brand-name reputation that surround those licenses. Starting over with a clean slate is not realistic.

But we can start from where we are today. The FCC's licenses constitute a set of de facto properties, with protections against interference. Unfortunately, the licenses are often defined in terms of inputs (the power of a transmitter, the height of the transmitting tower) than in the output terms of a signal's strength beyond a territory perimeter. Nevertheless, these licenses should simply be assigned, as is,⁶¹ to their incumbent holders in perpetuity, with the existing protections against interference.⁶²

⁵⁹ See, for example, Besen and Farrell (1994), Katz and Shapiro (1994), Economides and White (1994), Economides (1997), and White (1999a, 2000b).

⁶⁰ The approach here is similar in spirit and in some of the content that can be found in Keyworth et al. (1995) and De Vany (1998a) and in the draft legislation that Senator Larry Pressler circulated in May 1996; see Thierer (1996b).

⁶¹ Existing obligations with respect to spectrum assignments should be honored; this would include the television broadcasters' obligation to yield their original spectrum assignments back to the FCC after they are broadcasting digitally on the new spectrum that was granted to them in the mid 1990s.

⁶² Though aggressive actions by a "propertyzing" minded FCC could surely move spectrum policy strongly in the directions that I indicate in the text, ultimately the Congress would have to make substantive changes in the Communications Act. This was the pattern that was followed in the deregulation of the airlines. See, for example, Kahn (1998).

The owners of these licenses could then sub-divide, buy, sell, lease, etc., as under the "ideal" system described above. Further, they could begin to adjust their input combinations, so long as they did not violate the interference restrictions that are implicit in the license, or they could negotiate mutually advantageous arrangements with transmission "neighbors". Interference disputes that could not be settled by negotiation would, during an initial transition period, be referred to the FCC for quick adjudication and resolution.⁶³ Through this process of adjustment the input-based license system could be transformed into a beyond-boundary signal-strength limit system of property. The FCC could hasten this process by offering (quickly) to redefine the input-oriented licenses into roughly equivalent output-oriented licenses. After the transition period, disputes would be referred to the courts rather than to the FCC.

Bands of spectrum that are currently under-utilized should be auctioned, following the pattern established by the recent FCC auctions.⁶⁴ However, even under-utilized spectrum bands have some incumbents that have to be accommodated in some fashion: moved to another spectrum band, or paid off. Past auction winners have (knowingly) borne the burden of these negotiations, which has slowed the new utilization of the auctioned spectrum, as well as raising transactions costs. The FCC has considered the possibility that future auctions would also include a separate auction to determine which of the current incumbents is willing to be accommodated at the lowest cost.⁶⁵ This "double-sided auction" ought to be a feature of all future spectrum auctions. The double-sided feature would allow auctions to be extended much farther into the range of

⁶³ Keyworth et al. (1995) suggest an arbitration system.

⁶⁴ Auctions for portions of the spectrum that are currently heavily used are unrealistic. Current holders of spectrum licenses recognize that those licenses have great value and would not readily relinquish them, only to have to buy them back. Further, as was noted above, many current holders of licenses have already paid for them indirectly, by buying the companies that owned the licenses. That is why a simple grant of the property to them seems best.

⁶⁵ See Cramton et al. (1998) and Cramton (2000).

"inhabited" spectrum. However, auctions should not be seen as "magical" transformers of spectrum. Instead, as was discussed with respect to the ideal system, they are primarily a way of reducing the time and subsequent transactions costs of assembling efficient spectrum parcels, as well converting private windfalls into general government revenue.⁶⁶

Further, though government agencies would receive the same property rights to their currently held spectrum licenses as would other holders, the Congress ought to require the agencies (federal and other) to make a special evaluation of their spectrum inventory and to place the surplus on the market.⁶⁷ The Congress succeeded in the late twentieth century in legislating disposals of surplus military real estate (army, navy, and air force bases); it should do the same with respect to surplus spectrum in the early twenty-first century. The market prices for spectrum that will quickly emerge from the property system that we have described will provide a valuable benchmark for the Congress and spur disposal decisions. Auctions should be the disposal method chosen.

