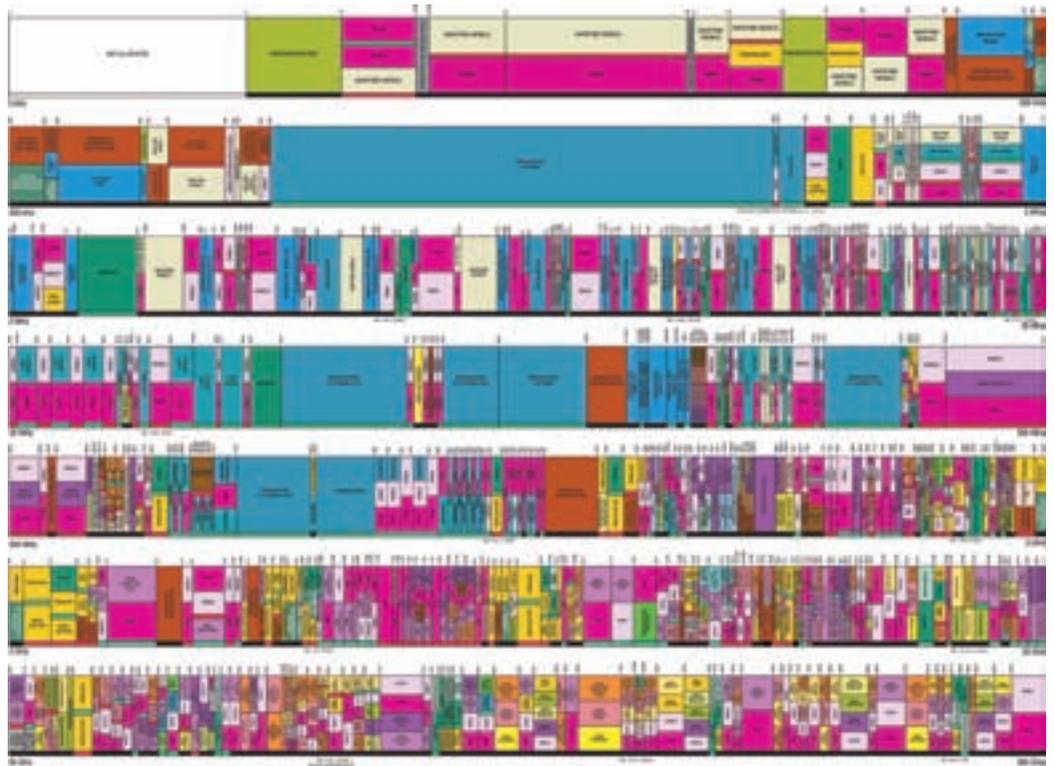
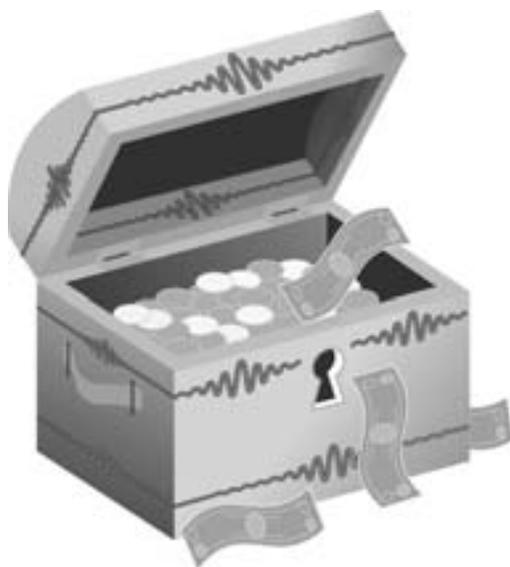


THE ART OF SPECTRUM LOBBYING

America's \$480 Billion Spectrum Giveaway, How it Happened, and How to Prevent it From Recurring

By J.H. Snider, MBA, Ph.D.





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Introduction

In the late 1980s, the Federal Communications Commission (FCC) conducted a series of lotteries to allocate electromagnetic spectrum (popularly known as the “public airwaves”) for mobile telephone service. More than 320,000 lottery tickets were acquired by spectrum speculators, including dentists, lawyers, accountants, and anyone else willing to devote the time and hire the legal talent necessary to fill out the complicated form to acquire a lottery ticket. Many of the lottery tickets were purchased as part of partnerships, whose members would collectively enter lottery tickets for hundreds of different licenses.ⁱ For example, in December 1989, the FCC selected the winning ticket for a lottery for one such license on Cape Cod, Massachusetts. The winning ticket holder then sold the ticket ten months later for \$41.5 million.ⁱⁱ Former Governor Mark Warner, a U.S. Senate staffer before the lottery, was among the politically savvy who made millions by acquiring and flipping the licenses granted in the lottery.ⁱⁱⁱ

The result was widespread outrage because the public could readily perceive that billions of dollars of public assets had been given away to private interests—well-connected, wealthy Americans—without public compensation. As the chairman of the FCC at the time characterized the lottery winners, “They receive a windfall and the public gets no payment.”^{iv} This outrage led to legislation in 1993 to auction future FCC licenses.^v Congressional leaders publicly promised that, except for a few services—notably public safety and terrestrial broadcasting—the government would henceforth grant exclusive rights to use spectrum only in return for monetary compensation.

This has not come to pass. According to calculations presented in this paper, since 1993, the government has given to private interests as much as \$480 billion in spectrum usage rights without public compensation. That comes to more than 90 percent of the value of spectrum usage rights it has assigned from 1993 through the present.

In addition, the government has warehoused as much as \$155 billion of spectrum

usage rights in guard bands. The warehousing in itself is not a giveaway to private interests. But, for reasons we shall see, it may position incumbent licensees to acquire the warehoused spectrum without public compensation. Thus, the act of guard band warehousing may be viewed as part of a multi step process that

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leads to giveaways just like winning a presidential primary election is necessary to winning the presidential general election. For example, since 1997 TV broadcasters have used the digital transition to acquire more than \$6 billion worth of guard band spectrum by winning rights to transmit programming across a larger geographic area.^{vi}

How did this happen? How could the government give away so much in public assets to private interests without public and congressional outrage? A large part of the answer is that the government no longer gives

away spectrum usage rights in highly visible ways such as spectrum lotteries. Instead, incumbent licensees and spectrum speculators have perfected strategies that enable them to acquire free spectrum rights below the public radar. Until public policies are

implemented to render those low visibility lobbying strategies ineffective—so that spectrum giveaways are once again as visible as they were in the days of spectrum lotteries—spectrum giveaways to private entities will persist. (Of course, when the FCC or Congress grants spectrum to public entities or for unlicensed use, no giveaway in this sense is involved because the public retains full rights to its airwaves.)^{vii}

This paper deals with what might be considered the third rail of spectrum policy: the rotten, special interest politics that has driven lawmakers to give away the public's airwaves to private interests without public compensation. In the vast stream of government reports seeking to reform spectrum policy since 1993, one looks in vain for more than a token acknowledgement, let alone a serious and sustained discussion, of this giveaway.^{viii} Like other politically embarrassing issues, it is an issue that congressional leaders and their proxies—the FCC, GAO, CBO, NTIA, and others—would prefer not to talk about. This, of course, suits the beneficiaries of the giveaway and their army of lobbyists and analysts just fine. For that very reason alone, however, it is an issue that desperately needs a public airing.

This paper is divided into three sections: Part I provides an estimate of the value of the government's spectrum rights giveaway since 1993, Part II provides a description of the strategies spectrum lobbyists have used to acquire such rights, and Part III provides policy recommendations to ensure that spectrum rights giveaways (which are closely linked to warehousing guard band spectrum) come to an end.



PART I

The Spectrum Giveaway

"A dollar raised in a [spectrum] auction is an extra dollar to strengthen Social Security and Medicare, to provide tax relief for America's families, to make prescription drugs affordable for our seniors, to provide health insurance for the uninsured, or simply to reduce our debt."

—U.S. Senator Frank Lautenberg ^{ix}

What is the total value of spectrum rights the government has given away to private interests? Answering this question is very difficult and involves making many simplifying assumptions. However, despite the difficulty of arriving at a precise estimate for the giveaway, the effort is worthwhile and doable. It is worthwhile because as long as the giveaway remains below the public radar, it will continue. And it is doable as long as readers understand that the purpose of such an exercise is not to arrive at a precise number, but to demonstrate that there is something seriously amiss with current spectrum management policies. For this purpose, a reasonable ballpark estimate of the magnitude of the giveaway is adequate. This paper estimates a range between \$140 billion and \$480 billion. Readers uninterested in the methodological details behind this calculation may want to jump to Part II of this paper.

Rigorously quantifying spectrum giveaways is a bit like studying power or love in a scientific way. We all know that power and love exist and are important explanatory variables in the real world. But studying them with absolute scientific precision—despite decades of attempts to do so—has not proven feasible.

Similarly, it is abundantly clear that the federal government has been conducting a huge giveaway of spectrum usage rights to the private sector. This giveaway has been done in such a way that the government and each recipient can find a plausible excuse to argue that, in each particular case, no such giveaway has been made. However, by keeping focused on the big picture and making some reasonable simplifying assumptions, we can see through this cloud of smoke and demonstrate with confidence that a huge giveaway is in progress and likely to continue unless fundamental institutional reform is implemented.

One useful simplifying assumption is that we can treat virtually all spectrum rights as having been first licensed since 1993, which was the year Congress passed a law mandating that new commercial licenses to spectrum be auctioned.^x Prior to 1993, no spectrum was auctioned. Although the 1993 law only applied to the allocation of new licenses rather than modifications of existing licenses, the expectation of many in 1993 was that the era of spectrum giveaways was about to come to an end. As we shall see, this expectation was not fulfilled.

There are two complementary reasons why treating 1993 as essentially the beginning of licensing is a reasonable assumption. First, the rights attached to an FCC license before 1993 were highly restricted. A TV broadcaster, for example, could only provide a single analog, standard definition TV channel with its FCC license. Similarly, a mobile telephone licensee was restricted to the use of highly inefficient analog technology and could not add or change individual cell towers without FCC permission.

If the telecommunications market were stable, this wouldn't have posed a serious financial problem for incumbent licensees. The services that were efficient and highly lucrative in 1993 would have continued to be so in 2007. In fact, however, the telecommunications market has radically changed since 1993. Most licensed services that were extremely valuable in 1993 would have become far less valuable and even unprofitable by 2007 if licensees had not received additional spectrum usage rights.

For example, prior to passage of the Telecommunications Act of 1996, which granted TV broadcasters digital rights, TV broadcast industry lobbyists argued before Congress and the FCC that without such enhanced rights (called "spectrum flexibility") the TV industry would go bankrupt.^{xi} Similarly, if the original analog mobile telephone licensees hadn't been granted digital rights in the late 1990s, they would have been at a severe disadvantage to the mobile telephone licensees who purchased licenses with digital rights after the auction era began. With digital rights, the analog mobile telephone licensees could increase by a factor more than ten the number of telephone calls provided with the same amount of spectrum. In addition, digital rights allowed them to provide many new types of data services.

Second, all FCC spectrum licenses have come up for renewal at least once since 1993. If we assume that licensees are not owed automatic renewal, then any uncompensated renewal since 1993 would be a giveaway. Although this is surely a controversial

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assumption, especially for licenses purchased at auction, the Communications Act is clear that license renewal should not be automatic. The Act reads:

It is the purpose of this Act, among other things, to maintain the control of the United States over all the channels of radio transmission; and to provide for the use of such channels, but not the ownership thereof, by persons for limited periods of time, under licenses granted by Federal authority, and no such license shall be construed to create any right, beyond the terms, conditions, and periods of the license.^{xii}

In case a licensee might later profess ignorance of this clause, the Communications Act requires that licensees must agree in writing to it:

No station license shall be granted by the Commission until the applicant therefor shall have waived any claim to the use of any particular frequency or of the electromagnetic spectrum as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise.^{xiii}

And in case those who purchased their licenses at auction might want to argue that they are a special exception, the Communication Act states that even such licenses would have to be of limited duration:

Nothing in this subsection [on auctions] or in the use of competitive bidding shall... be construed to convey any rights, including any expectation of renewal of a license, that differ from the rights that apply to other licenses within the same service that were not issued [by auction].^{xiv}

Writing in the *Federal Communications Law Journal*, Mark Fishman elaborates on the meaning of these passages:

Certainly, the overwhelming body of precedence is that FCC licenses do not have the sort of property right that is protected from an unconstitutional taking, in contrast to property rights in equipment, which are fully protected.... What is indisputable is that in allowing members of the public to use any particular portion of the spectrum, Congress was careful to specify that such authorization was temporary, limited, and subject to withdrawal in a wide variety of circumstances.^{xv}

In response to arguments that terminating a license is an unfair public taking of private property, Fishman cites a well known precedent, *General Telephone v. United States*. The case involved FCC adoption of rules barring telephone companies from continuing to possess cable TV franchises, a situation analogous to possessing spectrum licenses. The court ruled that the FCC could adopt rules that had retroactive effects as long as the rules were reasonable.^{xvi} In this case, they were to foster new entry and competition in local telecommunications service.

Fishman also acknowledges that regardless of the original intent of Congress when it passed the Communications Act, political reality appears to dictate ignoring the law. He cites FCC Commissioner Glen O. Robinson observing: “[despite] the legal theory of the Communications Act that a license is not a property right, the practical reality has been quite different, as all the world knows.”^{xvii}

What, then, is the value of the commercial spectrum rights given away since 1993? A rough cut involves estimating the following three sets of numbers: 1) the amount of spectrum allocated for various types of commercial services, 2) the market value of that spectrum, and 3) the upfront monetary payment to the government (mostly auction receipts) for the right to use that spectrum.

Amount of Commercial Spectrum Granted Since 1993

How much commercial spectrum has the FCC licensed to commercial users since 1993? To reduce the difficulty of answering this question, only grants of commercial rights below 3 GHz have been included. These cover only one percent of the entire radio spectrum, which is generally considered to range from 0 to 300 GHz. Obviously, this will tend to reduce the total estimated size of the giveaway. But the reduction is likely to be relatively small since the most valuable spectrum is located below 3 GHz, which is often described as “beachfront” or “prime” spectrum because of its favorable propagation characteristics. According to the U.S. General Accounting Office, more than 90 percent of spectrum use occurs below 3.1 GHz.^{xviii} Donald Evans, Secretary of the Department of Commerce, estimated that more than 95 percent of spectrum using devices

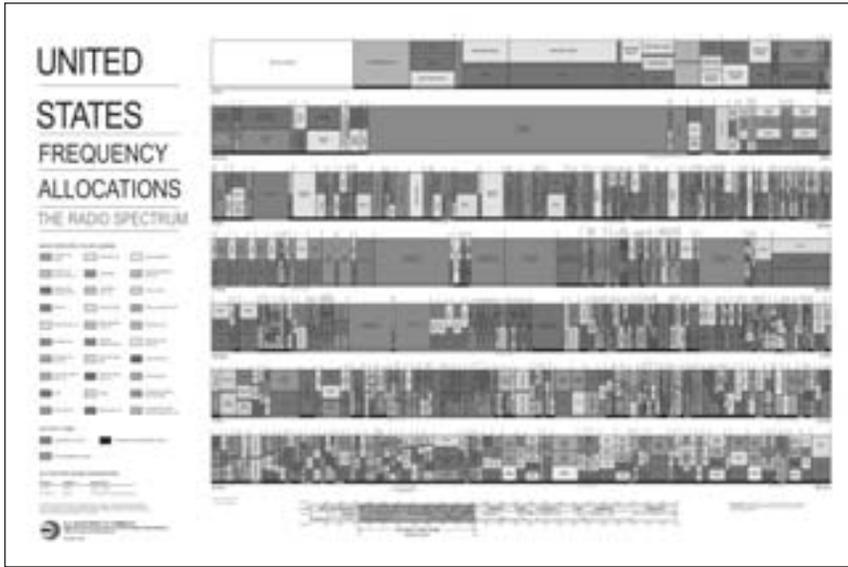


FIGURE 1. U.S. SPECTRUM CHART

operate below 3 GHz.^{xix} Figure 1 is the official U.S. government spectrum chart. Figure 2 shows the value per MHz of spectrum on the vertical axis versus frequency on the horizontal axis. The chart illustrates that the value of spectrum drops off rapidly above 2 GHz.

There are three categories of licensed commercial spectrum below 3 GHz that interest us because they each occupy spectrum worth at least ten billion dollars: 1) flexible use spectrum (estimated here at 693 MHz), 2) Wide area but not flexible use spectrum (estimated here at 88.8 MHz), and 3) guard band spectrum polluted by incumbent licensees and warehoused on their behalf by the government (estimated here at 227 MHz). Spectrum excluded from these calculations (1,991.2 MHz or about two-thirds of the spectrum below 3 GHz) include spectrum allocated for commercial point-to-point communication (such as a telephone company using a point-to-point link to connect two rural central offices), shared use within narrow industry segments (such as

TV broadcast stations within a given TV market sharing spectrum to transmit news from the field back to their stations), state and local government use (e.g., police, fire, and medical), federal government use (e.g., the U.S. military, the Federal Aeronautics Administration, and the CIA), commercial flexible use allocated but not licensed (the 60 MHz to be auctioned after the DTV transition), and unlicensed use (e.g., for Wi-Fi and Bluetooth).

Flexible Use Spectrum

Flexible use spectrum can

simply be defined as spectrum that can be used for its most profitable use. The FCC has defined license flexibility as granting licensees “the maximum possible autonomy to determine the highest valued use of their spectrum, subject only to the rules that are necessary to afford reasonable opportunities for access by other spectrum users.”^{xxi} The opposite of flexible use spectrum is *encumbered* spectrum.

Spectrum licensed for commercial flexible use can be divided into two categories based on whether the license can be used flexibly now or must overcome some relatively minor encumbrances before it can be so used. The first category, also known as CMRS or PCS spectrum, is approximately 190 MHz in size and occupies 6.3 percent of the spectrum below 3 GHz.^{xxii} Companies that use this spectrum for cellular telephone and data service include Verizon Wireless, AT&T, Sprint Nextel, and T-Mobile.

The second category is approximately 503 MHz in size and occupies 15.7 percent of the spectrum below 3 GHz. Most of the spectrum in this category

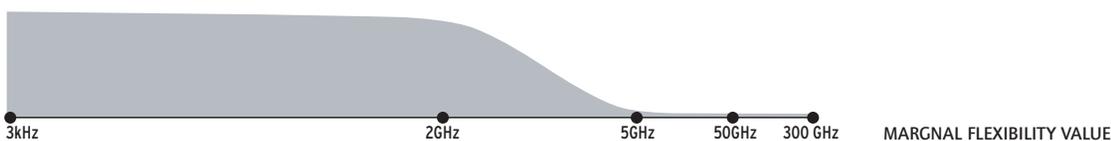


FIGURE 2. VALUE OF SPECTRUM^{xx}

achieved its flexibility since 2002 and occupies spectrum between 2 GHz and 3 GHz.^{xxiii} None of it has yet achieved widespread use on a national basis. About 80 percent occupies just three bands: 195 MHz in the MMDS/ITFS band; 95 MHz in the Mobile Satellite Service (MSS) band, and 90 MHz in the Advanced Wireless Service (AWS) band.

