

The Move to Spectrum Sharing: How Reclassification Under Title II Will Cause Spectrum Sharing to Dominate Telecommunications Policy

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I. INTRODUCTION

Electromagnetic spectrum plays an instrumental role in the daily lives of United States citizens as the nation's airwaves power countless devices from cellular phones to marine radios, and demand for spectrum continues to grow exponentially.¹ The Federal Communications Commission (FCC) faces the challenges associated with skyrocketing demand for spectrum that outpaces the amount of the resource available.² Meanwhile, in the public sector, federal agencies utilize spectrum to perform vital functions, including maintaining public safety and national security.³ Although there have been different methods of spectrum allocation in the past, recent methods include spectrum auctions and spectrum sharing. This Note will discuss how methods of managing spectrum in the United States must evolve with the expanding marketplace and the needs of federal agencies. Central to this Note's analysis is the impact of reclassifying broadband Internet access under Title II of the Communications Act on spectrum allocation implications.

In deciding among methods of allocation, one must understand how the actors in the private and public sectors value spectrum for their own use. The private sector derives value from spectrum based on the amount of potential profit from wireless services utilizing bandwidth.⁴ Federal agencies value spectrum based on potential social welfare.⁵ The United States government has demonstrated that it has an economic incentive for repurposing the spectrum held by federal agencies for the commercial sector through spectrum auctions.⁶ Spectrum valuation and incentives for repurposing federal agencies' spectrum, may be impacted by the reclassification of broadband Internet access as a common carrier under Title II of the Telecommunications Act.⁷ One theory asserts that reclassification under Title II will decrease capital investment and competition, thereby causing a devaluation of spectrum that will impact

1. See Ruth Milkman, *Spectrum: Supply and Demand*, FCC BLOG (Jan. 1, 2011, 12:15 PM), <http://www.fcc.gov/blog/spectrum-supply-and-demand>.

2. *Id.*

3. See *Spectrum Management*, NAT'L TELECOMM. & INFO. ADMIN., <http://www.ntia.doc.gov/category/spectrum-management> (last visited Apr. 5, 2015).

4. See COLEMAN BAZELON & GIULIA MCHENRY, *THE ECONOMICS OF SPECTRUM SHARING 1-2* (2013) http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2242008.

5. *Id.*

6. See *e.g.*, Letter from the H. Comm. on Energy & Commerce to Tom Wheeler, Chairman, FCC (May 2, 2014), <https://ecfsapi.fcc.gov/file/7521372330.pdf> (stating that a purpose of spectrum auctions was to raise money for the Treasury).

7. See Casey Given, *Title II Reclassification Harms Innovation and the Poor*, HILL: CONG. BLOG (Feb. 6, 2015, 5:00 PM), <http://thehill.com/blogs/congress-blog/technology/231942-title-ii-reclassification-harms-innovation-and-the-poor>.

spectrum policy.⁸ If reclassification devalues spectrum, new methods of allocation of spectrum will dominate telecommunications policy. This Note argues that the theory of spectrum devaluation, as a result of reclassification of broadband Internet access, will cause a decrease in governmental economic incentives to use clearing and auctions for the dominant means of spectrum policy. However, there will still be a skyrocketing demand for spectrum and a need to protect the interests of incumbent federal users, which spectrum sharing addresses. Due to theories of spectrum devaluation combined with growing private and public sector needs, spectrum sharing will become the dominant means to address the challenges of spectrum allocation.

Section II of this Note begins by defining spectrum and describing the modern uses of spectrum. It highlights that federal agencies hold large amounts of spectrum that could be put to use in the private sector while still protecting agencies' ability to perform vital public functions. Next, Section III describes past and current methods of spectrum allocation while demonstrating the benefits of spectrum sharing. In addition to potential methods of spectrum allocation, Section III explains how the private and public sectors value spectrum, and the incentives the federal government has when shaping spectrum policy. Section IV highlights the open Internet debate regarding reclassifying broadband Internet access providers under Title II, which some believe will cause a devaluation of spectrum. Accepting the theory that reclassification devalues spectrum dilutes the economic incentives the federal government has for repurposing spectrum. Because such concerns within the private sector constantly affect the marketplaces, Section V argues that, as a result of economic uncertainties, spectrum sharing will become the dominant and logical choice in telecommunications policy moving forward.