As was true for the ideal system, a national registry for spectrum ownership should be established,⁶⁸ to help buyers and sellers identify potential counterparties and to help property owners identify interferers.

In sum, after the transition period, this starting-from-where-we-are-today approach would

⁶⁶ Spectrum auctions in the context of full property rights should yield higher prices than when the potential uses of the spectrum are limited. Conversely, when auctioned spectrum allows some flexibility but not complete flexibility, the winners then have an incentive to return to the FCC to try to get the rules changed to allow greater flexibility. As a consequence, the highest bidder may be the party that is most optimistic about getting the rules changed and not necessarily the most efficient user.

⁶⁷ The government currently holds a claim on about a third of the usable spectrum, which appears to be substantially in excess of what it needs. See Keyworth et al. (1995). In October 2000 President Clinton ordered all federal agencies to assess their spectrum needs and to make unneeded spectrum available for auction. See Labaton (2000b).

⁶⁸ Surprisingly, despite the FCC's stewardship model, it does not maintain a readily accessible roster of all licensees. See FCC (1999).

yield a property rights system that would be reasonably close to the ideal system sketched above, with the flexibility and adaptability advantages that were described there.

In this approach, the FCC and the NTIA (or a combined or successor agency) would play key roles in the transition: The FCC would continue to hold spectrum auctions and would help define property rights and adjudicate disputes; the NTIA would lead the effort to rationalize the Federal Government's holdings of spectrum. After the transition, the two agencies could split between them the duties described for the ideal system; and the FCC would retain its wireline regulatory responsibilities.

C. Potential objections.

The following are nine likely objections to a property rights system for spectrum use, with rebuttals.

1. With a property ownership system for the spectrum, the "public interest" would no longer be served.

The "public interest" with respect to the use of the spectrum is a vague, ill-defined concept.⁶⁹ Under the "public interest" banner the Congress and the FCC have established far too many protectionist, anti-competitive, anti-innovative, inflexible, output-limiting regulatory regimes and have unnecessarily infringed on the First Amendment rights of broadcasters. This is a sorry record that has not served the general public well.

Under the property rights system that has been described in this paper, governments would still have the ability to own and use spectrum parcels in ways that taxpayers felt were worthwhile, including defense and public safety, public broadcasting, etc., in the same way (and subject to the same constraints) that public agencies can own and use other forms of property.

⁶⁹ See, for example, Krattenmaker (1994), Krattenmaker and Powe (1994), Hazlett (1997), Krasnow and Goodman (1998), and May (2000).

2. A property ownership scheme would mean a give-away of a vast and valuable national resource.

As was argued in Section II, the FCC has already given away most of the usable spectrum through its licenses, with their near-automatic renewals. It is unrealistic to believe that incumbent holders of these licenses would readily yield them back to the Federal Government at zero cost. This is especially true since many current holders of spectrum licenses bought them in imperfect "secondary" markets by buying the companies that held the licenses and thereby paying the scarcity value for the licenses. Spectrum auctions of relatively vacant spectrum can still help yield revenues for the national fisc, as well as reduce the transactions costs of assembling spectrum parcels. But the myth that all of the spectrum is still effectively owned and controlled by the Federal Government, as the trustee for the American people, is just that.

3. Under a property rights system, only the wealthy would own and use the spectrum.

The current holders of FCC licenses -- including large corporations such as General Electric (NBC), Viacom (CBS), Disney (ABC), AT&T, Sprint, Nextel, Verizon (Bell Atlantic), SBC -- are not exactly the meek and the poor. The FCC stewardship and licensing system has in fact meant severe limitations on general access to spectrum use, and the limitations have favored rich individuals and sizable companies.