MMDS/ITFS. In 2004, the FCC modified the rules in the joint 195 MHz Multichannel Multipoint Distribution Service (MMDS) and Instructional Television Fixed Service (ITFS) allocation, now called the Broadband Radio Service (BRS) and Educational Broadband Service (EBS) allocation, to allow incumbent licensees to provide mobile services.^{xxiv} But first, those licensees within each geographic region have to negotiate among themselves to reorganize the band. Only a small percentage of them have yet completed this negotiation process. But given their high payoff for doing so, it is reasonable to expect that they will.

AWS. In September 2006, the FCC auctioned 90 MHz for Advanced Wireless Service (AWS), which allows for the provision of mobile wireless service. But first, the bidders must clear off the existing federal government and commercial users, which for some licensees may take until December 2014.^{xxv}

MSS. Beginning in January 2003, the FCC allowed the failed Mobile Satellite Service (MSS) licensees the right to provide terrestrial mobile service,^{xxvi} eventually allowing 95 MHz of their spectrum to be used for such service. As with the AWS band, various terrestrial incumbents had to be cleared before the MSS licensees could use the spectrum terrestrially. In addition, the FCC placed some limitations on terrestrial mobile use of the formerly satellite spectrum that other mobile terrestrial licensees don't have. However, those limitations are relatively minor and can reasonably be expected to be eliminated at some point in the future should they prove to be more than a token obstacle to the affected licensees' financial success.

Adding these two categories of flexible use spectrum together gives us a total amount of flexible use spectrum of 693 MHz (23 percent of the spectrum below 3 GHz).

Wide Area But Not Flexible Use Spectrum

Broadcasters have wide area but not flexible use rights. They have exclusive rights to transmit information over large geographic areas, but they can not use their spectrum to provide mobile telecommunications services. Broadcasters have been actively pursuing more flexibility and have already received more of it than most people recognize. Part II of this paper, by explaining why broadcasters have been successful in gradually attaining more flexibility in the past, explains why they are also likely to gradually attain more flexibility in the future. The FCC's Spectrum Policy Task Report essentially concedes that after the digital TV transition, incumbent TV broadcasters will be granted flexible use rights, even if complete flexibility takes many years to bring about.^{xxvii} A book by this author, *Speak Softly and Carry a Big Stick: How Local Broadcasters Exert Political Power*, explains in great depth why the broadcasters are likely to be successful in this endeavor.^{xxviii}

In 1995, the FCC estimated that the average American lived in a TV market with approximately 13.3 stations or 80 MHz of spectrum licensed for terrestrial TV broadcast service.^{xxix} During the digital TV transition, this number temporarily increased to 160 MHz as each station was loaned a second channel. But when that transition is complete and stations return one of their two TV channels, the amount will once again be approximately 80 MHz. Since the entire TV band will then occupy 294 MHz, that gives us 214 MHz for guard band spectrum that broadcasters claim is necessary to protect themselves from harmful interference.^{xxx} The corresponding estimate for terrestrial AM and FM radio broadcasting is 8.8 MHz of spectrum licensed to stations on a national basis and 13.2 MHz of guard band spectrum to protect those stations. This gives us a total of 88.8 MHz licensed to terrestrial broadcasters .

Guard Band Spectrum Warehoused by Government on Behalf of Incumbent Broadcasters

Most spectrum originally allocated to terrestrial broadcasting service was not actually licensed to broadcasters but left fallow to protect incumbent licensees. Consider the striking observation that the average American could only receive 13 TV stations terrestrially over-the-air, despite the fact that there

were slots for 67 TV stations on a terrestrial, over-the-air TV tuner (the typical over-the-air tuner runs from channels 2-to-69, with channel 37 reserved for astronomy and medical telemetry). To the extent that terrestrial broadcast licensees were successfully able to protect themselves with an excessive amount of guard band spectrum, they reduced the economic value of adjacent spectrum in a socially harmful way, what economists call creating a “negative externality.” (An *externality* occurs in economics when a decision causes costs or benefits to individuals or groups other than the person making the decision; a *negative externality* occurs when the externality involves a cost to others.) That negative externality averaged as much as 24 MHz for every 6 MHz incumbent TV license. The popular term for creating a “negative externality” is “pollute.” Thus, in effect, a TV broadcast license to use 6 MHz of spectrum polluted large amounts of adjacent spectrum, crippling its productive use.

Over time, new technology has been evolving to greatly reduce the cost of using the unused spectrum (called “white space”) without significantly harming nearby incumbent licensees. Digital technology, for example, made it possible to loan each incumbent TV broadcaster a second channel from the spectrum previously viewed as TV guard band spectrum. The same spectrum is often characterized as “guard band” or “white space” depending on whether it is viewed as necessary to protect incumbent licensees or is available for productive use.

Broadcast licensees have played a two pronged game in relation to this white space. First, they have insisted to the FCC that any use of it by anyone but themselves would cause intolerable interference to their licenses. Meanwhile, to the extent that technology allows, they have lobbied the FCC to grant the white space to themselves. In this, they have been very successful. For example, the AM and FM broadcasters effectively doubled their spectrum holdings in 2002 as the FCC awarded each incumbent radio broadcaster the first half of each channel adjacent to its licensed channel.^{xxxii} Similarly, TV broadcast licensees have greatly expanded their coverage areas since the commencement of the digital TV transition in 1997, and in a variety of current FCC proceedings are proposing that new technology should allow them to expand their service areas

yet further.^{xxxiii} The FCC mindset that the broadcast bands are allocated for broadcasting and that broadcasting service should be expanded as long as it doesn’t conflict with existing high powered TV service contributes to this seemingly ceaseless lebensraum of the TV white spaces.

Although at first glance it might appear inconsistent to both claim that nobody else can use the spectrum and claim that you can use it yourself, this is not necessarily the case. To the extent that the control of pollution in nearby spectrum is a sacred right granted to broadcast licensees, then broadcasters’ claim that they are the only entity capable of utilizing the polluted spectrum (because they can internalize the cost of clearing it up) are compelling.

The total amount of white space currently used to protect terrestrial radio and TV broadcasting is approximately 227 MHz (214 MHz for terrestrial TV broadcasting and 13.2 MHz for AM and FM radio broadcasting). Whether terrestrial broadcasters can succeed in warehousing and then acquiring this spectrum for themselves has yet to be seen. The FCC currently is conducting a rule-making to allocate much of that spectrum in the TV band to unlicensed use.^{xxxiiii} TV broadcasters, of course, are lobbying intensely to maximize the amount that will remain warehoused until they have an opportunity to acquire more of that spectrum for themselves. In 2002, FM broadcasters succeeded in doubling their spectrum by acquiring guard bands adjacent to their licenses.^{xxxv} To date, TV broadcasters have been far less successful in acquiring guard band spectrum, perhaps because the amount of spectrum involved is more than an order of magnitude greater than in the FM radio band. This, in turn, may have led high profile politicians, including Senate Majority Leader Bob Dole and Senate Commerce Committee Chair John McCain, to threaten

If we add up the total amount of spectrum allocated to terrestrial broadcasting below 3GHz—both the spectrum that has been licensed and warehoused—we get 422 MHz or 14.1 percent of the total.

TABLE 1. VALUATIONS OF FCC LICENSES FOR THE FOUR LARGEST MOBILE TELEPHONE COMPANIES^{xxxvii}

Company	2006 Value of FCC Licenses*	National MHz**	\$/ MHz	\$/ MHz-pop
AT&T Mobility LLC	\$25,245,000,000	57.3	\$ 440,575,916	\$ 1.47
Verizon Wireless LLC	\$50,959,000,000	40.4	\$1,261,361,386	\$ 4.20
Sprint Nextel Corp.	\$ 19,519,000,000	51	\$ 382,725,490	\$ 1.28
T-Mobile USA	\$ 24,448,510,254	27	\$ 905,500,380	\$ 3.02
Total	\$120,171,510,254	175.7		
Weighted Average			\$ 683,958,510	\$ 2.28

Sources: *SEC 10-K for 2006.
 **UBS Warburg report cited in Dan Meyer, "Sprint Nextel Combo Clears Legal Hurdle," *RCR Wireless News*, August 8, 2005, p. 1.

to make a public issue of giving a second channel to incumbent TV broadcasters at an estimated cost to the public of \$70 billion.^{xxxv}

If we add up the total amount of spectrum allocated to terrestrial broadcasting below 3GHz—both the spectrum that has been licensed and warehoused—we get 422 MHz or 14.1 percent of the total.

Value of the Spectrum

What is the current value of spectrum? The most common unit of valuation used by spectrum valuation experts is the \$/MHz-pop. This means the amount of money an investor is willing to pay per person for a Megahertz of spectrum. For example, if a license for 10 MHz of spectrum covers a geographical area with 10 million people living there and costs \$100 million, then the valuation of the spectrum is \$1/MHz-pop (\$100 million/(10 MHz * 10 million people) equals \$1/MHz-pop).

Unfortunately, the \$/MHz-pop metric has some severe weaknesses because the value of a MHz-pop varies greatly in different regions of the country. For example, the value of a MHz-pop is greater in high income, densely populated areas of the country. That's because the demand for spectrum services is higher in those areas and the cost of providing it less. Similarly, in areas with many day workers or tourists but relatively little residential population, such as Washington, DC or New York City, the value of MHz-pops is inflated.

For this reason, a better valuation metric for our purposes is the value of a MHz aggregated across the entire United States. For example, if the average value of a MHz-pop is \$1, then the value of a MHz

across the entire country of 300 million people is \$300 million. By extension, a licensee with an average of 10 MHz of spectrum across the United States and an average value of spectrum of \$300 million/MHz, has a total spectrum portfolio worth \$3 billion (10MHz * \$300 million/MHz).

This aggregated metric has the methodological advantage of evening out the wide variation in \$/MHz-pop based on local demographic conditions. But since most FCC licenses are transacted on a local basis, relying solely on licenses acquired on a national basis loses most potential spectrum valuation data points.

One compelling way to value unencumbered flexible use spectrum on a national basis is through the use of SEC filings by the major mobile telephone companies. The top four companies (Verizon Wireless, AT&T/Cingular, Sprint/Nextel, and T-Mobile) have an average of 175.7 MHz per market and a total valuation of their spectrum of \$120 billion. See Table 1. This comes to \$684 million per MHz, or \$2.28/MHz-pop.^{xxxvi}

Why is this spectrum valuation compelling? SEC filings are government mandated and follow accounting practices set by the Financial Accounting Standards Board concerning FCC licenses. Companies can pay large fines for misleading accounting practices, and there are significant checks and balances—such as the use of outside auditors—designed to discover and punish fraudulent accounting claims. In this case, the SEC mandates that FCC licenses are reported annually at fair market value. Moreover, if those market values change since the previous accounting period, the FCC license valuation must be changed.

The SEC filings for these particular companies are also compelling because they control for local variation and are for unencumbered spectrum used for a service, mobile telecommunications, most highly valued by the market. The value of a MHz of spectrum differs greatly for a person in New York City and rural Montana. That's for reasons of both supply and demand. On the supply side, New York City has a much denser population of users, including commuters and tourists who don't live in New York City. This density reduces the cost of building a network. On the demand side, New York City is a high income demographic that makes unusually high use of mobile telecommunication services. The four carriers used in this valuation are all national carriers, so these geographic discrepancies are averaged out. Similarly, the valuations are primarily for unencumbered flexible use spectrum, which is a fairly small portion of the total spectrum currently licensed for exclusive commercial use.

Admittedly, the SEC data are far from perfect. The SEC gives companies a lot of leeway in how they assess the value of their licenses. Companies, for example, may use one of three basic valuation methods—cost, market, and present value of future discounted cash flows—to assess the value of FCC licenses. But this leeway and reliance on good faith estimates applies to the valuation of other corporate assets as well.

Where the SEC data tend to be most unreliable is when companies are in a “greenfield” or startup situation. In such a situation, there are no market comparables and estimates of future discounted cash flows can vary wildly. Unfortunately, this situation pertains to the major new allocations of flexible use spectrum, including WCS, MSS, and MMDS/ITFS. In none of these bands are there currently major, ongoing business operations.

Given the high level of discretion at arriving at FCC license valuations, one might expect that non-market criteria could influence the valuations. That does appear to be the case, especially for the immature businesses noted above where the level of discretion is greatest. One rule of thumb appears to be that companies that have primarily acquired spectrum rights through lobbying (e.g., Sprint Nextel) tend to value their spectrum rights on public 10-Ks

more conservatively than companies that acquired them via auction (e.g., Verizon Wireless). A related rule of thumb is that companies that have acquired spectrum and have yet to launch businesses with it (such as mobile TV providers Qualcomm and Crown Castle) tend to value it much lower than companies (such as conventional mobile telecommunications companies) with ongoing businesses.

For Table 1 above, the Verizon Wireless number, at \$1.26 billion/MHz, appears to be high, perhaps because the basic valuation metric was established shortly after the dot com boom ended in 2000, when spectrum valuations reached a peak. Still, the valuation is 25 percent less on a \$/MHz basis than what Verizon Wireless bid to acquire \$8.8 billion of spectrum licenses in 2001.^{xxxviii} In contrast, the Sprint Nextel number appears to be low, perhaps because Sprint Nextel's primary strategy for acquiring spectrum usage rights is to acquire FCC licenses with significant encumbrances and then lobby to be granted spectrum flexibility.

For such a business strategy, high public spectrum valuations may be an embarrassment because they call attention to the giveaway of public assets.

Adding to the difficulty in valuing SEC licenses is the fact that Congress and the FCC do not design auctions to maximize revenue. At first glance, it would appear that auction data are the best basis for valuing FCC licenses. But this valuation method would make the faulty assumption that the goal and practice of Congress and the FCC is to maximize auction revenue—the type of behavior we'd expect from a conventional asset seller in a market. For example, the Communications Act states that “In making a decision... to assign a band of frequencies... the Commission may not base a finding of public interest, convenience, and necessity on the expectation of Federal revenues...”^{xxxix} The FCC has inter-

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puted this to mean that “[r]adio spectrum is a public resource of the United States that Congress has authorized and directed the Commission to manage in the public interest,” with “the Commission’s most basic spectrum-management power is to assign spectrum to achieve public interest benefits other than monetary recovery.”^{xl} An example of a public interest benefit might be the provision of pre-school, news, or public safety programming at a financial loss.

Consider the auction of three TV channels in 2002. Those channels were auctioned in 2002 for use when the digital TV transition was completed. The catch was that no one knew with confidence when the transition would be complete. It might have become complete on January 1, 2007 at the earliest, providing that a number of ill-defined and renegotiable conditions were met, such as that 85 percent of Americans had TV sets capable of receiving digital, over-the-air signals. But few expected the 2007 date to be met and many expected it would take many more years for auction winners to actually be able to use the licenses they would acquire. The result, of course, was steeply discounted licenses. “A jackass out of a barn lot could have done a better job of selling this public property,” commented Representative John Dingell of Michigan, currently chair of the House Commerce Committee. “They set auction deadlines that were asinine, constituting a gross mismanagement of the spectrum.”^{xli}

Should the winning bids or some other method be used to value the licenses? It turns out to be a tricky question. In a 2005 white paper and letter to congressional leadership, Aloha, one of the winning bidders, valued comparable spectrum in the 700 MHz band at up to \$500 million/MHz, even though it paid far less only three years previously.^{xlii} Aloha is a private company and doesn’t have to file public FCC license valuations. But Qualcomm, a public company and another winning bidder in the same auction as Aloha, reports the value of its licenses at close to cost (\$164 million in its 2005 10-K) rather than at the future market value (from \$2 billion to \$3 billion) Aloha projects.

As we shall see, auctions for WCS, AWS, and PCS spectrum also were not designed to maximize revenue.

Another limitation of the SEC valuation data in Table 1 is that mobile telephone companies have spectrum holdings that are not being used to provide mobile telephone service. These companies

have substantial rights to spectrum above 3 GHz for fixed, point-to-point backhaul telecommunications. They may also have spectrum rights in other bands, notably the MMDS/ITFS and WCS bands. Since companies only provide aggregate license valuation data to the SEC, this information cannot be parsed out. Still, the valuations of the other bands should have a relatively small impact (certainly less than 50 percent) on the valuation metric derived above. The fixed, point-to-point spectrum is above 3 GHz and therefore of relatively low value despite occupying a large swath of frequencies. The WCS and MMDS/ITFS spectrum represents less than 50 percent of the spectrum in those bands, and the MMDS/ITFS spectrum in the near term retains substantial encumbrances. For example, more than 50 percent of the spectrum in the MMDS/ITFS band is controlled by educational licensees and the only way for an aspiring telephone company to access that spectrum is through a sub-leasing arrangement with one of those institutions (it is illegal for the educational institution to actually sell the license to the telephone company).

There are a variety of complementary valuation indicators that suggest the \$684 million/MHz metric is a reasonable ballpark estimate of the value of unencumbered flexible use spectrum. In 2005, the FCC valued 10 MHz of unencumbered, flexible use spectrum allocated to Nextel at \$4.8 billion (\$480 million/MHz or \$1.60/MHz-pop) as part of a spectrum swap. A sophisticated study by Kane Reece, paid for by Verizon Wireless, valued the 10 MHz at \$5.28 billion (\$528 million/MHz).^{xliii} The Cellular Telecommunications & Internet Association valued the spectrum at \$5.76 billion (\$576 million/MHz).^{xliv}

Many spectrum auctions with essentially national coverage have had higher valuations. In April 2000, an auction in the United Kingdom brought in \$35.4 billion (\$4/MHz-pop); in July 2000 a German auction brought in \$46.2 billion (\$8/MHz-pop), and in 2001 a U.S. auction brought in \$16 billion (\$4.2/MHz-pop).^{xlv} In a *New York Times* op-ed on June 2, 2007, FCC Commissioner Michael Copps estimated the value of the 402 MHz of terrestrial TV spectrum at up to half a trillion dollars, which can be derived from essentially the same MHz-pop valuation as the 2001 U.S. auction cited above that

brought in \$16 billion at \$4.2/MHz-pop.^{xvi}

Yet other spectrum auctions have brought in much lower sums. In FCC Auction #41 conducted in 2001, one PCS license sold for only \$0.02/MHz-pop. Some individual licenses haven't even had a single bidder.

Estimating different license valuations for each different frequency and special circumstance is a worthy undertaking but unnecessary to achieve the ballpark estimates adequate for the purposes of this paper. For example, as already noted, not all spectrum frequencies are equally valuable: the value of spectrum frequencies above 3 GHz tends to be worth much less than spectrum below 3 GHz. But even below 3 GHz not all spectrum is worth the same amount. For example, spectrum in the broadcast bands below 1 GHz tends to be valued more than spectrum above 2 GHz. Still, the SEC valuations, which predominantly involve spectrum below 2 GHz, are within the ballpark of spectrum valuations above 2 GHz and below 3 GHz.