II. SPECTRUM: ITS MODERN USES AND METHODS OF ALLOCATION

Spectrum is “commonly referred to as radio frequency spectrum or wireless spectrum, [which] refer to the properties in air that transmit electric signals and, with applied technology, can deliver voice, text, and video communications.”⁹ Electromagnetic spectrum is a finite resource,¹⁰ and current technological restraints limit the amount of spectrum that is actually usable.¹¹ Among the technological uses that competing for spectrum are

8. See generally FRED B. CAMPBELL, JR., INTERNET INNOVATION ALL., IMPACT OF “TITLE II” REGULATION ON COMMUNICATIONS INVESTMENT (2015), http://internetinnovation.org/images/misc_content/Impact_of_Title_II.PDF.

9. LINDA K. MOORE, CONG. RESEARCH SERV., SPECTRUM POLICY: PROVISIONS IN THE 2012 SPECTRUM ACT 1 (Mar. 12, 2014), <https://www.fas.org/sgp/crs/misc/R43256.pdf>.

10. See FCC, FACT SHEET: FCC MOBILE SPECTRUM HOLDINGS 1 (2014), https://apps.fcc.gov/edocs_public/attachmatch/DOC-327110A1.pdf [hereinafter FCC MOBILE SPECTRUM HOLDINGS].

11. See MOORE, *supra* note 9, at 1.

“public safety, commercial and non-commercial fixed and mobile wireless services, broadcast television and radio, satellite and other services.”¹² Wireless providers utilize spectrum to transmit communications, and increases in technological innovation have led to growing public and private sector demands for licensed and unlicensed spectrum.¹³ The FCC currently manages all commercial uses of spectrum, and the National Telecommunications and Information Administration (NTIA), an agency within the Department of Commerce, regulates federal spectrum.¹⁴ Spectrum concerns are not a resource problem, but a management problem.¹⁵

The approximately five billion mobile devices connected to networks today¹⁶ coupled with government operations creates an increasing demand for spectrum. Spectrum value in the commercial setting is based on how profitable spectrum will be to the market’s wireless carriers.¹⁷ Gains in social welfare determine the value of non-commercial spectrum.¹⁸ Spectrum has to be allocated among users, from commercial use to use by the federal government, and currently only frequency bands between 9 kHz and 275 GHz have been allocated.¹⁹ In order for wireless providers to continue to meet consumer demands, more spectrum needs to be made available and available spectrum needs to be used more efficiently.²⁰

A. *Spectrum and United States Federal Governmental Agencies*

Federal government agencies remain the largest holders of spectrum in the United States, with over sixty federal agencies possessing spectrum assets.²¹ The Department of Defense (DOD) is the largest user of federal spectrum, followed by the Federal Aviation Administration (FAA), the Department of Homeland Security (including the Coast Guard) and the

12. *Licensing*, FCC, <http://www.fcc.gov/topic/licensing> (last visited July 8, 2016).

13. See FCC, THE BROADCAST TELEVISION SPECTRUM INCENTIVE AUCTION: INNOVATION IN POLICY TO IGNITE INNOVATION FOR CONSUMER AND BUSINESS 1 (Jan. 16, 2013), https://apps.fcc.gov/edocs_public/attachmatch/DOC-318455A1.pdf.

14. See *Radio Spectrum Allocation*, FCC, <https://www.fcc.gov/engineering-technology/policy-and-rules-division/general/radio-spectrum-allocation> (last visited Mar. 6, 2016) [hereinafter *FCC Radio Spectrum Allocation*].

15. See PRESIDENT’S COUNCIL OF ADVISORS ON SCI. & TECH., REPORT TO THE PRESIDENT: REALIZING THE FULL POTENTIAL OF GOVERNMENT-HELD SPECTRUM TO SPUR ECONOMIC GROWTH, at vi (2012), https://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast_spectrum_report_final_july_20_2012.pdf [hereinafter PCAST REPORT].

16. See PCAST REPORT, *supra* note 15, at 1.

17. See BAZELON & MCHENRY, *supra* note 4, at 1-2.

18. See *id.*

19. See *FCC Radio Spectrum Allocation*, *supra* note 14.

20. See FCC MOBILE SPECTRUM HOLDINGS, *supra* note 10, at 1.

21. See Brent Skorup, *Reclaiming Federal Spectrum: Proposals and Recommendations*, 15 COLUM. SCI. & TECH. L.J. 90, 103 (2013).