By contrast, a system of spectrum property rights would cause spectrum to look much like real estate: Smaller units of spectrum would be available to anyone who could pay the market price. Though spectrum ownership would surely mimic the distribution found for other kinds of property -- richer individuals would own more -- nevertheless a property rights system would mean an opening-up and democratizing of this valuable resource as compared to the current system.

4. Under a system of ownership rights, large corporations would buy large blocks of spectrum and acquire monopoly positions in telecommunications.

The antitrust laws would apply to spectrum markets, just as they apply to most other

markets in the U.S. The Clayton Act's prohibitions on mergers and acquisitions (including spectrum acquisitions), where their effects "may be substantially to lessen competition, or to create a monopoly", would apply and would be enforced by the U.S. Department of Justice's Antitrust Division and/or the Federal Trade Commission.

5. Under a system of property ownership, public uses of the spectrum would be eliminated.

Again, government agencies' ownership of spectrum parcels would be expected, just as government agencies own other types of property.

6. Since the spectrum is finite and scarce, government management and allocation is necessary.

All useful resources are scarce: They command positive prices in exchanges between suppliers and demanders; equivalently, at a zero price there would be shortages (demand would exceed supply). And land and other minerals are specifically finite. Nevertheless, the U.S. economy is organized around the general principle that private ownership and decision-making with respect to resources yields the best outcomes. Spectrum is fundamentally no different.

The past policies of the Congress and the FCC have meant that zero prices have been charged for the licenses to use the valuable spectrum resources. It is not surprising that there would be perceived "shortages" or a "drought"⁷⁰ of spectrum at a zero price. But these false shortages, created by misguided policies, should not in turn be used as a justification for continuing those policies.

7. The interference problems of spectrum use can be solved only through government management of the spectrum.

A system of properly defined property rights in spectrum use would provide the primary basis for restricting interference. Government would still play a secondary role, through

⁷⁰ See Kennard (2000).

individuals' use of the courts to enforce their property rights against specific interferers and individuals' reliance on law enforcement agencies for general protection against interferers. Government would also play a role in dealing with more widespread "pollution control" and "zoning" issues as they might apply to spectrum (albeit a far more limited role than that of the FCC and one that would be guided by efficiency and benefit-cost principles).

This is broadly the system that applies to and works well for real estate. It would work well for spectrum use as well.

8. Since spectrum uses extend across national boundaries, government management of spectrum is necessary to achieve international coordination and harmonization.

Much spectrum use involves local transmissions that have minimal consequences across national boundaries. For those spectrum uses that could have international consequences, some international coordination is needed to minimize interference problems. But that coordination does not require domestic management of spectrum by the government.

In principle, the property rights approach (with its beyond-boundary signal-strength limits) could apply to national boundaries. Ideally, treaties between governments would extend the property rights system described in this paper into the international realm. More realistically, the U.S. is currently involved in a web of coordinated de facto restrictions on international interferences, through the ITU. Those restrictions would become the basis for the property rights in the U.S. with respect to spectrum bands and transmission territories that could have significant international consequences. The FCC and/or the NTIA (or a successor agency) would still be the instrument for U.S. international coordination negotiations in the future; the advance of the interests of U.S. spectrum property holders would presumably be a major goal of the agencies.

9. Since the FCC is already auctioning spectrum and easing restrictions on its use, further actions are not necessary.

Though the auctions and eased restrictions of the 1990s are a welcome improvement over

the FCC's policies of previous decades, they do not extend nearly far enough. The auctions and concomitant easing has applied to only a small fraction of the usable spectrum. The remainder is still encumbered within the FCC's "public interest" regulatory regime. And even for the slivers of spectrum that have been auctioned, use and service restrictions still apply, and a full system of property rights is not in place. A much more widespread application of property rights in spectrum is necessary.

In sum, the potential objections to a system of spectrum property rights have satisfactory answers.