The results of the most recent auction of national flexible use spectrum deserve special note because on a pure \$/MHz-pop basis they suggest the SEC-based valuation of flexible use spectrum is too high. On September 18, 2006, the FCC concluded an auction of 90 MHz of spectrum for advanced wireless service, the type of service most highly in demand

by the marketplace. Half the spectrum was in the 1.7 GHz band and the other half in the 2.1 GHz band. All licenses involved a sliver of both bands, as one band was used for receiving information and the other band for sending it. The auction raised \$13.7 billion, equivalent to about \$150 million/MHz, or \$0.53/MHz-pop. That is approximately one-quarter of the \$2.28/MHz-pop derived from the SEC data used above.

There are four major factors that explain much of this discrepancy: 1) the AWS spectrum was heavily encumbered 2) the auction format allowed signaling between bidders, 3) the AWS frequencies were second-tier beachfront spectrum, and 4) no affordable mobile telecommunications equipment was available to operate in the AWS band.

1) Encumbrances. Bidders for the AWS spectrum faced a major encumbrance. There were 1,990 federal frequency assignments that had to be cleared off the band before they could use it, and the government wouldn't guarantee that the incumbent government users would be cleared off until December 2014—more than eight years after the auction commenced.^{xvii} Various divisions of the Department of Defense and Department of Energy, for example, estimated they would take up to six years to clear the band once the U.S. government transferred reloca-

Low- vs. High-Frequency Spectrum

Why do exclusive licenses for low frequency spectrum earn a premium in the marketplace? There are two long-term structural reasons why low frequency spectrum is most valuable for mobile communications. Both are based on the propagation characteristics of low frequency spectrum, which allow it to easily transmit information through obstacles such as walls, cars, and trees. High frequency spectrum cannot easily transmit information through obstacles, so it tends to be used for fixed, line-of-sight communications. It turns out that these fixed communications have close and superior substitutes with wired telecommunications. Optical fiber, for example, is rapidly being used to connect all businesses and residences in the U.S. Once this network is in place, it greatly reduces any premium that high frequency wireless services can charge. Meanwhile, wired networks are a very poor substitute for mobile communications. For example, you cannot communicate over a wired network while driving a car. This gives mobile applications—using low frequency spectrum—a fundamental comparative advantage.

tion funds to them.^{xlviii} This transfer of funds was a new process, could take months to complete, and would not commence until after the FCC actually handed out licenses for the band, which usually took at least four months from the date an auction ended. In a litigated auction, handing out the licenses could be further postponed, or the auction could be canceled altogether.

Moreover, prior to the auction, the government users would not say exactly where they used their assignments because they considered this classified information. If terrorists knew where the government's radios were, they could jam them or otherwise harm vital public safety communications. As Medley Global Advisors advised its clients shortly after the first few rounds of the auction: "Government entities are not obligated to release any specific information about what part of the band they occupy and when they planned to relocate due to national security concerns. This leaves active bidders... vulnerable to unforeseen obstacles... once the relocation process commences."^{xlix}

Finally, it didn't matter if all of a bidder's spectrum was encumbered. If only half a bidder's spectrum were encumbered, it had the same effect as if the whole were encumbered because one band (the 1710-1755 MHz band) would be used for upstream communications, and the second band (the 2110-2155 MHz band) would be used for downstream communications. A mobile broadband service that could only communicate in one direction would be useless.

How did this encumbrance affect the price of the auction? Clearly, the uncertain and potentially long delay in being able to use the spectrum would tend to depress prices. One senior official with spectrum valuation responsibilities at one of the four largest mobile telephone companies estimated on a not-for-attribution basis that the uncertainty and delay reduced bids by as much as 50 percent. A Yankee Group report published before the auction predicted a 25 percent discount for the encumbrances.¹ A former FCC Chief Economist who consulted for one of the bidders characterized the bidders' dilemma quite colorfully: "The FCC didn't give us the necessary information; it treated us like s**t."^{li} The precise discount will never be known but the 50 percent

figure would put the auction valuation at \$27.4 billion, equivalent to about \$300 million/MHz or \$1.06/MHz-pop—much closer to the SEC valuation used above.

2) Signaling. The AWS auction, by requiring that bidders identify themselves in up to 150 ascending rounds, would have facilitated signaling among bidders during the early rounds. As argued by economist Gregory Rose in a paper for the New America Foundation, this signaling would have facilitated a variety of strategies to reduce auction prices, including blocking and retaliatory bidding. Blocking bidding seeks to prevent new competitive entry. Retaliatory bidding punishes small company bidders who dare to bid on particular licenses avidly sought by large company bidders. Rose argues that the way to eliminate these demand-reducing bidding strategies would be to shift from open to anonymous bidding (also known as "sealed" bidding), which would greatly reduce, if not completely eliminate, the ability to signal during the opening auction rounds. Unfortunately, Rose does not estimate the revenue lost from using open bidding in the AWS auction.^{lii}

3) Frequencies. The average frequency of AWS spectrum was 1,932.5 MHz (the bands auctioned were 1,710-1,755 MHz and 2,110-2,155 MHz, with sections of the lower and upper bands paired for separate upstream and downstream communications). In contrast, the primary frequencies valued in the SEC reports for mobile telephone licenses range from 824 MHz to 1,990 MHz, with a weighted average of 1,438.7 MHz.¹ The discount for second tier beachfront frequencies is unknown, but it is noteworthy that fifteen years ago spectrum suitable for mobile telephone service was not even thought to reach above 2 GHz. Only in recent years has the beachfront/mobile spectrum generally been considered to reach 3 GHz.

4) Equipment. With the development of WiMax and other smart radio technologies, the availability of specialized equipment on favorable terms is rapidly becoming less of an issue in valuing spectrum. But for at least the next few years and probably another decade, the absence of an installed customer

Major Terrestrial Broadcast Station Groups	FCC License Valuation	TV Stations	Radio Stations
ABC TV Stations Group (Walt Disney)	\$ 1,400,000,000	10	70
Belo Corp.	\$ 1,289,504,000	21	
CBS/Viacom	\$ 9,531,000,000	27	104
Citadel Broadcasting	\$ 1,327,305,000		223
Clear Channel Communications	\$ 4,326,592,000	33	1,177
Cox Radio	\$ 1,702,442,000		76
Cumulus Broadcasting Inc.	\$ 934,140,000	299	
Emmis Communications Corp.	\$ 916,518,000		24
E.W. Scripps Co.	\$ 309,243,000	10	
Entercom Communications	\$ 1,351,389,000		102
Entravision Communications Corp.	\$ 746,048,000	22	
Fox/News Corp.	\$ 6,910,000,000	35	
Gannett Broadcasting	\$ 183,514,000	22	
Gray Television	\$ 1,059,066,000	30	
Hearst-Argyle Television Inc.	\$ 2,413,257,000	29	
Ion Media Networks (formerly Paxson Communications)	\$ 844,150,000	53	
LIN TV Corp.	\$ 1,041,153,000	26	
Media General	\$ 721,437,000	23	
Meredith Corp.	\$ 517,799,000	12	
NBC Universal	\$ 2,295,000,000	26	
Nexstar Broadcasting Group.	\$ 163,795,000	28	
Post-Newsweek Stations	\$ 517,742,000	6	
Radio One Inc.	\$ 1,826,127,000		68
Sinclair Broadcast Group	\$ 409,620,000	55	
Tribune Co.	\$ 871,946,000	23	
Univision	\$ 4,220,180,000	40	
Young Broadcasting	\$ 475,929,000	11	74
TOTAL	\$ 48,304,896,000	542	2,217

TABLE 2. VALUE OF TERRESTRIAL TV AND RADIO BROADCAST LICENSES^{lv}

base with a correspondingly large frequency-specific equipment market would have been a significant barrier to entry, especially for relatively small companies that lack the resources to a) vertically integrate into the equipment manufacturing market (a common strategy to jumpstart equipment markets in

newly allocated frequency bands), b) sell consumer equipment at a loss to jumpstart the market, or c) wait for years hoping and praying that an equipment market would develop on its own.

* * *

The value of a license to use spectrum, if allocated for fixed, terrestrial broadcast service, is substantially less than if it were allocated with the flexibility to provide mobile telecommunications service. Thus, in the broadcast bands, we have to clearly distinguish between the opportunity cost of the spectrum and its current value to incumbent licensees.

To find the present value of spectrum licensed to terrestrial radio and TV broadcasting, we can again use the SEC valuations. Using this method, we get \$48.3 billion for the total value of TV and radio licenses, or \$544 million per MHz (\$48.3 billion divided by the 88.8 MHz licensed to incumbent TV and radio broadcasters in an average metropolitan area). See Table 2. These valuations are derived from the public companies among the top 25 broadcast TV groups as ranked by *Broadcasting & Cable*^{liii} and the top 10 publicly-traded radio groups as ranked by the Center for Public Integrity website for 2006. On the one hand, this is an underestimate because the private companies in the top categories are ignored (four of the top 25 TV groups are private) as are any stations or station groups outside the top groups. Of TV stations, approximately 31 percent (542 of 1,756) are covered in this valuation; of radio stations, approximately 16 percent (2,217 of 13,837).^{liv} However, TV and station groups tend to own the largest stations in the areas with the best demographics, so the top station groups cover a significantly larger fraction of the U.S. population than these percentage numbers would suggest.

On the other hand, the \$48.3 billion is an overestimate because News Corp. also owns DirectTV, a satellite TV company. Terrestrial broadcasters also have access to about 4 GHz of relatively high frequency spectrum used for auxiliary services such as transmitting information to TV studios from TV towers, satellites, and reporters in the field. Rights to use this spectrum are a privilege that comes with possession of a terrestrial broadcast license on TV channels 2-69. This spectrum is generally shared with other broadcasters and considered of relatively low value because of its high frequency.

Given all these qualifications, it is therefore surprising that the SEC valuations are close to the flexible use valuations above. This might in part reflect forward thinking about the future prospect of receiving spectrum flexibility.

The value of the white space is harder to assess. If we assume that this warehoused spectrum were granted full flexibility—that is, used for its highest marginal value in the marketplace—it would be reasonable to use our benchmark of \$684 million/MHz as an upper bound. Applying this value to the 225.8 MHz of white space in the terrestrial TV and radio bands would give us \$154 billion. Tom Wolzien, a media analyst, used such a method when he issued a report in early 2001, when spectrum valuations reached their peak, valuing the entire terrestrial TV band as potentially worth \$365 billion in total.^{lvi} FCC Commissioner Copps used a similar valuation method when, in a 2007 New York Times op-ed, he estimated the total value of the TV broadcast band at as much as \$500 billion.^{lvii}

However, these valuations say nothing about the likelihood that the broadcasters will be able to capture that value for themselves. In the radio band, broadcasters have so far been far more successful at capturing white space than in the TV band. If the status quo persisted or the broadcasters were unable to capture any of the white space for themselves, the ultimate giveaway would be zero.

Government Receipts from the Assignment of New Licenses

According to U.S. government estimates, only two percent of FCC licensees were originally allocated by auction.^{lviii} Of course, there is only an imperfect correspondence between the percentage of the total *number* of licenses and the percentage of the total *value* of licenses. Nevertheless, it is clear that only a small fraction of spectrum has been allocated via auction.

In addition to granting licenses, the FCC grants license modifications. In 2007, the FCC's Wireless Telecommunications Bureau granted 137,132 such modifications.^{lix} The FCC seeks no monetary compensation to recoup the market value of these modifications.^{lx} In the future, most spectrum rights will be granted via license modifications because, as the U.S. General Accounting Office observes, “nearly all of the usable radio spectrum has been allocated already.”^{lxi}

Total net bids for new licenses auctioned by the FCC totaled \$59 billion from the first completed auction in 1995 to the last completed auction in 2006. (Net bids are the bids for licenses after bid-

ding discounts for designated entities—small and minority-owned bidders—are deducted from gross bids.) As of December 31, 2006, however, the Treasury only reported \$20.8 billion in net receipts. What explains the discrepancy?^{lxiii}

Many winning bidders didn't actually pay for the licenses and so they had to be re-auctioned. Thus, there is substantial double counting in the FCC data. Other winning bidders found that they could keep their licenses without paying for them if they filed for bankruptcy protection. In the case of the re-auction of the NextWave spectrum in 2001, a court ruled that the government had to give back the winning bids of more than \$16 billion because the licenses had been protected in bankruptcy court.

Another factor is the discrepancy between the time an auction is completed and the time the Treasury receives the money. In the case of the AWS auction, the final tally that goes to the Treasury may not be known until December 2014, when the relocation of federal incumbents must be complete.

If we now add the actual U.S. Treasury receipts as of December 31, 2006 (\$20.8 billion) plus the receipts from the AWS auction in late fall 2006 (\$13.7), we get a total value of \$34.5 billion.

The federal government also took in a net of \$2.7 billion in a controversial 2005 swap of spectrum with Nextel. Of that \$2.7 billion, however, \$500 million was paid to relocate the equipment of TV broadcasters from their electronic newsgathering band at 2GHz, so the government only took in a net of \$2.2 billion (and even then it was not clear what the final cost to relocate the broadcasters would be).^{lxiii} With this adjustment, we get a total value of \$36.7 billion.

This is not a complete tally. From this figure should be deducted the costs of administering spectrum auctions from 1993 to the end of 2006,^{lxiv} the costs to relocate commercial licensees taken out of the trust fund created by the Commercial Spectrum Enhancement Act, and the cost of the interest free loan to designated entities in the early PCS auctions. In the case of the cost of relocating commercial licensees, the total cost is currently unknown and may not be known for some years. From this figure should also be added the cost to winning bidders of relocating government users prior to passage of the

Commercial Spectrum Enhancement Act, which pays for such relocation costs out of a trust fund created from auction receipts.

All these adjustments, however, would be relatively small. In total, it is unlikely the government has received more than \$40 billion from assigning new licenses since the auction era began.

Adding It All Up

If we multiply the valuation per MHz of spectrum (\$684 million/MHz) by the number of flexible use MHz below 3 GHz (693 MHz), we get a total value for exclusive, commercial, geographic area service licenses of \$474 billion. If we then add \$48.3 billion for the terrestrial TV and radio bands, we get \$522 billion. If we then subtract the \$40 billion that went to the U.S. Treasury, we get approximately \$480 billion unaccounted for.

Excluded from this calculation is the warehoused TV and radio band spectrum valued at up to \$155 billion (227 MHz X \$684 million/MHz), a fraction of which incumbent radio and TV licensees are likely to be granted in coming years. This spectrum is excluded because of the difficulty in assessing when and how much of it the incumbent broadcasters will succeed in acquiring.

One way to arrive at a more conservative valuation of the FCC licenses is to simply add up the available valuations contained in financial reports submitted to the SEC. This could give us a lower range to juxtapose against the higher range we have used above. Table 3 attempts to do this by focusing on 41 of the largest FCC license holders, which collectively have license valuations reported to the SEC of \$177 billion. Unfortunately, there are tens of thousands of entities with FCC licensees (There are more than three million licenses in the FCC license database but many of these licenses are possessed by the same entity), and many of these belong to private entities that don't need to file FCC license valuations with the SEC. Thus, the \$177 billion represents only a very small fraction of entities with FCC licenses, albeit a large fraction of the entities with the most valuable licenses. Given that the \$177 billion figure represents a subset of SEC valuations, we shall round it up to \$180 billion. From this figure we can deduct the \$40 billion of government

The Spectrum Giveaway

	2006 License Valuation
Major Terrestrial Broadcast Station Groups	
ABC TV Stations Group (Walt Disney)	\$ 1,400,000,000
Belo Corp.	\$ 1,289,504,000
CBS/Viacom	\$ 9,531,000,000
Citadel Broadcasting	\$ 1,327,305,000
Clear Channel Communications	\$ 4,326,592,000
Cox Radio	\$ 1,702,442,000
Cumulus Broadcasting Inc.	\$ 934,140,000
Emmis Communications Corp.	\$ 916,518,000
E.W. Scripps Co.	\$ 309,243,000
Entercom Communications	\$ 1,351,389,000
Entravision Communications Corp.	\$ 746,048,000
Fox/News Corp. (includes DBS licenses)	\$ 6,910,000,000
Gannett Broadcasting	\$ 183,514,000
Gray Television	\$ 1,059,066,000
Hearst-Argyle Television Inc.	\$ 2,413,257,000
Ion Media Networks (formerly Paxson Communications)	\$ 844,150,000
LIN TV Corp.	\$ 1,041,153,000
Media General	\$ 721,437,000
Meredith Corp.	\$ 517,799,000
NBC Universal	\$ 2,295,000,000
Nexstar Broadcasting Group.	\$ 163,795,000
Post-Newsweek Stations	\$ 517,742,000
Radio One Inc.	\$ 1,826,127,000
Sinclair Broadcast Group	\$ 409,620,000
Tribune Co.	\$ 871,946,000
Univision	\$ 4,220,180,000
Young Broadcasting	\$ 475,929,000
Total	\$ 48,304,896,000
Major Public Mobile Telephone Companies	
Alaska Communications Systems	\$ 18,193,000
Alltel Corp.	\$ 1,657,800,000
AT&T Mobility LLC	\$ 25,245,000,000
Centennial Communications	\$ 483,339,000
Cincinnati Bell	\$ 94,200,000
Dobson Communications Corp.	\$ 1,941,226,745
Leap Wireless International	\$ 1,563,958,000
NTELOS	\$ 133,696,000
Rural Cellular Corp.	\$ 524,713,000
Sprint Nextel Corp.	\$ 19,519,000,000
Suncom Wireless Holdings	\$ 640,991,000
T-Mobile USA	\$ 24,448,510,254
US Cellular	\$ 1,494,327,000
Verizon Wireless LLC	\$ 50,959,000,000
Total	\$ 128,723,953,999
Grand Total	\$ 177,028,849,999

TABLE 3. VALUE OF FCC
LICENSES AS REPORTED
BY LARGE PUBLIC
COMPANIES TO THE SEC^{lxv}

receipts, to come up with a discrepancy between current value and government receipts of \$140 billion.

Of course, there are other possible explanations than a giveaway for the discrepancy between the current value of spectrum usage rights and the amount of receipts the government has received from assigning new licenses. In particular, changing conditions of supply and demand could help explain the discrepancy. Take an auction of spectrum from a decade ago. If soaring demand and fixed supply occurred since then, using a current valuation would be a misleading way to estimate the size of the giveaway. Similarly, if soaring supply and fixed demand occurred since then, using a current valuation would also be misleading. For purposes of this paper, which only seeks reasonable ballpark estimates, the market clearing price of spectrum usage rights has been assumed to remain roughly constant since 1993. That is, both demand for spectrum and the supply of it have greatly increased since 1993 (and are likely to continue to increase at a rapid rate in the future), but it is assumed they have done so in such a bal-

anced way that the price of spectrum has remained roughly the same; that is, there may be significant short-term fluctuations in value, but the overall trend is fairly flat. Support for this assumption is that the valuations of FCC licenses submitted to the SEC on an annual basis have changed remarkably little despite an SEC requirement to reappraise them annually for changes in value.