Department of Justice.²² The NTIA currently regulates the federal government's spectrum usage.²³ The delegation of a band as federal or non-federal is subject to an informal agreement between the FCC and the NTIA.²⁴

Redeploying spectrum from incumbent public-sector users helps the spectrum scarcity problem in the commercial sector.²⁵ Some argue that spectrum is better utilized by private commercial users who can "(a) internalize the benefits and costs of deploying the input, and (b) can later sell it to parties who value it more," than by the federal government.²⁶ As a counterargument, the government uses its spectrum for important purposes such as public safety, emergency communications, and national security.²⁷ Unlike the FCC rules, which have a market-based approach to allocating commercial spectrum for the private sector, the government still does not pay for its own use of the valuable resource.²⁸ The federal government holds a large amount of important radio frequencies, which it utilizes for next to no cost.²⁹ For example, the utilization of free spectrum eliminates the possibility for massive revenues as seen in previously spectrum auctions.³⁰ Economists have stated that the resulting misallocation from the government's inefficient use of spectrum costs hundreds of billions of dollars annually.³¹ The demands for commercial spectrum and the harms to the economy demonstrate a need to reallocate lightly-used federal spectrum. The design of spectrum allocation to the federal government also poses a problem as a report from the President's Council of Advisors on Science and Technology (PCAST) asserts:

In addition to limiting the amount of contiguous spectrum available for commercial or federal use, the current regime has created a multiplicity of spectrum borders where underutilized

22. See U.S. GOV'T ACCOUNTABILITY OFF., GAO-11-352, SPECTRUM MANAGEMENT: NTIA PLANNING AND PROCESSES NEED STRENGTHENING TO PROMOTE THE EFFICIENT USE OF SPECTRUM BY FEDERAL AGENCIES 1, 20 (2011), <http://www.gao.gov/new.items/d11352.pdf>.

23. See 47 U.S.C. § 305(a) (2012); see also *A Short History of NTIA*, NAT'L TELECOMM. & INFO. ADMIN., <https://www.ntia.doc.gov/legacy/opadhome/history.html> (last visited Mar. 6, 2016).

24. See NAT'L TELECOMM. & INFO. ADMIN., MANUAL OF REGULATIONS AND PROCEDURES FOR FEDERAL RADIO FREQUENCY MANAGEMENT § 4.1.2(2)(a) (2014).

25. See Skorup, *supra* note 21, at 90.

26. *Id.* at 96.

27. See U.S. GOV'T ACCOUNTABILITY OFF., GAO-12-1018T, SPECTRUM MANAGEMENT, FEDERAL GOVERNMENT'S USE OF SPECTRUM AND PRELIMINARY INFORMATION ON SPECTRUM SHARING 1, 3 (2013), <http://www.gao.gov/assets/650/648206.pdf> [hereinafter GAO-12-1018T].

28. See Skorup, *supra* note 21, at 92.

29. *Id.*

30. See Chloe Albanesius, *FCC Spectrum Auction Pulls in Staggering \$44.9 Billion*, PC MAG (Jan. 29, 2015, 3:20 PM EST), <http://www.pcmag.com/article2/0,2817,2476035,00.asp>.

31. See Thomas W. Hazlett & Roberto E. Munoz, *A Welfare Analysis of Spectrum Allocation Policies*, 40 RAND J. ECON. 424, 425 (2009), <http://www.jstor.org/stable/25593718>.

guard bands are imposed to prevent mutual disturbance of services in neighboring bands. In general, the fragmented partitioning of [f]ederal spectrum leads to inefficiency, artificial scarcity, and constraints on current and future [f]ederal and non-[f]ederal users.³²

The PCAST Report asserts that the federal government needs to share its spectrum holdings with non-federal users.³³ Because federal agencies use a large quantity of spectrum and only pay a small fee to the NTIA, the agencies have little economic incentive to utilize spectrum efficiently or share spectrum.³⁴ Federal users hold about eighteen percent of the most highly valued spectrum.³⁵ Although the federal government remains the largest holder of spectrum in the United States, many commentators state that federal spectrum holders do not use spectrum efficiently.³⁶ Depending on which estimate is used, the exact total amount of highly valued spectrum that the federal government uses exclusively or predominately ranges from thirty-nine to fifty-seven percent.³⁷ In approximately eighty percent of the shared spectrum, federal users have dominant use that prevents substantial commercial use in those bands.³⁸ Federal spectrum users effectively dominate sixty percent of coveted “beachfront”³⁹ spectrum.⁴⁰

In addition to holding large amounts of spectrum, the PCAST Report states that “[f]ederal users currently have no incentives to improve the

32. PCAST REPORT, *supra* note 15, at 10.

33. *Id.*

34. See U.S. GOV'T ACCOUNTABILITY OFF., GAO-13-7, SPECTRUM MANAGEMENT: INCENTIVES, OPPORTUNITIES AND TESTING NEEDED TO ENHANCE SPECTRUM SHARING 11 (2012), <http://www.gao.gov/assets/660/650019.pdf>.