D. The real estate analogy once again.

In the Introduction we developed a set of parallels between land and spectrum. In the light of the property rights system that has been described, we can now extend those parallels substantially:

-- Owners of land can buy, sell, sub-divide, lease their parcels for short⁷¹ or long time periods (subject to appropriate laws); *the same would be true of spectrum.*

-- Markets, formal and informal, along with brokers and other intermediaries, have developed for smoothing and enhancing these land transactions; *the same would be true of spectrum.*

-- Owners of land can flexibly arrange their parcels and alter their uses so as to achieve the greatest efficiency of use; *the same would be true of spectrum.*

-- Owners can choose not to use their land; *the same would be true of spectrum.*

-- Government agencies own land; *the same would be true of spectrum.*

-- Government agencies can buy, sell, and lease land; *the same would be true of spectrum.*

⁷¹ Hotel rooms are regularly leased for periods as short as overnight; hotels near airports rent rooms to travelers for even shorter periods.

-- Government can acquire land for "large" projects through condemnation and eminent domain; *the same would be true for spectrum.*

-- Owners of land who claim that specific neighbors are trespassing or otherwise interfering with their own use can negotiate and then, if necessary, sue them in the courts; *the same would be true of spectrum.*

-- When a land owner's property rights are difficult to enforce generally against trespass (e.g., burglars) or interference (e.g., pollution, where the sources and/or sufferers may be numerous), government enforcement becomes the vehicle for protection of rights; *the same would be true of spectrum.*

In sum, under the property rights system described in this paper the spectrum truly would approach real estate in its rights and uses. The U.S. economy would be all the better for it.

IV. A Parable

Imagine that, immediately following the ratification of the Louisiana Purchase in 1803, the question of whether east-of-the-Mississippi property law would apply to the newly acquired western territory was unclear. Settlers who began using prime pieces of farm land in the new territory found that other settlers were deciding that they too could use the same pieces of land. Each claimant interfered with the other's use of the land.

In response to this "chaos" of interference, the Congress passed the Federal Lands Commission Act of 1804, declaring that all land west of the Mississippi River, including any lands that would be newly discovered or come under the domain of the United States in the future, would be the common property of the people of the United States and that no private property claims to land could be made. Permissions or licenses to use individual plots of land for specified uses would be granted to individuals for short periods of time; the specified uses would have to be consistent with the "public interest, convenience, or necessity." The licenses would be granted to the recipient at a zero price and would be renewable. For reasons of fairness, land that was east of the Mississippi was also declared to be a common national resource, but incumbents on that land were automatically granted zero-price renewable licenses for their current uses. To administer the details of this scheme, the Congress established the Federal Land Use Commission (FLUC).

For the next two centuries the FLUC carefully "managed" the land mass that was west of the Mississippi (as well as the unoccupied portions of eastern land). It allocated land on a case-by-case basis, first deciding on the uses to which specific bands of land should be put; then deciding the specific types of technologies and specific inputs that users of each band should use; then deciding, in comparative hearings, which of competing claimants should be permitted to use each parcel; and then enforcing its decisions and adjudicating disputes among neighbors as to incursions or interferences in each others' uses.

Because the numbers of applicants for the land plots were so large, the comparative hearings took considerable amounts of time. By 1850 the FLUC had succeeded in allocating the first tier of states west of the Mississippi: Louisiana was reserved for rice growing; Arkansas for hogs; Missouri for growing corn; Iowa for wheat; and Minnesota for dairy farming. Of course a few square miles of land, around places like Baton Rouge and Hannibal, were reserved for commerce and trade. The claimants for reserving the nascent villages of New Orleans and St. Louis for commerce were turned down.

The absorption into the United States of Texas and then California, with their large land areas, greatly expanded the FLUC's responsibilities and lengthened its backlog of pending applications. By 1900 the FLUC had determined that Texas should be devoted entirely to cattle ranching, and California (after the discovery of gold in 1849 at Sutter's Creek) to minerals extraction. Brownsville and San Luis Obispo were reserved for commerce and trade in the two states. Also, by 1900 the rights-of-way for a transcontinental railroad were finally allocated; when the "golden spike" that marked the completion of that railroad was driven into the ground in 1913 at the top of Pike's Peak, Colorado, President Woodrow Wilson proclaimed a national holiday. In his speech at Pike's Peak on that momentous day, President Wilson acknowledged that the 8,000 mile route from Bangor, Maine, to San Juan Capistrano, California, that had been assigned by the FLUC was a bit circuitous and had posed stupendous engineering and construction difficulties (especially the Pike's Peak portion) but declared the railroad to be a great step forward in the unification of the country.