Should we accept that the value of the government's spectrum usage rights giveaway is somewhere between \$140 billion and \$480 billion? I believe this is a reasonable range. But even if the actual sum was much smaller, the giveaway would be huge. If Representative Jefferson can be indicted for accepting bribes of less than \$1 million, and an average citizen can be thrown in jail for attempting to walk out of a government building with a decrepit chair worth \$5, then surely a giveaway of public assets of at least ten billion dollars deserves careful public scrutiny to ensure that the conditions that caused it do not persist.

Part II of this paper seeks to explain how the spectrum giveaway occurred, and Part III proposes remedies to prevent additional giveaways.



PART II

The Art of Spectrum Lobbying

*"They used to rob trains in the Old West. Now we rob spectrum."
—U.S. Senator John McCain*

How did this giveaway happen? How was the government able to give tens of billions of dollars worth of public assets to private interests without monetary compensation? And how did this giveaway happen with so little media attention and virtually no political accountability?

Conventional media explanations for the success of special interest groups tend to rely on easily quantifiable and comparable indicators of political resources, notably campaign and lobbying expenditures. As a way of explaining the government's giveaway of public spectrum to private interests, these indicators certainly merit note. The companies and industries that have been the greatest beneficiaries of the spectrum windfall—the wireless telcos and the broadcasters—are widely known to be among the most politically powerful and best represented in Washington, D.C. According to the Center For Responsive Politics, for example, the telephone utilities industry, which included both wireline and wireless telecommunications companies, contributed \$107 million to federal candidates from 1990-2006 and spent \$368 million on lobbying from 1998-2006. In addition, the mass media industry, including TV and radio broadcasters, Hollywood, and the record industry, contributed \$202 million from 1990-2006 and spent \$393 million on lobbying from 1998-2006.^{lxvi}

However, this paper offers a different type of explanation, one that focuses on the special characteristics of spectrum as a public asset. Spectrum is different from other public assets the government manages because of the public's relative ignorance of it. It is, to use the title of one of the most important early works on spectrum policy, "the invisible resource."^{lxvii}

Why is invisibility such an important political resource? Because when you can steal something from someone without being noticed, you can get away with it without paying a cost. Plato captured this idea—as well as the ethos of the spectrum lobbying community—in his famous story of the Ring of Gyges. Gyges, a shepherd, finds a ring that allows him to become invisible. He then uses this power to commit a series of foul deeds. After telling this story, Plato reflects on its meaning:

"No man can be imagined to be of such an iron nature that he would stand fast in justice.

No man would keep his hands off what was not his own when he could safely take what he wanted.... If you could imagine any one obtaining this power of becoming invisible, and never doing any wrong or touching what was another's, he would be thought by the lookers-on to be a most wretched idiot, although they would praise him to one another's faces...."^{lxviii}

Capturing the moral temptations of invisibility, a former FCC official who wished not to be cited described a church official lobbying the FCC for favorable license modifications to his diocese's ITFS licenses potentially worth hundreds of millions or even billions of dollars. The church official joked that grave sites and spectrum were his diocese's two main sources of income. Then he fretted that acquiring spectrum rights was a temptation from the devil.

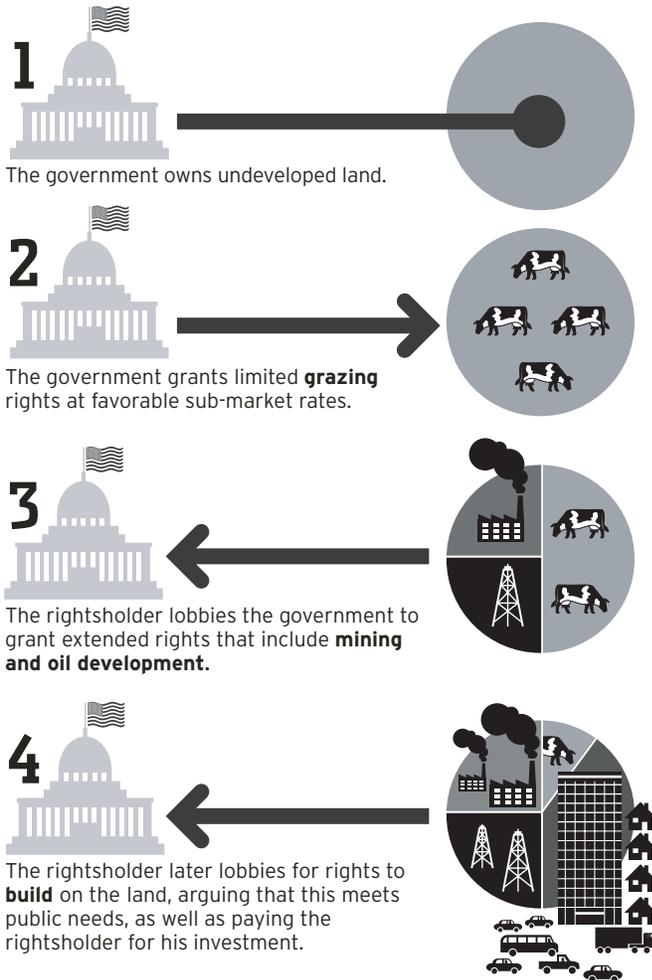
The causes of the public's ignorance of spectrum are multifaceted and deep rooted. They include the public's scientific ignorance of spectrum's physical and economic properties (e.g., the relationship between technology, economics, and white space), the unprecedented nature of spectrum applications (e.g., Wi-Fi, Bluetooth, RFID, Zigbee, and UWB), and the various government decision-making processes, including the FCC rulemaking process and the Congressional budget process, that have been designed to foster that ignorance for the benefit of incumbent spectrum licensees (described in Part III of this paper).

Compare the ability of the government to give away spectrum usage rights to the granting of rights to use tangible, easily understood, public assets. The New York City Department of Parks and Recreation

[A] church official lobbying the FCC for favorable license modifications... joked that grave sites and spectrum were his diocese's two main sources of income. Then he fretted that acquiring spectrum rights was a temptation from the devil.

The politics of spectrum

To help understand **how spectrum lobbying works**, here's an analogy with federal land grants:



Similarly, lobbying by incumbent licensees for spectrum 'flexibility' can turn a limited-term, low-value TV license into a permanent and far more valuable mobile Internet service.

FIGURE 3^{kix} ILLUSTRATES THE CUMULATIVE EFFECT OF SPECTRUM LOBBYING WITH AN ANALOGY BASED ON AN INITIAL ASSIGNMENT OF CATTLE GRAZING RIGHTS RATHER THAN HOT DOG CONCESSION RIGHTS.

maintains more than 1,700 parks, playgrounds and recreation facilities and sells short-term concessions to operate hot dog stands in many of those locations. What if a hot dog vendor wanted the right to operate his concession in perpetuity; wanted the right to construct and sell office, retail, and residential real estate on the territory covered by his concession; and did not want to pay for any of the above rights? One could not conceive of a hot dog vendor acquiring such rights on such terms because the stench of corruption would be impossible to hide. But when it comes to FCC licensing, this type of rights expansion is routine and passes without controversy, even when the rights expansion is orders of magnitude larger than what a hot dog vendor could hope to win even in the implausible scenarios above.

Let's now explore the art of spectrum lobbying—the strategic games that spectrum lobbyists can play to acquire spectrum rights without paying for them. Strategic behavior involves taking actions to influence the actions of other rational actors. In this case, the strategic decision making involves changing both the real and perceived social costs associated with giving public spectrum assets to private entities without public compensation. The real costs involve creating unnecessary but real economic harm if incumbents are not given the spectrum windfalls for which they will later lobby. The perceived costs involve the public's awareness that its property is being given away to private interests without compensation.

Although the details vary greatly, the overall sequence of spectrum lobbying tends to follow a highly predictable pattern. The four stages in the sequence are:

- 1) A problem is created that the potential licensee can solve
- 2) The potential licensee makes a public interest promise to solve the problem
- 3) The incumbent licensee increases its negotiating power vis-a-vis the government
- 4) The incumbent licensee exploits its enhanced power to renegotiate the license terms in its favor.

These four stages may be referred to as “the political economy of an FCC license.” The first two stages belong to the initial licensing phase and the next two belong to the license modification phase. In all stages, the spectrum lobbyist seeks to acquire spectrum usage rights at the least possible cost. In the licensing phase, the spectrum usage rights must generally (since 1993) be awarded through a competitive process such as an auction or comparative hearing. In the license modification phase, the FCC can grant the rights to the incumbent licensee without first considering the best competitive offer for the grant of rights.

Unlike stages one and two, which are complete when the license is acquired, stages three and four tend to form an endless cycle, the cumulative effect of which accounts for most of the giveaway from the public to private interests. This is reflected in this paper’s estimate that auctions for new licenses since 1993 raised \$40 billion for the government, while the total value of spectrum usage rights given away since then may be as much as \$480 billion. This paper, unlike the great majority of published work on the granting of new rights to use spectrum, focuses on the license modification phase. Insofar as licenses are automatically renewed and no new highly valuable (below 3 GHz) exclusive commercial spectrum will be assigned, this is the phase where the lion’s share of the giveaway will take place in the future.

Indeed, since many license modifications so substantially change the rights and market value associated with a license, simply avoiding the competitive auction of a modified license is a key objective of the spectrum lobbyist.

As a practical matter, it may be hard to distinguish between a new license and a license modification. Is an FM broadcast licensee’s acquisition of an adjacent guard band channel a new license or a license modification? Is a TV broadcast licensee’s acquisition of the right to provide ten times the number of previously allowed standard definition TV programming streams a new license or a license modification? Is a mobile satellite service licensee’s acquisition of rights to provide terrestrial service with a license that previously allowed only satellite service a new license or a license modification? All the modifications above have generated huge windfalls for incumbent

licensees, but they have nevertheless been deemed relatively minor modifications by the FCC. This is a vital advantage for incumbent licensees who greatly prefer acquiring spectrum rights via modifications rather than new licenses because the former process allows them to avoid the higher cost and scrutiny that comes with the use of a formal, competitive rights allocation process.

Once we understand that the big payoff for a spectrum lobbyist usually comes in the second phase, the license modification phase, we can see that the strategic imperative of the first phase is simply to get your foot in the door. This involves finding and promoting a problem and then making a public spirited promise to solve it. The public spirited promise, of course, must appear to be a good deal for the public.

Public spirited promises may include offers to provide “public safety,” “free TV,” “universal broadband,” “free broadband,” “educational programming,” “minority programming,” and “news and public affairs programming.”

Since 9/11, public safety has been the favorite argument for commercial companies to win spectrum windfalls.^{lxv} Auctions may mitigate the ability to later renegotiate a promise but do not necessarily eliminate the ability to renegotiate. For example, NextWave bid \$4.7 billion for spectrum but was able to keep the spectrum even after it didn’t pay for the licenses because it protected its spectrum assets by entering bankruptcy court protection. Economically, this is no different than a TV broadcaster who promises public interest obligations to get a license and then doesn’t provide them.

After the license is in hand, the strategic situation between the public and the entity seeking additional spectrum usage rights changes. In the licensing phase, the negotiating power of the entity seeking

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additional spectrum usage rights is relatively weak. This radically changes in the license modification phase, where the incumbent licensee can now obtain “holdup power” over government license modifications. Holdup power occurs when one party to a negotiation has enough power to win the entire surplus to be gained through a negotiation. In this case, that means instead of the public getting compensated for the use of its spectrum asset, the asset must be simply handed over to the incumbent licensee.

[B]usiness people suffer when they enter into a holdup relationship, whereas politicians are rewarded with campaign contributions, positive news coverage on radio and TV broadcast stations, and praise for their political astuteness.

Holdup power is generally obtained through two mechanisms, one political and one economic. Politically, it of course helps that an incumbent licensee has substantial economic resources that it can trade for political influence. But those seeking to acquire new licenses presumably have the same level of economic resources as those seeking to acquire additional rights for the licenses they currently have. The critical difference is that in the second phase, due to the lack of a formal, competitive process, the giveaway of rights can become much less

visible. A shrewd incumbent licensee can exploit this difference to greatly improve its negotiating position.

Economically, the situation also changes because the social costs of license modifications are not fixed. The social cost of not renewing an incumbent’s license at the end of its term and of not granting it additional spectrum usage rights are variables that can change. A shrewd incumbent can take steps to increase those costs to the maximum extent possible, the result of which is that it actually becomes in the public interest to grant incumbents additional spectrum usage rights in a way that would otherwise be a windfall. All this strengthens the incumbent licensee’s negotiating hand.

The legal system can also contribute to the creation of holdup power because of the special posi-

tion it gives to licensees. If licensees can credibly threaten to hold up an FCC action in the courts for years, then the public may be better off not charging for the new spectrum usage right so that the new service can quickly get to market. However, the ultimate power of incumbents in the courts tends to result from the economic and political forces described above. This paper will ignore judicial sources of holdup power.

The public could, of course, fight back by changing the visibility associated with license modifications and preventing incumbents from changing the social costs of license modifications after acquiring a license. But this requires a deep understanding of the strategic situation and a clear focus on the long-term. These are not intellectual traits closely associated with the DC policymaking community in general, let alone the spectrum policy community in particular. Part III of this paper nevertheless attempts to provide such a perspective.

Holdup power also exists in the private sector, as evidenced by the large business literature urging general managers to avoid entering markets and business relationships where the other party to a transaction is likely to possess holdup power.^{lxxi} The difference is that business people avoid getting themselves into such situations like the plague, whereas Congress and the FCC have been attracted to them like moths drawn to a light. The strategic difference is that business people suffer when they enter into a holdup relationship, whereas politicians are rewarded with campaign contributions, positive news coverage on radio and TV broadcast stations, and praise for their political astuteness.^{lxxii}

Now let us explore some of the strategies incumbents can use to enhance their holdup power in acquiring license modifications on more favorable terms. These can be divided into economic and political communication strategies.

Economic Strategies

In understanding economic incentives, it is often useful to distinguish between a short-term and long-term perspective. Clearly, from a long-term perspective, it is unnecessary and harmful to give away vast economic resources to special interests skilled in the arts of spectrum lobbying. But from a short-term

perspective, giveaways may actually make sense. The skilled spectrum lobbyist understands this and thus encourages the creation of social costs in such a way that at any given point in time a giveaway actually appears to maximize social welfare.

An analogy would be a general who destroys the bridge necessary for his soldiers to escape from the enemy. If the bridge existed, the soldiers would have an incentive to retreat in the face of an enemy onslaught. But by destroying the bridge, the general can motivate his soldiers to fight to the death.

Asset Specificity Strategy. A specialized asset is a non-redeployable investment specialized to a task. For example, a machine that can only produce a single product, such as a glove compartment for a particular brand of car, is a highly specialized asset. In more technical terms, asset specificity is the extent to which the investments made to support a particular transaction have a higher value to that particular transaction than they would have if they were redeployed for any other purpose.^{lxxiii}

In private markets, asset specificity is closely associated with economic opportunism. An employer, for example, can often exploit an employee foolish enough to invest in a highly specific skill that cannot easily be transferred to another occupation (universities address this problem by granting academics tenure, thus encouraging them to become narrow specialists). In business and economic textbooks, investments in specific assets are discouraged because they lead to negotiating weakness and an invitation to exploitation.^{lxxiv}

In lobbying, however, asset specificity can be a great negotiating strength. This has been especially true with spectrum lobbying. There are two types of asset specificity of particular importance to the spectrum lobbyist: 1) the stranded investments of an incumbent's customers should an incumbent cease operation, and 2) the stranded investments of an incumbent himself should his license not be renewed. Spectrum lobbyists may seek to increase both types of asset specificity.

For type 1 asset specificity, consider a mobile telephone company that can cripple all the cell phones its customers use so that they will only operate on its own network. Taking away an incumbent's license

would therefore economically harm its customers and provoke their political opposition. Similarly, consider the TV broadcasting industry that can claim that a hundred million people would lose TV service if spectrum allocated to terrestrial, over-the-air TV were re-allocated to mobile telecommunications service. Recalling TV broadcasters' licenses and converting TV broadcast spectrum from broadcast to broadband service would therefore economically harm broadcasters' customers and provoke their political opposition.^{lxxv}

For type 2 asset specificity, consider a mobile phone operator that only invests in cell tower equipment useful with its particular FCC license. The result would be that any attempt to let a license expire would create a lot of collateral economic damage, which in turn would harm telecommunications investment and innovation.

To a large extent, asset specificity doesn't have to be real. It only has to be perceived. For example, TV broadcasters constantly harp that if analog TV sets go off the air, tens of millions of expensive TV sets will lose their economic value. But this is not quite right. The vast majority of TV sets are used primarily for purposes other than watching TV terrestrially over-the-air. This includes watching TV via satellite, cable TV, and telco TV; playing videogames; and increasingly using it as a general interface for a computer and Internet connection. They would retain economic value even without terrestrial over-the-air broadcasting. And to the extent that they would lose value, the whole TV doesn't need to be replaced, just an inexpensive converter to watch a digital signal on an analog TV set.

However, asset specificity is often very real, even if through modest upfront investments it could have been avoided. The key strategic insight is to design equipment (such as mobile phones that cannot switch providers) that maximize asset specificity when it strengthens your market and lobbying power. The mobile phone example is especially good because in that case the licensee pays an upfront premium to *increase* asset specificity. The phone is manufactured with the flexibility to roam across many frequencies and carriers, but the incumbent licensee pays a premium to cripple that functionality.

Pollution Strategy. An FCC license typically involves creating a negative externality on nearby spectrum. To the extent that electromagnetic waves don't magically stop at the edge of a licensee's territory, some interference is inevitable. This negative externality can be maximized to the incumbent licensee's advantage. TV and radio broadcasters, for example, have strenuously opposed any FCC attempt to mandate more selective receivers so that the huge amount of guard band spectrum surrounding their licenses could be productively used.

Once large amounts of white space are polluted, the incumbent licensee can then go to the FCC and say that in exchange for solving this pollution problem, it should be granted the white space.

Once large amounts of white space are polluted, the incumbent licensee can then go to the FCC and say that in exchange for solving this pollution problem, it should be granted the white space. The public benefits from this because valuable new spectrum is opened up for productive use. The incumbents benefit by receiving the right to provide those services without payment. In this way, for

example, the AM and FM broadcasters acquired use of the adjacent channels to their licensed channels. More recently, satellite licensees have used the strategy to acquire "tweener" orbital slots between their existing slots.

Closely related to the Pollution Strategy is the **Reband Efficiency Strategy.** In this strategy, a license is acquired in a band that is inefficiently allocated. The incumbent then promises to reorganize the band more efficiently if given additional spectrum and spectrum rights. As new technology makes guard band spectrum more economical to use than ever before, the opportunities for this rebanding strategy have increased. Incumbent licensee Access Spectrum has proposed such a plan in the 700 MHz band that will be auctioned as part of the digital TV transition. Access Spectrum acquired guard band spectrum for a dirt cheap price because of its limited functionality. Now it has proposed a more efficient

band plan for the 700 MHz auction that will simultaneously enhance its spectrum rights and put more spectrum to productive use for consumers.^{lxxvi}

Louisiana Purchase Strategy. When the United States acquired the Louisiana Territories from France, the property lines of the territory were not precisely defined. The United States later exploited that ambiguity to its advantage when Napoleon was distracted with wars in Europe. The U.S. claimed territory that could reasonably but not definitively be characterized as outside the contractually defined Louisiana Territory. Similarly, contrary to what most incumbent licensees have said in congressional testimony and FCC comments,^{lxxvii} strategic ambiguity works to their advantage in the license modification phase of their lobbying efforts. In general, incumbents like ambiguity when it offers them the possibility of acquiring more spectrum usage rights. Conversely, they dislike clarity when it comes at the expense of rights they hope to win.

For example, broadcasters have opposed efforts to clarify their protected license contours when that clarity involves making a choice between giving up viewers that can receive their signals but are outside their Grade B contour and giving up viewers that are within their Grade B contour but cannot receive their signals. That is because the broadcasters' best strategy in this case is to argue that the rules are ambiguous, so they should receive both types of spectrum usage rights. In contrast, when it wasn't clear whether a broadcast license provided rights to transmit 1) a single standard definition TV channel, or 2) whatever programming would fit within a 6 MHz channel (e.g., ten or more standard definition TV channels), the broadcasters supported clarification of rights as long as the result was a more generous definition of their rights. If the FCC had decided that the broadcasters only had rights to preserve their existing level of service—a definition of service that could have resulted in the FCC reducing a broadcast license from 6 MHz to 1 MHz—the broadcasters would have strenuously opposed the effort at clarity. In the United Kingdom, the government decided to define a broadcast license in terms of the spectrum needed to provide a service rather than in terms of the original amount of resources

(i.e., spectrum) used to provide that service using the older, less efficient (analog) technology.^{lxxviii} In the U.S., the FCC has often defined license rights in the same restrictive way for incumbent licensees lacking holdup power. In such cases, it is never rational for incumbent licensees to prefer clearly defined spectrum usage rights.

Case-by-Case Waiver Strategy. The Administrative Procedures Act requires a formal and public notice and comment system to create more flexible spectrum allocations. This relatively public process can be skirted by seeking special “temporary” authorizations for an experimental license modification or a case-by-case permanent waiver of the allocation rules that would otherwise apply to a licensee. Once hundreds of these temporary or permanent exceptions have been granted below the public radar, it is almost impossible not to grant the requested license modification when it finally comes under review via the Administrative Procedures Act. That is because by then manufacturers and licensees may have already invested substantial sums in highly specialized equipment to produce the new service and tens of thousands of consumers may have already purchased equally specialized equipment to use the new service (see “asset specificity” strategy just above). Radio broadcasters, for example, employed such a strategy when acquiring multicasting rights on their new digital spectrum. These rights were highly valuable and there was pressure on the FCC to ask for something in return for granting such valuable rights. By using special “temporary” authorizations—which were issued without any public notice—to put more than 800 multicasting radio stations in operation before the FCC finally got around to completing a formal rulemaking, the incumbents’ negotiating position was greatly strengthened.^{lxxix}

Political Communication Strategies

Spectrum giveaways, of course, are a political embarrassment, so incumbent licensees have a great incentive to minimize any perception of a giveaway. To the extent possible, this means operating below the public radar, keeping in mind that in affairs like this the least publicity is the best publicity. As one former FCC insider explained the political logic, “If

people asked for something and no one objects, we gave it to them.”

However, it is not enough to keep things below the public radar. It is also necessary to have a store of arguments that can be used for political cover when anyone seeks to point out the giveaway taking place. We’ll start by looking at strategies incumbents use to keep giveaways below the public radar. Then we’ll look at some ways they seek to frame giveaways as something other than a giveaway.

The Go-Slow Strategy. By asking for new spectrum usage rights in small pieces over time, no individual ask makes it worth the effort for the public and its advocates to mobilize in opposition. If a group of incumbent licensees ask for billions of dollars of spectrum rights all at once, it is a much more newsworthy request than if the same giveaway is incrementally asked for over several decades and in dozens of different FCC proceedings.^{lxxx} This go-slow approach also works to the advantage of spectrum lobbyists who want to keep their jobs and would lose them if they succeeded in getting a giveaway all at once; that is, from their perspective, it may be better to get \$100 million a year for ten years than \$1 billion all at once the first year. Over the decades, TV and radio broadcasters have played the go-slow strategy brilliantly, transforming a three-year license with substantial public interest obligations and a high risk of non-renewal into an eight-year license with minimal public interest obligations and almost no risk of non-renewal. At the same time, they have greatly expanded their service areas and the types of services they can provide.

A noteworthy variant of the Go-Slow Strategy is the **Create-Red-Tape Strategy.** In this strategy, an incumbent licensee’s public interest obligation is attacked in two steps. In the first step, the substance is quietly eviscerated. In the second step, the paperwork associated with enforcing the public interest obligations is ridiculed for being without substance. This “red tape” is then eliminated. Both the radio and TV broadcasters played this strategy brilliantly from the 1960s through the 1980s. Originally, broadcasters were supposed to renew their licenses based on a rigorous competitive process—just like

the process used to win their original license. The competition was based on what were perceived to be credible commitments to provide public interest programming, such as local, objective news. Over the years, however, broadcasters gradually eviscerated the substance of the comparative renewal process without attacking either the principle behind it (that if they received free use of the public airwaves, they would have to give something back to the public) or the paperwork associated with the principle's implementation. By the 1980s, the paperwork had become a farce because it became clear that license renewal had become automatic except for gross misconduct. It then became easy to attack the paperwork—which had been the centerpiece of the FCC's system for verifying the broadcasters' public interest claims—as “red tape” serving no useful public purpose.

Yet another variant of the Go-Slow Strategy is the **Wait-For-The-Next-Government Strategy**. Government leaders and priorities come and go with remarkable frequency in Washington, D.C. Incumbent licensees know that they can use that change to renegotiate more favorable license terms because with a change of government can come a change in priorities and a blissful ignorance of and lack of responsibility for what has come before. One presidential administration, for example, may believe that it is an urgent national priority to allow TV broadcasters to transition from fixed standard to fixed high definition TV service and thus be willing to grant broadcasters the additional rights to spectrum necessary to allow that to happen. The next administration may come in and believe that fixed HDTV isn't a high priority so broadcasters should be allowed to provide ten or more fixed SDTV channels in the spectrum granted to them for the HDTV service. The next administration may come along and say neither fixed SDTV nor fixed HDTV service is critical: broadcasters should be allowed to provide TV of whatever resolution they want and shift from site-based licensing to mobile telephone style geographic licensing so that broadcasters can provide mobile TV service. The next administration may then come in arguing that broadband is the future and drop the requirement for one way com-

munications. What is constant throughout this process is that the incumbent licensee is increasing his or her spectrum usage rights.

The One-Hand-Not-Knowing-What-the-Other-Hand-is-Doing Strategy. By asking for new spectrum rights in different FCC proceedings that are not apparently linked to each other, the size of a particular incumbent's campaign for a rights giveaways may not be noticed even if it all happens at the same time. In recent years, for example, TV broadcasters have exploited this strategy to seek rights over white space in a half dozen different and obscure proceedings, each one of which to the lay person might seem unrelated and which the FCC usually treats as wholly unrelated, placing the entire burden on the public to find a linkage. An especially nice feature of this strategy is that it can mask inconsistencies in policy rationales. For example, in the FCC's white spaces proceeding, the TV broadcasters argue that using the white space will inevitably result in harmful interference to incumbent licensees.^{lxxxix} But in the distributed transmission system technologies (DTS) proceeding, they argue that those incumbent licensees should be given access to those white spaces because they can operate on those white spaces without causing harmful interference to existing viewers.^{lxxxii}

Technobabble Strategy. All requests for license modifications must be subject to some type of public notice. But there is no requirement that the request for a modification has to be in a form that anyone without a Ph.D. in spectrum technology can understand. Even trade reporters who make a career out of reporting on the FCC may have only a minimal understanding of the economic significance of a particular license modification. Thus, it is quite possible for a license modification to be “public” in a literal sense but completely private in a practical sense.

The Information Logrolling Strategy. The public depends on conflicts among elites with inside knowledge for much of their policy information. But if those elites have more to gain by playing a game of you'll-scratch-my-back-if-I'll-scratch-yours, then the public will be deprived of essential information. This

strategy works especially well for issues, such as spectrum policy, which are viewed as non-partisan, meaning the political parties choose not to differentiate themselves on this issue. Traditionally, this strategy is how Congress manages telecom policy, including spectrum policy. It asks the stakeholders to meet in a back room and work out a deal that Congress will then approve. A classic example is the Telecommunications Act of 1996, where the mobile telephone and broadcasting interests decided not to go against each other because both had more to gain by quietly cooperating than openly fighting.

When an incumbent licensee is challenged about a particular giveaway, it often responds with a stock set of arguments that seek to minimize the size of the giveaway and shift the topic to another subject. Here are a handful of those arguments, each of which may seem reasonable in the context of a particular request for a license modification but seen over time and across countless license modifications appear in their true light.

Spilled Milk Strategy. With this strategy, incumbents argue that the great majority of any possible giveaway has already taken place and it does no good to cry over spilled milk.^{lxxxiii} This strategy focuses on the observation that many incumbent licensees paid for their licenses in the market and it would be unfair to penalize them for giveaways given to others. It also contrasts the large giveaway that has already occurred with the very modest license modification currently being sought. The fact that the same argument has been used for decades while huge license modifications have accumulated is not noted. Nor is it noted that the current license modification is not the end of the giveaway sequence but merely one point in a long series of giveaways that may occur for decades into the future. A related strategy is the Two-Wrongs-Make-a-Right Strategy. According to this argument, if so much injustice has already occurred, it is only fair that it continue so that spectrum lobbyists' reasonable expectations of the FCC are not disturbed. As one former FCC chief of staff explained this mindset (without necessarily agreeing with it), "The FCC has on so many occasions engaged in unjust enrichment, it's too late to stop now."^{lxxxiv}

Political Inevitability Strategy. Incumbent licensees and their advocates point to the fact that Congress and the FCC have no political willpower to prevent spectrum giveaways. Thus, no rational person would seek to oppose a particular giveaway because the result would simply be wasted resources. It is rarely pointed out that this argument is undemocratic and a classic argument favored by despots.

A corollary argument is the **Economic Efficiency Strategy.** According to a popular economic theory, the initial distribution of assets has nothing to do with their long-term efficient allocation in a market

where those assets can be freely traded. Thus, whether or not spectrum usage rights are given away to incumbent licensees has no efficiency implications. If we now assume that the only way to get spectrum usage rights into the market is to give them to incumbents (because the FCC has no practical political way to charge for them), then the rational economic course of action is to give the spectrum rights to the incumbents.^{lxxxv} But the assumption of political inevitability should be controversial. If applied to the management of other public resources—

such as whether oil companies should be given free access to exploit oil on public lands because the public would benefit from the resulting oil in the marketplace—the argument appears simply ludicrous. Yet somehow, when it is applied to spectrum, it is accepted as a synthesis of conventional political and economic wisdom.

Save-By-Killing-It-Strategy. To save what they argue is an uneconomical service, incumbent licensees may argue that they need the flexibility to provide a more profitable service. They will then use the profits from the more profitable service to subsidize the less

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profitable service. The incumbent keeps making this ask until eventually the service for which spectrum flexibility was granted no longer exists. In other words, what is saved is the incumbent's valuable license rights, and what is killed is the reason the licensee got his license in the first place. A classic example of this occurred in the ITFS band, where the incumbent educational services kept asking for more commercial usage rights to subsidize their education services until they no longer provided those services and just collected commercial rents from their licenses. TV broadcasters have also employed this strategy with brilliant effect in their efforts to save free TV by gradually killing it.^{lxxxvi}

Two-Option Strategy. In this strategy, incumbent licensees invest heavily in one option favorable to its interests. This option is then only contrasted with the status quo. The FCC, partly because it is expensive and requires some foresight to develop additional options, then makes its decision not by comparing all the possible options but only the option favored by the incumbent in comparison to the status quo. A classic example is the set of options the FCC considered in managing the digital TV transition. A single channel transition, as advocated by John Nickel at Los Alamos Labs, would have freed up the TV white spaces for productive use more than a decade ago.^{lxxxvii} But the broadcasters wanted that white space for themselves and so didn't invest in a single channel option. The public was then told that the only efficient way to transition to terrestrial broadcast TV required granting broadcasters a second channel.

A close variant of the Two-Option strategy is the **Standards Body Strategy**. Often industry dominated and unaccountable standards bodies will take on the role of artificially restricting options in the guise of a standard. The problem occurs when the FCC then endorses the standard in a rulemaking. The Advanced Television Systems Committee (ATSC) has taken on this role for broadcast digital television standards, and an IEEE working group (802.16) has taken on this role for allocating TV broadcast guard band spectrum.^{lxxxviii}

Ten Illustrative Spectrum Giveaways

The following ten spectrum giveaways are only a small subset of the spectrum giveaways that have occurred during the past two decades. Most spectrum giveaways occur in many obscure dribs and drabs over many years. For example, the giveaway of spectrum usage rights to high power TV broadcasters since 1993 has occurred in more than a dozen different rulemakings, the great majority of which received no mass media news coverage.^{lxxxix} Often licenses are held by spectrum speculators willing to wait many years for the right opportunities to win additional spectrum flexibility. The examples below were chosen for their diversity and relatively large size. Most received at least some mass media news coverage.

1) Metro TV Broadcasters (broadcast TV band).

Beginning in the 1940s, the FCC granted free licenses to high power terrestrial TV broadcasters who promised to provide TV service in the public interest. Each license consisted of the right to provide a single standard definition TV channel for three years, whereupon the FCC was supposed to renew the license on a competitive basis known as "comparative renewal." As of 2006, there were 1,756 licensed high power TV stations in the U.S.

In 1996, high power terrestrial TV broadcasters operating in the 210 metropolitan area TV markets won digital flexibility, which allowed each broadcaster to provide ten times as many standard definition programming streams plus new services such as HDTV and computer data; an indefinite, interest free loan of a second channel, which they were able to leverage into many more subsidies; and a greater presumption of automatic license renewal, including an increase in license duration from five to eight years and abandonment of the last vestiges of comparative renewal.^{xc}

2) Rural TV Broadcasters (broadcast TV band).

The FCC envisaged that local TV broadcast programming would originate in 210 local markets centered in metropolitan areas. To rebroadcast that programming in rural areas, a system of TV translators was established. By 2006, there were 4,518 TV translators re-broadcasting programming from the nearest local TV market.

In 2004, TV translators serving areas outside of the 210 metropolitan area TV markets won the set of rights high power TV broadcasters won in 1996 plus an additional set of rights, including no fixed date to return their analog TV channel and the right to cluster all their public interest obligations on the channel of a single broadcast licensee within a market.^{xcii} For example, if there were 12 licensed TV translator stations in a TV market, they could agree to get together to broadcast their mandated one, “free” (ad-supported) standard definition TV channel on the channel of a single licensee, thus freeing the 11 other channels to provide more profitable non-broadcast services.

3) AM and FM Radio Broadcasters (broadcast radio bands). Beginning in the 1920s, the FCC granted free licenses to AM broadcasters who promised to provide radio service in the public interest. The license consisted of the right to provide a single standard definition audio channel for a limited number of years, whereupon the FCC was supposed to renew the license on a competitive basis known as “comparative renewal.” The FCC created a similar licensing system for FM broadcasting in the 1950s. As of 2006, there were 13,837 licensed high power AM and FM stations in the U.S.

In 2002, AM and FM broadcasters won rights to double their licensed bandwidth by acquiring rights to half the adjacent guard band channel on each side of their licensed channel.^{xciii} This would allow each radio broadcaster to eventually provide as many as 20 standard definition audio programming streams plus HD audio and computer data.

4) Mobile Satellite Operators (MSS band). In the 1990s, the FCC allocated spectrum for mobile satellite service, which was to provide mobile telephone service to areas not covered by terrestrial mobile service. Fearing that if the U.S. auctioned satellite rights other countries might do the same, the award of satellite licenses was exempted from the auction rules. As terrestrial mobile telephone service spread faster than had been expected and provided a superior service at lower cost,^{xciiii} satellite operators found they couldn’t provide a profitable mobile telephone service.

In 2003, mobile satellite operators won rights to provide terrestrial as well as satellite service on their spectrum.^{xciv} Unlike satellite operators who use higher frequencies suitable only for fixed, line-of-sight communications, the mobile satellite operators use frequencies below 3 GHz suitable for mobile communications.

5) Wireless Cable TV Operators (MMDS band). In the 1970s, the FCC was worried about an emerging cable monopoly on subscription TV service. Therefore, it allocated a large swath of lower frequency spectrum for terrestrial wireless cable TV service. Satellite TV proved to be a much more efficient delivery vehicle for such wireless subscription TV service, and the terrestrial wireless cable TV operators failed. Most of the wireless cable TV operators subsequently sold out to spectrum speculators such as Nextel and Sprint with an eye for winning spectrum flexibility.

In 2004, building on a decade long run of small victories, wireless cable operators won flexibility to provide mobile broadband service.^{xcv}

6) Instructional Wireless Cable TV Operators (ITFS band). In the late 1950s and early 1960s, the FCC was worried about what was perceived to be the superior educational system of the Soviet Union. The evidence for this apparent superiority was that the Soviet Union, beginning in 1957, launched a series of manned rockets into space years before the U.S. would be able to do so. At the time, TV was perceived to be a new technology that could greatly improve the quality of American education. Consequently, the FCC granted a large swath of spectrum to the so-called Instructional Television Fixed Service. This TV service required the purchase of specialized transmitters and receivers; the tuner on a regular TV could not pick up the educational programming. A relatively small group of colleges, K12 parochial schools, and non-profits (set up specifically to use this spectrum) were the primary beneficiaries of this allocation. The hopes for the ITFS spectrum were never realized, and a decade after it was first granted almost half of it was taken back and reallocated for wireless cable TV service, which technically was very similar to the instructional service.

In 2004, instructional television fixed service operators won the same flexibility as the wireless cable TV operators (see above).^{xcvi} They further won the right to lease their spectrum to the wireless cable operators, effectively turning their spectrum licenses into cash cows divorced from their original educational purpose.

7) Dispatch Service Operators (800 MHz band).