Meanwhile, the Congress, growing restless with the lengthy delays that the comparative hearings were yielding, authorized land lotteries, which the FLUC duly used to assign forestry users to Oregon and Washington, tourism services to Idaho, Montana, and Wyoming, etc., etc. In a burst of speed the FLUC succeeded in establishing allocation bands, service rules, and assignments for all 48 states by 1925. It then had to deal with the backlog of requests for changes in allocations. By

1935 it had agreed that east Texas and southern Louisiana should be re-allocated to petroleum extraction. By 1950 it had agreed that the central valley of California should be re-allocated to agriculture and, in an unprecedented display of flexibility, agreed that the permit holders in that region could make their own decisions as to which crops to grow. But arguments that Kansas should be re-allocated from corn to wheat growing were rejected.

By the early 1990s the citizens of the U.S. were quite aware that their growth rates and standards of living for almost two centuries had been substantially below those of the citizens of Europe, Canada, and even Mexico. Some began to wonder whether the land management system of the FLUC might be partially responsible. They considered the possibility that auctions might be better ways of assigning unoccupied land. But incumbent holders of FLUC land licenses were fiercely opposed to any auctions, even of unoccupied land, since they feared that the precedent of auctions might subsequently be used for re-allocations of occupied land. Nevertheless, the Congress authorized the FLUC to conduct auctions for some parcels of unoccupied and lightly used land. The auctions brought astoundingly high sums, as areas like San Francisco were converted from low-level minerals mining to a major seaport and financial center.

Some critics even began to wonder whether the entire structure of land management by the FLUC ought to be re-examined and replaced with the property rights system that had worked well for the prosperous citizens of neighboring Canada and Mexico. But the defenders of the FLUC system pointed with pride to how orderly the system was and how well the system had minimized interference problems among land users. And, as one Commissioner of the FLUC claimed at an en banc hearing in 1999, "... land is a national resource and the FLUC is its steward, charged with assuring the efficient use of land for the benefit of the American public."

V. Conclusion

Fortunately, the parable of the Federal Land Use Commission of Section IV is far-fetched; this type of approach to land and its use is unimaginable as a general matter in the United States.⁷²

Unfortunately, the parable is not far-fetched with respect to the way that spectrum has been handled in this country for the past 73 years. Instead, it is a near-documentary of the process.

As this paper has argued, there is a better way for handling spectrum. It is the way that land in the U.S. has in fact been handled since 1803 (as well as before 1803): There is the presumption that private (and public) property rights in land, and the myriad decisions that follow from those rights, are a productive basis for our economy's use of land. When problems of interferences in land use have arisen, our political and legal systems have crafted remedies for them without altering the fundamental notions of property.

That same property rights system, with the same presumptions, should apply to the spectrum. Similar legal remedies for interferences could be developed and applied.

The FCC should continue with its current programs of auctioning spectrum and easing restrictions on auctioned spectrum, and should move as aggressively in the direction of establishing property rights as it can. But, ultimately, the Congress will need to make the appropriate changes to Title III of the Communications Act so as to implement fully the "propertyzing" of the spectrum described in this paper.

It is never too soon (or too late) to make productive improvements to the workings of the U.S. economy. The "propertyzing" of the spectrum is just such an improvement. The time to begin is now.

⁷² However, the Federal Government does own large amounts of land, primarily west of the Mississippi River, some of which it leases to private entities for restricted uses. The Bureau of Land Management controls 270 million acres, and the Forest Service controls another 191 million acres.

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