In the mid-20th century, the FCC granted dispatch services, such as fleets of locally licensed taxis, audio channels to coordinate their internal operations. Each channel used a single transmitter that would cover a large geographic area such as a metropolitan market. By the late 1980s, spectrum speculators began acquiring dispatch licenses in the hope that they could later be transformed into flexible use licenses.

In 1991 dispatch service operators won the right to provide cellular, mobile telephone service.^{xcvii} This allowed them to expand the service capacity of their licenses by multiple orders of magnitude and expand their market from a narrow set of occupations to the general public.

8) Electronic News Gathering Operators (2 GHz band). Each licensed high power broadcaster is given rights to not only broadcast on a retail channel (a channel from 2-69 in a given local TV market) but also use of an additional set of frequencies for electronic news gathering and other so-called auxiliary services. The electronic news gathering spectrum allows a reporter in the field to transmit raw footage back to the TV station. The electronic news gathering spectrum is shared with the other TV stations in a local TV market and allocated with the help of a local frequency coordinator, usually an engineer from one of the local TV stations. As part of the DTV transition, the FCC expected the broadcasters to migrate from analog to digital technology and give back a small fraction of their electronic newsgathering spectrum, which occupied beachfront

spectrum. This spectrum was widely perceived to be inefficiently used because it was only used a small fraction of the time and provided point to point communications while consuming a vast geographic expanse of spectrum.

In 2004, the federal government granted high power TV broadcasters a minimum of \$512 million to upgrade their electronic newsgathering technology from analog to digital service. This technology upgrade made it possible to free up a small portion of the broadcasters' electronic news gathering spectrum while greatly increasing the capacity of the broadcasters' electronic news gathering service.^{xcviii}

9) TV Auction Speculators (700 MHz band). In 2002, the FCC auctioned TV spectrum in the DTV band at a huge discount to the market value of similar unencumbered spectrum because the bidders had little idea when, if ever, they would be able to use the spectrum they had bid upon.^{xcix} In 2005, the federal government unexpectedly committed to spend at least \$1.5 billion to speed the digital TV transition, thus freeing up the winning bidders' spectrum by 2009 and increasing the value of their spectrum manifold.^c

10) Mobile Telephone Auction Speculators (PCS band). In 1996, the FCC auctioned spectrum with minority owned and small business bidders paying for the spectrum on an installment basis. However, winning bidders (most notoriously, a company called NextWave Communications, Inc.) were able to keep their licenses even if they didn't pay by seeking bankruptcy protection from creditors, including the U.S. government. In 2001, the FCC re-auctioned the licenses from the 1996 auction that hadn't been paid for. Winning bids totaled more than \$16 billion but the FCC had to return the auction receipts when the Supreme Court ruled that the licenses auctioned in 1996 continued to be the property of the original bidders who had protected the licenses in bankruptcy court.^{ci}



PART III

Public Policy Recommendations

To stem the giveaway of public spectrum assets to private interests without public compensation, two sets of public policy reforms must be undertaken. First, the visibility of spectrum giveaways needs to be increased so spectrum lobbyists lose their Ring of Gyges. Second, the government's rational economic incentive for creating such giveaways—a critical cause of incumbent licensees' current holdup power—needs to be reduced by eliminating the unnecessary asset specificity currently associated with spectrum investments.

Reduce the Informational Sources of Incumbents' Holdup Power

1) *Improve Accounting Rules for Tracking Rights to Spectrum Assets and Changes to those Rights*

The total value of spectrum assets in the U.S. has been estimated by a former chief of the National Telecommunications and Information Administration (NTIA) to be worth as much as \$2 trillion. The government's accounting for that asset is abysmal and needs to be reformed. Just as Congress is currently considering a Broadband Data Improvement Act to improve the quality of federal broadband data, it needs to create a Spectrum Data Improvements Act to improve the quality of federal spectrum data. Here are some specific proposals:

The government needs to create a central database including the details of every spectrum assignment in the United States. Currently, government spectrum databases are divided between the NTIA, part of the Department of Commerce (which tracks use of spectrum by the 58 federal entities, such as the U.S. Army, Capitol Police, and Department of Transportation, with their own spectrum allocations), and the FCC (which tracks all other spectrum allocations). Within the NTIA and FCC, the data is also fragmented. At the NTIA, most of the data is treated as confidential for reasons of national security and not disclosed publicly. And at the FCC, the data is fragmented among the different bureaus with responsibility for spectrum management. All this data needs to be integrated into a single database and much if not most of the NTIA spectrum data currently withheld from public scrutiny needs to be publicly released. In 2006, Representative Jay Inslee introduced an amendment in the House Commerce

Committee to create an inventory of federal spectrum, but it was defeated.

The database also needs to include historical information so that the modifications of any license over time can be tracked. Every year the FCC's Wireless Bureau approves tens of thousands of minor license modifications. Companies with a track record of incessantly seeking minor modifications to their licenses should be easy to identify. Similarly, the query letters to the FCC by members of Congress on behalf of incumbent licensees seeking minor modifications should be linked to the license modification database.

The government should require that all spectrum license and allocation modifications that reach a threshold valuation should be valued by an independent auditor and integrated into the FCC's and NTIA's rulemaking procedures, including both formal rulemakings and waivers of particular rules on a case-by-case basis. OMB should then review the costs and benefits of such modifications with an expected economic impact above a certain threshold.

Detailed valuations, as opposed to ballpark estimates within an order of magnitude, may not be necessary. For example, the proposed independent auditor could be asked to mark a checkbox that a proposed license or allocation modification has an estimated value between 0 and \$1,000, \$1,000 and \$10,000, \$10,000 and \$100,000, \$100,000 and \$1 million, \$1 million, and \$10 million, \$10 million and \$100 million, and so on. In addition, every year, the FCC should issue a report that tallies the value of all such modifications over the last year and the cumulative value of such modifications for all allocated services over the previous ten years.

Such valuations included as part of the rulemaking procedure are analogous to the mandates Congress has passed to estimate the financial impact of every proposed rule on small businesses and to estimate the time to fill out paperwork for every new regulation requiring reporting to the federal government

[T]he visibility of spectrum giveaways needs to be increased so spectrum lobbyists lose their Ring of Gyges

It is also analogous to the President's mandate under Executive Order 12,866, that agencies notify the Office of Management and Budget on rule changes with an economic impact greater than \$100 million.

To make such valuations possible, a coherent and codified body of financial accounting standards for spectrum valuations needs to be developed. Central to such a set of standards should be the assumption that any spectrum usage right not explicitly given away as part of the Communications Act has not in fact been given away. Basic metrics for valuing spectrum by geography, frequency, service and other parameters need to be developed. A basic geographic metric should be the industry standard \$/MHz-pop, which should vary across frequency and service. Compared to other accounting valuation tasks, such as valuing stock options based on uncertain future events, valuing spectrum rights is comparatively simple. The current Financial Accounting Standards Board rules for valuing FCC licenses, including the annual impairment test, should be used as a starting point.

All license valuations should include a note assessing the potential holdup power associated with a modification. Many modifications are small in themselves but create great holdup power, which is useful when acquiring additional spectrum rights in the future. That is, the feasibility of a particular modification isn't independent of other modifications; one modification may create great economic and political pressure to later approve another modification. The TV broadcasters' current request for Distributed Transmission System (DTS) rights fits in that category. The proposed switch from site-based to flexible geographic area licensing may seem slight if all the extra transmitters can only retransmit the same signal as the original site-based transmitter. But if the resulting network of transmitters greatly enhances the broadcasters' holdup power to later convert to cellular licensing, this is an important financial consideration that needs noting.

All this spectrum asset information should be available in a highly structured format (e.g., with XML tags such as the SEC uses) and be available for free download from the FCC's website. As a service to the public, the FCC should also provide easily usable visualization tools—such as the tools NTIA uses internally to track classified spectrum assign-

ments and that ComSearch, a private company, sells to well-heeled spectrum lobbyists.

The Congressional Budget Office and the Office of Management and Budget should integrate all the spectrum asset valuations into a single public assets database and include this information in a compiled balance sheet of U.S. public assets, which includes changes in the value of assets over one or more preceding accounting periods. The government currently accounts for many other infrastructure assets such as roadways, bridges, sewage facilities, and dams.^{cii} But spectrum assets have been exempt from these public asset reporting requirements.

Current FCC rulemakings and rules waiver requests relating to the same spectrum allocation or assignment should cross reference each other and the cross references should be automatically updated as new information is added to the FCC's rulemaking databases. The FCC should also be required to provide a note explaining how the passage of one rulemaking might impact another. For example, if the outcome of the FCC's DTS, TV translator, and TV allotment proceedings could seriously affect the amount of white space still available in its white space proceeding, this fact would have to be noted.

2) Reduce Conflicts of Interest among FCC Employees

The problem of the conflict of interest created by the revolving door between government workers and the private organizations they regulate has been widely observed. A conflict of interest occurs because government regulators have an interest in not alienating potential future sources of financial support in the form of salary or equity investment. The conflict of interest causes regulators to write rules that support private interests, not the public interest. This problem is pervasive at the FCC. Its spectrum rule writers often leave the FCC to work for companies and industries directly affected by the rules they were writing. A classic recent case is Bruce Franca from the FCC's Office of Engineering and Technology. In the mid-2000s, he went directly from writing the proposed rules concerning the future of the TV guard bands (white spaces) to MSTV, the leading broadcast trade association lobbying on those rules.

What distinguishes this conflict of interest at the FCC from other agencies is not its existence but its magnitude. FCC rulemakers have remarkable discretion over “minor” license modifications and auction designs that might result in the giveaway of billions of dollars worth of wealth from the public to private sector. Increasingly, too, former FCC employees are given equity interests—some worth potentially hundreds of millions of dollars—in telecommunications companies seeking favorable treatment before the FCC. Normally, public opinion in a democracy would provide a check on this type of giveaway. But, as we have seen, the remarkable ability of spectrum lobbyists to win spectrum giveaways below the public radar cripples this check.

A classic instance of the new scale of profits from the revolving door is Janice Obuchowski. In the 1980s she went from being a senior aide to an FCC Chairman to being head of the NTIA, where she helped write the rules for the PCS (mobile telephone) auctions that took place in the mid-1990s (the role of the NTIA was to free up the spectrum from federal users so the FCC could auction it). Then she left office, and as president and a major investor in NextWave, bid on that PCS spectrum, with NextWave investors later walking away with a multi-billion dollar windfall at taxpayer expense.

To reduce the conflict of interest stemming from the revolving door, the ban on FCC workers with spectrum management responsibilities from lobbying the FCC and Congress should be increased. In Anne Arundel County, Maryland (where this author lives) the ethics law forbids former county employees from profiting from matters of which they had intimate knowledge while employed in the public sector.^{ciii} This is probably too onerous a standard for former government spectrum managers, but increasing the ban on the revolving door from one to three years may be feasible. In addition, private companies lobbying the FCC or Congress with former FCC employees as stockholders should be required to disclose those equity interests, regardless of how long ago the stockholders worked at the FCC. This latter disclosure won’t directly stem the problem, but it would provide a valuable indicator of its dimensions.

3) Reduce the Current Number of Heterogeneous Spectrum Bands

The FCC’s Spectrum Policy Task Force Report, issued in November 2002, recommended that the FCC reduce the number of spectrum bands managed on a command and control basis and increase the number managed on a flexible use basis.^{civ} Since there are countless discrete ways to manage spectrum on a command and control basis but far fewer ways to manage it on a flexible use basis—because the choice of how to use the spectrum is left up to the licensee rather than the government—the practical effect of such a policy would be to radically simplify the FCC’s band plan and rulemaking process. The Spectrum Policy Task Force Report focused on the economic advantages of such a simplification of the FCC’s allocation system, but the political advantages are equally great. The complexity of the current system militates against public involvement. Newspapers, for example, won’t run articles on spectrum policies that are perceived to be “inside baseball.” Similarly, public interest groups won’t seek to mobilize the public on issues that don’t in-and-of-themselves have significant impact on the public. The result is that band-by-band rulemaking is synonymous with special interest politics, with politically powerful incumbent licensees making out like bandits. By creating fewer different types of bands, changes to any one band are more important and thus can draw the interest of a larger fraction of the public.

4) Require Congress to Appropriate Spectrum Usage Grants and Thus Be Accountable for Them

Verizon has been arguing that under the Anti-Deficiency Act (“ADA”) and Miscellaneous Receipts Act (“MRA”), the FCC cannot give away and receive valuable assets, such as spectrum, without explicit congressional approval.^{cv} The principles behind these rules are quite simple and uncontroversial. As Verizon’s General Counsel explained:

Congress well understood that stewards of public resources could be exposed to relentless pressures to convert those resources to private gain. It therefore took stern measures, and aimed them directly at the officials themselves, to ensure that they would not succumb to these pressures and instead remain true to the public interest.^{cvi}

Whether or not the FCC is currently required to follow these rules in granting valuable spectrum rights^{cvi} has no bearing on whether it should be required to follow them, which is the more fundamental question. And the answer to this question is a resounding “yes”: Congress should be forced to take public responsibility for the giveaway of billions of dollars of spectrum assets to the private sector. One approach to doing so would be to integrate spectrum giveaways into the PAYGO rules, which require con-

[T]he terminology and conceptualization of spectrum leasing should more closely parallel the more general language of federal contracting regulations.

gressional expenditures to be offset with revenue.

A cynical reading of Congress’ current role in granting spectrum giveaways would have it focused on taking campaign contributions and other types of support from spectrum lobbyists in return for avoiding public and embarrassing congressional oversight of the FCC’s license modification and enforcement policies. What over-

sight Congress does do is primarily surreptitious and unaccountable; for example, working behind the scenes to facilitate spectrum giveaways by appointing quiescent FCC commissioners and structuring the FCC rulemaking process to not include explicit consideration of spectrum giveaways.

5) *Re-characterize Licenses as Leases and Integrate Spectrum Leasing into the Government Contracting System*

The current degree of exceptionalism in the management of spectrum assets and spectrum licensing should be reduced. It should always be remembered that a license is essentially just a government sanctioned lease. The politics of government leasing may be very different from the politics of private sector leasing, but the underlying economic principles involved are very similar. Spectrum “leases,” for example, should be included in the Federal Procurement Data System and the terminology and conceptualization of spectrum leasing should more closely parallel the more general language of federal con-

tracting regulations. Basic principles of contracting, such as competitive bidding and contract terms of minimum necessary duration, should be applied to spectrum leasing. For example, just as the practice of not awarding government contracts on a competitive basis (called “sole source contracting”) is universally disparaged, except in rare circumstances, sole source spectrum leasing should be disparaged in favor of competitive bidding. At the FCC, even after the advent of auctioning in the early 1990s, the great majority of spectrum usage rights are still awarded on a sole source basis to incumbent licensees. This should be a red flag for the FCC’s inspector general and the General Accounting Office that there is a great likelihood of waste, fraud, and abuse in the management of this vital public asset.

6) *Integrate the Management of Spectrum Assets into the Systems for Managing Other Natural Resources*

It is striking that both Congressional Research Service and General Accounting reports for Congress on the management of natural resources don’t even mention spectrum.^{cvi} This should be changed. Indeed, spectrum may now be the most valuable natural resource the government manages. Although the federal government is notorious for giving away rights to use public resources at below market rates,^{cix} its track record of giving away spectrum assets appears to be even worse. Shifting at least some control over spectrum management audits at the General Accounting Office from the Physical Infrastructure Issues group to the Natural Resources and Environment group would thus be a positive step.^{cx} Similarly, spectrum should be added to the purview of the natural resource economists at the Congressional Research Service.

7) *Enforce Buildout Requirements Via Automated Transparency*

All over the world today, businesses are using automation to reduce the cost of detecting contract violations when the cost of manual detection would be prohibitive. Insurers of homes in disaster prone areas, for example, are using satellite images from Google Earth to check on whether homeowners have installed the fire proof roofs, storm-resistant

window shutters, and other disaster mitigation equipment they claim to have installed.^{cxv} However, when it comes to the FCC—the agency that regulates one of the most high tech industries on earth—the enforcement mechanisms are stuck in long obsolete methods devised decades ago.

Consider the repeated pattern of spectrum lobbyists promising the FCC that they will quickly build out their telecommunications facilities (a promise that gives them special advantages under the Communications Act) and then not doing so. To deal with the build-out problem, FCC enforcement of buildout rules should be highly automated with the results made public in real time. Current enforcement systems require that the FCC send out field officers all across the country to inspect for buildout, including testing particular frequencies in particular areas to see whether they are in use. This enforcement system is hugely expensive and difficult to manage. With today's technology, it could be replaced with a simple remote monitoring system. Each transmitter required for buildout could be attached to the Internet via an FCC certified device that would read all the relevant buildout parameters from the transmitter and send them to a central, real-time database. If there were a discrepancy between the promises in the license and the automated readings from the field, an automated alarm would sound that would be available for the public to subscribe to and be posted on the FCC's public website as well. This proposed government mandated automated metric is akin to the Department of Transportation-certified car odometer that insurance companies rely on for certain discounts and consumers rely on to plan maintenance and to value used cars.

This proposal is also akin to the FCC's proposal to require unlicensed devices to use real-time geolocation to protect incumbent TV broadcast licensees. However, in this case, the technology is used to hold the incumbent licensee to account rather than an average consumer who might be infringing on the incumbent's rights. The costs are also much lower because for every incumbent base station—as in the case of TV broadcast transmitters with their large coverage areas—there may be millions of consumer devices. If such inexpensive consumer equipment

can be expected to have such equipment to automate enforcement, surely the same can be expected of incumbent licensees.

8) *Make the FCC's Inspector General Into a True Inspector General Ferreting out Waste, Fraud and Abuse*

The FCC's Inspector General, presumably picking up cues from Congress and the FCC, has long had a knack for ferreting out waste, fraud, and abuse among the weak while giving the powerful *carte blanche* to do what they want.

Nowhere is this more evident than in the Congressional mandate to the FCC against unjust enrichment. The Communications Act of 1934 states that the FCC shall “prevent the unjust enrichment of recipients of licenses”^{cxvii} and then later repeats that the FCC should avoid “unjust enrichment through the methods employed to award uses of [the spectrum] resource.”^{cxviii} Another formulation of the unjust enrichment clause, “the public interest, convenience, and necessity” clause, also appears repeatedly as an injunction against spectrum giveaways.^{cxix} Through the clever hairsplitting of some of the best paid and most talented legal minds, the FCC has virtually completely ignored this mandate, except for the politically weak.

It is striking that the largest case of fraud involving the acquisition of spectrum usage rights was not identified by either the FCC's inspector general or anyone else at the FCC. It was a private lawsuit filed in Manhattan's Federal District Court under the federal False Claims Act, a Civil War statute. This statute allows whistle blowers to receive a portion of the money recovered. The suit alleged that money manager Mario Gabelli defrauded the government of approximately \$90 million by using sham companies to buy spectrum licenses under an FCC program to provide discounts for small and minority-owned businesses. For his efforts, the attorney who won the lawsuit personally won \$32.2 million of the \$130 million total settlement.^{cxv}

To prevent unjust enrichment, the FCC's Inspector General, which currently has a staff of 17 permanent employees, should appoint two new directors: A Director of Public Interest Obligation Audits and a Director of License Modification Audits. The first

director would audit licensee's clear and verifiable public interest obligations, such as buildout requirements. The second director would audit license modifications to determine if any were unjustified windfalls.

Where the FCC's Inspector General is unwilling or unable to fulfill its duties to prevent waste, fraud, and abuse, the job should be taken over by the General Accounting Office. The GAO has carefully audited such programs as the Universal Service Fund's "E-Rate" for waste, fraud, and abuse. But it has never seriously investigated the claims made on behalf of those incumbent licensees seeking government handouts costing the taxpayers much larger sums of money. For example, the TV and radio broadcasters now routinely make claims on Capitol Hill and at the FCC that they annually contribute vast sums to public service.^{cxvi} The last claim in 2006 was \$10.3 billion a year in public service.^{cxvii} This claim is invariably made when broadcasters are lobbying for more favorable license terms. But to the best of this author's knowledge, neither the GAO nor any other government entity has ever seriously examined the validity of these claims. No one in the private sector can verify the validity of these claims because the broadcast lobbyists who compile the data have kept their sources confidential. Common sense suggests the broadcasters' claims are ludicrous, if only because any corporate CEO who frittered away 50 percent or more of his corporate profits in voluntarily and anonymously contributing to such public service would be thrown in jail for violating his fiduciary duty to shareholders.

Reduce the Economic Sources of Incumbents' Holdup Power

As long as incumbent licensees continue to have substantial holdup power—which occurs when one party to a transaction has virtually all the negotiating power—spectrum giveaways will continue much as they have in the past. A major contributor to incumbent licensees' holdup power is their disproportionate political power, which makes it virtually impossible for the FCC not to renew or otherwise terminate a license. The policy recommendations above, by increasing the visibility of spectrum giveaways, seek to reduce this political power.

But the tremendous negotiating power of incumbent licensees also rests on very real economic forces.

These economic forces stem from incumbent licensees' ability to link possession of rights to use a particular frequency band with expensive and long-term investments in equipment dedicated to the use of that particular band. To the extent that spectrum using equipment loses this asset specificity, incumbents' negotiating power would be significantly weakened.

A key insight is that the asset specificity of spectrum is not fixed by nature but is an artifact of temporary technological forces and institutions tailor made to enhance the bargaining power of incumbent licensees. In contrast, the FCC has traditionally viewed spectrum asset specificity as a fixed law of nature, the degree of which, like the force of gravity, is outside its regulatory purview.^{cxviii} As radio technology becomes increasingly more versatile, incumbent licensees' negotiating power should naturally dissipate. But to the extent that current spectrum management policies strengthen rather than weaken the current regime of spectrum asset specificity, these pro-competitive economic forces cannot take hold. Consequently, it is also necessary to explore public policies to reduce the unnecessary and socially harmful negotiating power of incumbent licensees. To the extent that the asset specificity of spectrum using equipment declines, the power of license holders to negotiate for favorable license terms—including longer, automatically renewed, and more flexible license terms—should be lessened.

1) Minimize the Duration of Licenses and End the Practice of Automatically Renewing Them

The major justification for long and automatically renewable license terms is spectrum specificity of radio equipment. Incumbent licensees can argue that since they must invest in highly specific equipment to utilize their licensed band, they need adequate time to recoup that investment. Similarly, since users must also invest in highly specific equipment to utilize the spectrum in a particular band, they need to be protected from any government actions that would render that investment worthless. As the FCC's Spectrum Policy Task Force concluded, "a level of certainty regarding one's ability to continue to use spectrum... is an essential prerequisite of investments... Thus, licensees in bands that are subject to periodic review should nonetheless be entitled to a strong

renewal expectancy.”^{cxix} However, in a world where spectrum equipment loses its asset specificity, the collateral damage from requiring competitive bids for license renewals is greatly reduced.

Of course, investments in a wireless business go well beyond investment in particular spectrum equipment. But the value of those assets is not tied to the use of a specific FCC license. The assets are equally valuable when used with other FCC licenses. Consider brand awareness. A brand like AT&T is equally valuable regardless of the frequencies with which it is linked. Indeed, the AT&T brand has already been carried across many frequencies, most recently when Cingular acquired AT&T and shifted many of its customers to Cingular licensed spectrum.

Presumably, if consumers and carriers know that band specific spectrum equipment is more likely than flexible spectrum equipment to become obsolete or otherwise become economically inefficient, they would take constructive steps to deal with this possibility. For a carrier, this could include getting out of the equipment business altogether or paying a small incremental amount upfront to acquire more flexible equipment, which could be more easily sold to another spectrum licensee or used by the same licensee but on the frequency of another one of its licenses. Similarly, consumers could choose to pay a small incremental upfront cost so that if a particular frequency no longer was usable there would be others they could easily substitute. In the case of mobile telephone equipment, most handsets are already manufactured to work on the spectrum of thousands of different licenses worldwide. All that is needed is to make it easy for consumers to unlock that flexibility—a step that carriers often make as difficult as possible.^{cxx}

An irony is that for the consumer equipment where asset specificity is likely to remain a long-term concern—that is, for very inexpensive devices such as RFID and Wi-Fi devices—the FCC grants consumers the least investment protection. That is because those devices use unlicensed spectrum and must accept any interference they receive. But for the expensive devices that already have or could easily have radio smarts, the FCC acts as though asset specificity is a universal law of nature the only rational response to which is to automatically renew licenses.

A precedent for this proposal is the FCC’s past practice of clearing incumbent licensees from bands when they were no longer making efficient use of those bands.^{cxix} Even in the recent AWS auction, certain commercial incumbents providing point-to-point communications had to be cleared. But the FCC has always drawn the line at clearing politically powerful licensees with valuable licenses. And even for incumbents with relatively little negotiating power, it increasingly pays them high relocation fees that amount to granting them a spectrum windfall.

Another precedent is the November 2002 plan of Japan’s Ministry of Public Management, Home Affairs, Posts, and Telecommunications (MPHPT) not to engage in automatic license renewal for incumbent licensees but rather to allow their licenses to expire like other types of government leases. An additional feature of the MPHPT plan was to reimburse licensees for the remaining book value of their depreciated equipment.^{cxix}

Yet another precedent is the Spectrum Accountability Act (H.R. 4715), a bill introduced by Representative Nussle, the Chair of the House Budget Committee, on June 25, 2005. The bill would have required incumbent licensees to bid for major modifications to their licenses.

2) Mandate Stricter Receiver Standards and Transmitter Out-of-Band Emission Limits to Reduce the Level of Spectrum Pollution and Incumbent Licensees’ Holdup Power

The necessary amount of spectrum to transmit and receive information depends on the quality of receivers and transmitters. When receivers and transmitters are built strictly to minimize their cost, their successful operation may require the use of excessive amounts of guard band spectrum. Once many such inferior transmitters and receivers are in the marketplace, they contribute to an incumbent licensee’s holdup power in negotiations over future rights to use guard band spectrum.

The FCC has repeatedly tried to deal with this problem by mandating stricter receiver standards and transmitter out-of-band emission limits.^{cxix} However, incumbent licensees have opposed all such attempts unless the stricter standards go along with an initiative to grant them the newly cleaned up

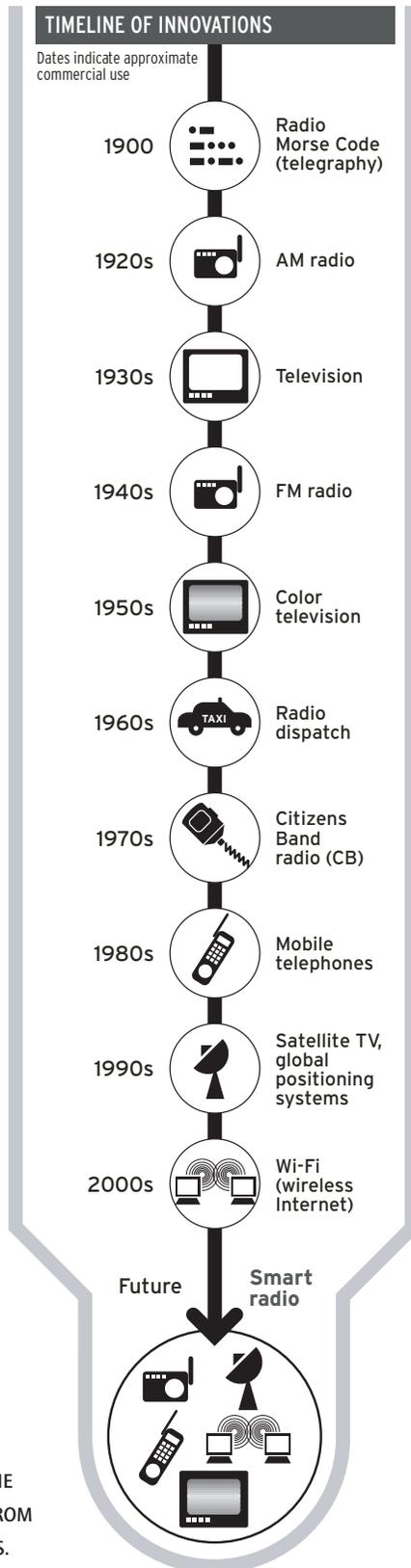


FIGURE 4^{cxvii} DEPICTS THE EVOLUTION OF RADIOS FROM DUMB TO SMART DEVICES.

spectrum. The NTIA's recent set-top converter program to facilitate the DTV transition is a classic example.^{cxxiv} The NTIA imposes tight receiver standards but only does so to the extent that the incumbent broadcasters can gain access to the resulting white space.^{cxv}

As the FCC has requested, Congress should grant the FCC explicit authority to reduce spectrum pollution.^{cxvii} Additionally, that requirement should not be attached to a second requirement that the FCC give incumbent licensees the cleaned up spectrum.

3) Require the FCC to Periodically Report on the Extent to which Changing Technology and Economics is Changing the Asset Specificity of Spectrum Equipment

Consumers are beginning to purchase “smart radios” that can access many more bands of spectrum and communication standards. A fully equipped state-of-the-art high-end consumer laptop PC, for example, can currently receive signals on the FM radio band (20 MHz from 88 MHz to 108 MHz), the TV bands (402 MHz from 54 MHz to 806 MHz), the CDMA2000 1X EV-DO mobile telephone bands (1700 MHz from 400 MHz to 2100 MHz), the unlicensed Wi-Fi bands (more than 500 MHz from 2.4 GHz to 5.8 GHz), the unlicensed Bluetooth band (83.5 MHz from 2.4 GHz to 2.4835 GHz), and the GPS bands (at both 1,227.6 MHz and 1,575.42 MHz). Within a year, high end consumer PCs are also expected to be able to receive signals on the ultrawideband bands (7.5 GHz from 3.1 GHz. To 10.6 GHz) and WiMax bands (more than 600 MHz from 1.7 GHz to 5.8 GHz).

According to Intel, once a chip has already been designed to handle a set of radio standards and frequencies, the marginal difference in the cost of producing a chip with or without a particular functionality is generally minimal. This means that the cost of producing consumer equipment that isn't tied to transmitting and receiving information on particular bands is likely to continue to plummet in the coming years.

To some extent, consumers already have a lot of experience using such spectrum flexible devices. For example, most TV sets currently in existence allow consumers to receive any TV channel between 2 and 69. They don't have to purchase a separate TV to

receive each one of those TV channels. Similarly, when consumers travel, their mobile phones will typically switch frequencies and carriers depending on the roaming agreements their primary carrier has. One new wireless handset standard, just now being introduced by T-Mobile to the market, allows consumers to seamlessly roam between Wi-Fi (unlicensed) and CMRS (commercial mobile) frequencies while making telephone calls and transmitting data.^{cxviii}

Businesses are also purchasing flexible radios. For example, in-building wireless networks are widely used in office buildings, malls, sports stadiums, and other public milieus. Customers don't want to be restricted to the use of only certain carriers and frequencies, so the in-building networks include radios that can service a variety of different carriers and frequencies.

The most flexible smart radios now in production may be the Joint Tactical Radio System (JTRS) radios used by the U.S. military. These radios can receive and send signals from 2 MHz to 3,000 MHz and have the computer power to interpret and transmit many different radio standards. A related military program called XG (for neXt Generation radios), is developing flexible software to work with the JTRS hardware.

Carriers are also increasingly unbundling spectrum equipment and frequencies. For example, cell towers are increasingly owned by independent companies that provide service to multiple carriers. Since it costs essentially the same amount of money to build a cell tower to service four carriers as one, this separation of the tower and spectrum holding businesses greatly reduces the cost of building telecom networks and encourages new entry.

The next step in this evolution may be to have the tower companies provide a single flexible radio to service all its carriers rather than multiple, essentially redundant radios. In addition to the economies of scale and scope associated with building flexible radios, the placement of similar radio equipment close to each other tends to reduce interference. That's a major reason that both mobile phone and terrestrial broadcasters locate their base station radios as close to each other as possible—preferably on the same tower. Crown Castle, the largest tower company in the U.S., has already sought to vertically integrate by adding its own radio equipment to its towers.

Manufacturers are also unbundling the tight linkage between spectrum equipment and frequencies. WiMax, a wireless broadband standard developed by Intel, NextWave Broadband, and other manufacturers, potentially operates over more than a 10 GHz band and is being incorporated in PC laptops and other multipurpose consumer electronics equipment.

Increasingly, it is becoming easy to envisage a world in which spectrum licensees can run a viable business without owning any towers or spectrum equipment, and consumers can purchase general purpose radios that can easily switch among networks. An analogy might be a company that buys a seat on a stock exchange and leases it out to another company that staffs the seat and purchases any necessary equipment to fully utilize it. A current example of such a system in practice is the ITFS spectrum. The educational companies that have leases to this spectrum make no capital equipment investments and simply sublease the spectrum to other carriers. The FCC, prodded by Incumbent license holders, envisaged such a world in its Spectrum Policy Task Force Report and its subsequent Secondary Markets proceeding.^{cxix} The idea was to set up a general purpose wireless network and then sublease in tiny increments the spectrum necessary to use it. Cantor Fitzgerald, a prominent Wall Street trading firm, endorsed the proposal in an FCC filing. Most recently, Google has revived a variant of this idea as part of a much more ambitious proposal for real-time auctions.^{cxix}

4) Require the FCC to Study the Way Asset Specificity Harms Spectrum Licensees with Small Holdings and Minimal Market Power

Manufacturers do not like producing equipment for single companies in narrow spectrum bands with few existing customers. Not only is the market for such products small but producing products with high asset specificity puts them in a poor strategic situation because, as every introductory textbook on industrial organization observes, it invites opportunistic behavior on the part of the buyer, in this case the FCC licensee. In practice, the only way a small licensee can get equipment for a new band is to vertically integrate and either invest in a manufacturer or become a manufacturer itself. But this

requires a lot of money and greatly increases the economies of scale necessary to earn a profit with a spectrum license. All these problems could be solved by encouraging the development of smart radios. The incremental cost of adding functionality for a new licensee would be relatively insignificant and consumers would be willing to take a greater risk on a new service because its failure would not result in their equipment becoming obsolete.

Reducing asset specificity to encourage small spectrum-based wireless businesses is more efficient than creating “designated entities” to receive auction discounts to win licenses. The reason is that auction discounts don’t change the fundamental economics of the spectrum business. Virtually all designated entities that win auctions either are fronts for much larger companies seeking to win licenses at a discount or flip their licenses to such companies as soon as the FCC allows them to do so. Thus, the Congressional Budget Office has demonstrated that the FCC auction discounts have been a dismal failure.^{cxxxii} The designated entities tend to inefficiently warehouse spectrum while waiting for their opportunity to flip their licenses. And then when they do flip their licenses, they receive a windfall based on the discount the government gave them at taxpayer expense. To the extent that smart radios genuinely change the economies of scale necessary to succeed in the wireless business, such perverse incentives don’t come into play because small industry players can survive and thrive.

WiMax is the first commercial spectrum standard designed to significantly reduce asset specificity. As previously noted, WiMax provides an off-the-shelf standard to provide wireless broadband service across more than 10 GHz of frequencies. With Intel and other large vendors backing WiMax and planning to incorporate it into PC laptops and other consumer electronics devices, small spectrum entrepreneurs have latched onto this technology as a relatively inexpensive way to launch a wireless broadband business on a previously unused FCC licensed frequency.

5) Require the Department of Homeland Security to study the way Asset Specificity Harms Public Safety

In the wake of 9/11 and the *9/11 Commission Report*,^{cxxxiii} there has been great attention focused on the need for interoperable public safety communications so that distinct first responder groups within and across jurisdictions can communicate with each other. During 9/11, for example, the police and fire personnel at the World Trade Center each had equipment that couldn’t communicate with each other, thus leading to a tragic loss of life. But the principle of “interoperability” need not stop there. It could potentially include the ability to communicate across all frequencies and standards. Indeed, as already noted, the military’s smart radio initiatives, including JTRS and XG, attempt to do just that.

The advantages of less asset-specific radios for public safety could include lower long-term radio equipment costs (through greater economies of scale in production), greater reliability in a disaster (through the ability to switch to a greater number of alternative wireless telecommunications networks), more bargaining power with commercial network carriers and manufacturers (because of the ability to credibly threaten to switch vendors), and greater innovation (as a result of the greater competition within both equipment and carrier markets).

6) Encourage the International Telecommunications Union (ITU), FCC, and Municipal Telecommunications Officers to Propose and Implement Ways to Reduce Asset Specificity in Radio Equipment

There are many different steps government agencies at all levels of government could take to foster the development of flexible, smart radios. One important one would be to reduce the time and cost of getting FCC authorizations to use equipment across multiple radio bands. Currently, authorizations are band specific. For example, a device will be separately authorized to operate on the TV broadcasting, FM radio, Wi-Fi, and mobile telephone bands. A hypothetical device that could operate on all bands would cost a small fortune in FCC authorization fees and probably significantly slow down the time it takes to get a product to market. Moreover, a truly flexible device, such as the military’s JTRS radio, would be illegal for

a commercial entity to produce and make available for consumer markets. This is because it is illegal for a commercial entity to manufacture equipment that would operate on restricted frequencies. An added problem is that restricted bands vary across countries. Thus, it is hard to achieve economies of scale in manufacturing a truly flexible smart radio because each country or region requires that radios be crippled in different ways.

Solving the authorization problem may require completely rethinking the way both the FCC and ITU approach the problem of managing interference. A shift from *ex ante* to *ex post* regulation of interference may be necessary to efficiently exploit the emerging world of flexible, smart radios. This shift would put management of electromagnetic speech on a par with acoustic speech. The First Amendment has always been held to favor *ex post* over *ex ante* speech regulation. That's a principle that may be critical for fostering not only democracy but also, as suggested here, economic efficiency.

Recently, the FCC has been seriously considering applying *Carterfone* principles to wireless telecommunications. The FCC's *Carterfone* policy allows consumers to attach any device to the wireline telecommunications network as long as the device doesn't harm the network.^{cxviii} The proposal above essentially says that this *Carterfone* principle should be extended not only to conventional mobile phone service but to all wireless networks. The particular rationale suggested here for such an extension of *Carterfone* principles is that they not only foster competition and innovation in private markets, but also reduce the power of spectrum holders when negotiating with the government for spectrum giveaways.

More generally, any agency at any level of government with responsibility for radio equipment on public rights of way should commit to a gradual program of installing flexible, smart radios as a way to reduce asset specificity and enhance competition, innovation, and public safety. This includes municipalities; federal, state, and local departments of transportation; and the U.S. Department of Homeland Security. To date, only the U.S. military has committed to deploying such radios, and the deployment is primarily for overseas operations. Other agencies need to encourage the deployment of such

radios domestically. For example, the municipal light post is rapidly becoming one of the most valuable resources for building a wireless broadband network. Municipalities have the option of leasing the light posts to many different FCC licensees and creating an inefficient wireless network with ugly, equipment filled light posts on every street. Alternatively, they can require the installation of JTRS-like flexible, smart radios. To the extent technology and economics allow, they should require the latter. Similarly, departments of transportation at all levels of government plan to launch an "Intelligent Transportation Network" using relatively inflexible radios (pejoratively known as "dumb radios") at every intersection and ultimately on every road in America. Perhaps the greatest risk is not that government agencies will invest in unnecessary equipment but that, in response to the immense political pressure from the incumbent carriers who fear that spectrum equipment with low asset specificity would damage their monopoly power, the installed radios will be artificially crippled to operate on only a narrow band of frequencies and standards.

7) Shift the Responsibility from the Public to the Private Sector for Protecting Investors from the Risk of Spectrum Asset Obsolescence, Including Non-Renewal of Licenses

It is not the government's role to insure the public against all possible hardship. The government may have a duty to post a sign on the edge of the Grand Canyon that it is dangerous to walk over the edge, but it is not the government's responsibility to pay for the consequences if someone does walk over the edge.

Similarly, when the government subleases office space, it is not its responsibility to pay for relocating or replacing the tenant's furniture located in that space when the lease expires. The presumption is that tenants will know that their lease will one day terminate and thus take reasonable care to invest in furniture with minimal asset specificity.

By extension, it is not the government's responsibility to pay for any spectrum equipment that could be made obsolete by the termination of a license when consumers and carriers could take reasonable steps to purchase equipment that would prevent that obsolescence. Consumers and carriers need to understand

that the equipment risk associated with the loss of an FCC license is something they can and should be able to manage on their own. It is in the public interest to create such a mindset because it would reduce the power of incumbent spectrum licensees to achieve multibillion dollar windfalls at the public's expense. Presumably, this is a matter of common sense and need not be incorporated into law. However, the frequency and success with which incumbent licensees have asserted that the government must protect their

own and consumers' investments in band-specific spectrum equipment suggests that a more formal policy statement that this is not the government's responsibility may be warranted.^{cxxxiv} One option might be to place a warning label on every FCC authorized radio device, especially one that is narrowly tied to a particular licensee, alerting its potential purchaser that the device could become obsolete if the licensee chose not to pay to renew its license.

Conclusion

Spectrum has rapidly become one of the most valuable natural assets managed by the federal government, but the control procedures for managing it have not kept pace with its growing importance. This has allowed tens of billions of dollars of spectrum assets to be acquired without public compensation by private interests who understand and exploit the weaknesses in the present spectrum management system. These incentives need to be changed by enhancing the visibility of spectrum giveaways and reducing the reliance on asset specific investments that provide the giveaways with an economic justification. Given the amount of money at stake and the huge investment in the current system

by those who benefit from it, implementing these reforms will be very difficult and require leadership at the highest levels.

Those leaders must take a step back from the frantic spectrum policy battles of the moment—battles that have been primarily shaped by the interests of incumbent licensees—to see the big picture. This is rarely done because the rewards for doing so are so slim. But given the high stakes involved, it is imperative that leaders be found with the vision and courage to make it happen.

Endnotes

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- ⁱⁱ Peter Passell, “Administration Seeks Profits in Plan to Auction Airwaves,” *New York Times*, May 30, 1991, p. A1.
- ⁱⁱⁱ Murray, pp. 148-150, 172-174, 185-188, 302-303.
- ^{iv} Edmund Andrews, “System to License Airwaves Needs Reform, Critics Assert,” *New York Times*, September 7, 1991, p. A1.
- ^v Omnibus Budget Reconciliation Act of 1993 (“OBRA ’93”).
- ^{vi} See Appendix D in J.H. Snider, *Speak Softly and Carry a Big Stick: How Local TV Broadcasters Exert Political Power*, New York: iUniverse, 2005, pp. 578-580.
- ^{vii} For a discussion of the economic advantages of unlicensed spectrum, see J.H. Snider, “Reclaiming the Vast Wasteland: The Economic Case for Re-Allocating the Unused Spectrum (White Space) Between TV Channels 2 and 51 to Unlicensed Service,” Washington, D.C.: New America Foundation, February 2006.
- ^{viii} For recent examples of this gross omission, see FCC Spectrum Policy Task Force (SPTF) Report, November 2002; and “Strong Support for Extending FCC’s Auction Authority Exists, but Little Agreement on Other Options to Improve Efficient Use of Spectrum,” GAO-06-236, December 2006.
- ^{ix} Opening Statement of Senator Frank Lautenberg, U.S. Senate Committee on the Budget, Hearing on Spectrum Auctions, Technology, and the Federal Budget, February 10, 2007.
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- ^{xi} Snider, *supra* note 6, pp. 346-347.
- ^{xii} See 47 U.S.C. §301.
- ^{xiii} *Ibid.*, §304.
- ^{xiv} *Ibid.*, §309(j)(6)(D).
- ^{xv} William L. Fishman, “Property Rights, Reliance, and Retroactivity Under the Communications Act of 1934,” *Federal Communications Law Journal*, Vol. 50, No. 1, pp. 2-3.
- ^{xvi} Cited in *Ibid.*
- ^{xvii} *Ibid.*, footnote 33.
- ^{xviii} “Better Coordination and Enhanced Accountability Needed to Improve Spectrum Management,” GAO-02-906, September 2002, p. 6.
- ^{xix} Keynote Speech of Donald Evans, Secretary, Department of Commerce, NTIA Spectrum Summit, April 4, 2002.
- ^{xx} From J.H. Snider, “Explanation to the Citizen’s Guide to the Airwaves,” New America Foundation, 2003, p. 16 (Graphics by Nigel Holmes).
- ^{xxi} See FCC SPTF Report, *supra* note 8, p. 16.
- ^{xxii} See, e.g., Spectrum Catalogue Spring 2005: Industry and FCC Take Seasoned Approach, Legg Mason, March 16, 2005.
- ^{xxiii} J.H. Snider, “Myth vs. Fact: The Rhetoric and Reality of Progress in Allocating More Spectrum for Unlicensed Use,” New America Foundation Fact Sheet, February 2006. Total licensed flexible-use spectrum under 3 GHz totals 753 MHz, according to the aforementioned report. CMRS and PCS allocations (190MHz), as well as the 700 MHz band spectrum, which has not yet been auctioned (60 MHz), have been subtracted to produce the total of 503 MHz.
- ^{xxiv} In the Matter of Amendment of Parts 1, 21, 73, 74 and 101 of the Commission’s Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands, WT Docket No. 06-33. RM-10586 (released July 29, 2004).
- ^{xxv} Commercial Spectrum Enhancement Act: Report to Congress on Agency Plans for Spectrum Relocation Funds,” Office of Management and Budget, February 16, 2007, pp. 3-7.

- ^{xxvi} In the Matter of Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands, IB Docket No. 99081 (adopted January 28, 2003); In the Matter of Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems, ET Docket No. 00-258 (adopted January 28, 2003).
- ^{xxvii} SPTF Report, *supra* note 8, p. 47.
- ^{xxviii} Snider, *supra* note 6.
- ^{xxix} Letter from Robert Pepper, Chief, FCC Office of Plans and Policy, to Senator Joseph Lieberman, May 5, 1995.
- ^{xxx} Each station occupies 6 MHz, so 6 MHz * 13.3 stations = 80 MHz. The total amount of spectrum allocated to broadcasting after the digital TV transition is 294 MHz (down from the 402 MHz today), so 294 MHz – 80 MHz = 214 MHz.
- ^{xxxi} Digital Audio Broadcasting Systems And Their Impact On The Terrestrial Radio Broadcast Service, First Report and Order, 17 FCC Rcd 19990, 2002.
- ^{xxxii} See Snider, *supra* note 6, Appendix D.
- ^{xxxiii} FCC ET Docket 04-186, Unlicensed Operation in the TV Broadcast Bands.
- ^{xxxiv} Digital Audio Broadcasting Systems And Their Impact On The Terrestrial Radio Broadcast Service, First Report and Order, 17 FCC Rcd 19990, 2002.
- ^{xxxv} See Snider, *supra* note 6, Chapter 15.
- ^{xxxvi} For an excellent example of the type of analysis that can go into valuing flexible use spectrum, see "Determination of the Fair Market Value of the Certain Portions of FCC Licensed Wireless Spectrum Proposed for Realignment by Nextel Communications, Inc. Under FCC WT Docket No. 02-55, As of December 31, 2002," study by Kane Reece Associates, Inc. for Verizon Wireless, filed in *Ex Parte* of Verizon Wireless In the Matter of Improving Public Safety Communications in the 800 MHz Band, WT Docket No. 02-55, October 27, 2003.
- ^{xxxvii} Data compiled by the New America Foundation's Naveen Lakshmiopathy.
- ^{xxxviii} Verizon Wireless bid \$5.79/MHz-pop for a total of \$8.8 billion of winning bids, or the equivalent today of \$1.7 billion/MHz. See Stephen Labaton and Simon Romero, "F.C.C. Auction Hit With Claim of Unfair Bids," *New York Times*, February 21, 2001, p. A1.
- ^{xxxix} 47 U.S.C. §309(j)(7)(A).
- ^{xl} "Improving Public Safety Communications in the 800 MHz Band," First Report and Order, FCC WT Docket 02-55, July 8, 2004, para. 85.
- ^{xli} Molly M. Peterson, "House Panel Votes To Kill Deadline For Airwaves Auction," *Technology Daily*, May 2, 2002.
- ^{xlii} Letter to Representatives Joe Barton, John Dingell, Fred Upton, and Edward Markey, April 27, 2005; "Spectrum Valuation White Paper," submitted to the Subcommittee on Energy and Commerce in the U.S. House of Representatives, April 18, 2007.
- ^{xliii} *Supra* note 36.
- ^{xliv} *Ex Parte* of Cellular Telecommunications & Internet Association In the Matter of Improving Public Safety Communications in the 800 MHz Band, FCC WT Docket No. 02-55, December 4, 2003.
- ^{xlv} *Communications Daily*, August 18, 2000; Stephen Labaton, "Prized Spectrum Goes on the Block," *New York Times*, December 8, 2000, p. C1; "Evaluation of Spectrum Valuation for Mobile Services in Other Countries," Lemay-Yates Associates Inc., March 2003, p. 16; J.H. Snider, *Explanation to the Citizen's Guide to the Airwaves*, New America Foundation, 2003.
- ^{xlvi} Michael J. Copps, "The Price of Free Airwaves," *New York Times*, June 2, 2007.
- ^{xlvii} "Commercial Spectrum Enhancement Act: Report to Congress on Agency Plans for Spectrum Relocation Funds," Office of Management and Budget, February 16, 2007, pp. 6-7.
- ^{xlviii} *Ibid.*, p. 5
- ^{xlix} "AWS Auction," *Telecom Update*, Medley Global Advisors, August 16, 2006, p. 3.
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- ^{li} Interview with Simon Wilkie, November 21, 2006.
- ^{lii} Gregory Rose, "Spectrum Auction Breakdown: How Incumbents Manipulate FCC Auction Rules to Block Broadband Competition," New America Foundation, June 2007.
- ^{liii} Of the 25 companies, 21 were public. See Paige Albinak, "Private Property: Broadcasting Moves Away from Wall Street," *Broadcasting & Cable*, April 16, 2007.
- ^{liv} Total TV stations (1,756) and radio stations (13,837) derived from FCC Media Bureau statistics as of December 31, 2006. See http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-269784A1.doc.
- ^{lv} Data compiled by the New America Foundation's Naveen Lakshminpathy and Jeff Meyer.
- ^{lvi} Tom Wolzien, "Whose Bandwidth Is It Anyway?" Bernstein Research, April 2001. Also presented as a speech to the National Association of Broadcasters Futures Summit, Monterey, California, March 25, 2001.
- ^{lvii} *Supra* note 46.
- ^{lviii} GAO, *supra* note 8, p. 10.
- ^{lix} 2007 Annual Report of the FCC's Wireless Telecommunications Bureau Presented at the FCC's Open Meeting on January 17, 2007.
- ^{lx} Market value is defined as the discounted present value of the anticipated income streams generated by the minor modification.
- ^{lxi} "Better Coordination and Enhanced Accountability Needed to Improve Spectrum Management," GAO-02-906, September 2002, p. 3
- ^{lxii} FY2008 Budget Estimates Submitted to Congress by the Federal Communications Commission, February 2007.
- ^{lxiii} See, e.g., Glen Dickson, "Spectrum Shift Sprints to Finish Line," *Broadcasting & Cable*, May 1, 2006.
- ^{lxiv} During FY 2004, 2005, and 2006 Congress appropriated \$85 million each year to administer the FCC's auction program. From this it may be inferred that from 1993 to 2007 the total cost of administering the auction program was in the vicinity of \$1 billion. See FY2008 Budget Estimates Submitted to Congress by the Federal Communications Commission, February 2007, p. 33.
- ^{lxv} Data compiled by the New America Foundation's Naveen Lakshminpathy and Jeff Meyer.
- ^{lxvi} See <http://www.opensecrets.org/industries/index.asp>.
- ^{lxvii} Harvey Levin, *The Invisible Resource*, Washington, D.C.: RFF Press, 1971.
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- ^{lxix} From J.H. Snider, "Explanation to the Citizen's Guide to the Airwaves," New America Foundation, 2003, p. 41 (Graphics by Nigel Holmes).
- ^{lxx} For classic examples, see the following FCC proceedings, 02-55 (Nextel), 01-185 (MSS), 06-49 (Progeny), 07-16 (M2Z).
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- ^{lxxiii} McGuinness, T. "Markets and Managerial Hierarchies." In G. Thompson, et al. (Eds.), *Markets, Hierarchies and Networks*, Sage, London, England, 1994, pp. 66-81.
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- ^{lxxviii} See Hernan Galperin, *New Television, Old Politics: The Transition to DTV in the United States and Britain* (New York: Cambridge University Press, 2004).
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^{lxxxiii} See, e.g., GAO, *supra* note 8, p. 19; Lecture by FCC Commissioner James H. Quello, "Broadcasting and the First Amendment," Michigan State University Club, October 23, 1997;

^{lxxxiv} Interview with Blair Levin, former FCC Chief of Staff, April 26, 2006.

^{lxxxv} See Comments of 37 Concerned Economists in the Matter of Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets, WT Docket No. 00-230, February 7, 2001.

^{lxxxvi} Snider, *supra* note 6, pp. 308-312.

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^{lxxxviii} See, e.g., <http://www.atsc.org> and http://standards.ieee.org/announcements/pr_80222.html.

^{lxxxix} See Speak Softly and Carry a Big Stick, Chapter 3 and Appendix C

^{xc} *Ibid.* See also the Telecommunications Act of 1996; Balanced Budget Act of 1997 §3002 Public Law No. 105-33, 11 Stat.251, 259 (1997)

^{xci} See FCC MB Docket No. 03-185, In the Matter of Amendment of Parts 73 and 74 of the Commission's Rules to Establish Rules for Digital Low Power Television, Television Translator, and Television Booster Stations and to Amend Rules for Digital Class A Television Stations, Report and Order, September 9, 2004; See also NAF, *et al.* Petition for Reconsideration in MB Docket No. 03-185, December 29, 2004.

^{xcii} Digital Audio Broadcasting Systems and Their Impact on the Terrestrial Radio Broadcast Service, First Report and Order, 17 FCC Rcd 19990 (2002). For the most recent giveaway in this band, see Digital Audio Broadcasting Systems and Their Impact on the Terrestrial Radio Broadcast Service, Second Report and Order, May 31, 2007. See also J.H. Snider, "The FCC's

Imminent Radio Multicasting Vote: Will it be another broadcast industry giveaway?" March 26, 2006, http://quixote.blogs.com/telecompolicy/2006/03/the_fcc_s_immine.html.

^{xciii} Terrestrial handsets were much smaller and less expensive than satellite handsets in part because they served a much larger market and were much closer to their base stations. Closer base stations require smaller batteries for the same amount of service.

^{xciv} In the Matter of Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands, IB Docket No. 01-185, released July 3, 2003. See Jesse Drucker, "As Satellite Firms Move to Add Cellular Service, Critics Cry Foul," *Wall Street Journal*, February 9, 2006, p. A1.

^{xcv} In the Matter of Amendment of Parts 1, 21, 73, 74 and 101 of the Commission's Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands, WT Docket No. 06-33. RM-10586 (released July 29, 2004). See also In the Matter of Amendment of Parts 21 and 74 to Enable Multipoint Distribution Service and the Instructional Television Fixed Service Amendment of Parts 21 and 74 to Engage in Fixed Two-Way Transmission, MM Docket No. 97-217.

^{xcvi} *Ibid.*

^{xcvii} Murray, pp. 251-266.

^{xcviii} See Joint Proposed BAS Relocation Plan in the Matter of Improving Public Safety Communications in the 800 MHz Band, WT Docket No. 02-55, May 3, 2004; and "Nextel, Broadcasters Strike Spectrum Deal," *Communications Daily*, May 5, 2004.

^{xcix} See "Wireless," *Communications Daily*, June 17, 2003.

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^{ci} Linda Greenhouse, "Supreme Court Rules F.C.C. Took Licenses Away in Error," *New York Times*, January 28, 2003.

^{cii} See, e.g., Kris Middaugh, "The Great GASB: Governmental Accounting Standards Board's Statement 34 seeks to make state and local government financial statements more comprehensive and comprehensible," *Government Technology*, October 2003, p. 50.

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cxiii See Comments of *Ad-Hoc* Public Interest Spectrum Coalition, FCC Docket No. 06-150, May 23, 2007; Wu, *supra* note 120; Petition of Skype Communications S.A.R.L. to Confirm a Consumer's Right to Use Internet Communications Software and Attach Devices to Wireless Networks, February 20, 2007.

cxiv See Comments, August 11, 2004, and Reply Comments, September 7, 2004, of the National Association of Broadcasters, FCC MB Docket No. 04-210, In the Matter of Over-The-Air Broadcast Television Viewers.



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