35. See *id.* at 6.

36. See Skorup, *supra* note 21, at 103 n.60 (quoting Harvey J. Levin, *The Radio Spectrum Resource*, 11 J.L. & ECON. 433, 434 (1968)) (“Most other users (like those in public safety and local or federal government radio) are not directly constrained in their use of spectrum by pressures in any ‘markets’ for their end products or services.”); THOMAS M. LENARD ET AL., INCREASING SPECTRUM FOR BROADBAND: WHAT ARE THE OPTIONS? 23 (2010), http://web-docs.stern.nyu.edu/old_web/economics/docs/workingpapers/2010/Lenard,%20White,%20Riso_Increasing%20Spectrum%20for%20Broadband.pdf (“There appears to be a widespread consensus that spectrum in government hands is likely not being used efficiently”); James Losey & Sascha Meinrath, *Free the Radio Spectrum*, IEEE SPECTRUM (Jun. 28, 2010, 19:59 GMT), <http://spectrum.ieee.org/telecom/wireless/free-the-radio-spectrum/0> (stating that “the 270,000 [allocations] held by government agencies . . . are woefully underutilized.”); Martin Cave & Adrian Foster, Commentary, *Solving Spectrum Gridlock: Reforms to Liberalize Radio Spectrum Management in Canada in the Face of Growing Scarcity*, 303 C.D. HOWE INST. 1, 3 (2010) (“To a significant degree, these [efficiency] improvements have not worked their way into spectrum use by public sector users, including the military, emergency services, or aeronautical or maritime transport.”).

37. See GAO-13-7, *supra* note 34, at 7.

38. See PCAST REPORT, *supra* note 15, at 8.

39. *Id.* (due to their valuable transmission capabilities, frequencies between 225 and 3700 MHz are often referred to as “beachfront spectrum”).

40. PCAST REPORT, *supra* note 15, at 8.

efficiency with which they use their own spectrum allocation”⁴¹ Efficiency is commonly defined as the output based on the amount of input.⁴² In the case of spectrum, the 2002 FCC Spectrum Task Force declared that efficiency “occurs when the maximum amount of information (i.e., output) is transmitted within a given amount of spectrum (i.e., input), or equivalently, when the least amount of spectrum is used to transmit a given amount of information.”⁴³ The efficiency of federal spectrum management is based on findings reported in government audits.⁴⁴ Such reports demonstrated inefficient management of spectrum resources.⁴⁵ As a United States Government Accountability Office (GAO) Report stated, “Federal officials from one agency told us that approximately [thirty] percent of the time, program offices at the agency procure spectrum-dependent equipment without first notifying the agency spectrum managers, and in some cases, before the assignment has been granted.”⁴⁶ Many agencies do not closely monitor their spectrum usage because for federal agencies acquiring more bandwidth is currently a less costly approach than investing in new equipment or practices that would better maximize spectrum availability.⁴⁷

Additionally, agencies fail to properly report their spectrum use, further indicating large amounts of inefficient use.⁴⁸ The NTIA requires federal users to evaluate their frequency needs in five-year reviews based on the amounts used, but agency spectrum managers do not have to validate or verify any of the reported spectrum use information.⁴⁹ The GAO reported that “[s]even out of [ten] federal spectrum managers we contacted reported that they do not have mechanisms in place to verify the accuracy of the information collected during these processes.”⁵⁰ In addition to those findings the GAO found that “[five] out of [ten] federal spectrum managers reported that their agency had not conducted site visits or sample surveys to verify information in their data systems.”⁵¹

B. Methods of Spectrum Allocation: Clearing and Reallocating, and Other Implausible Solutions

Various methods have been offered as means of handling the spectrum scarcity issue. Clearing and reallocating has been the current

41. PCAST REPORT, *supra* note 15, at ix.

42. See FCC SPECTRUM POLICY TASK FORCE, REPORT OF THE SPECTRUM EFFICIENCY WORKING GROUP 5 (2002), http://transition.fcc.gov/sptf/files/SEWGFfinalReport_1.pdf.

43. *Id.* at 5. The Report also defines “technical efficiency,” and “economic efficiency” in the various aspects of efficiency to be considered. See *id.*

44. See Skorup, *supra* note 21, at 104.

45. *Id.*

46. GAO-11-352, *supra* note 22, at 27.

47. See Skorup, *supra* note 21, at 104.

48. *Id.* at 105.

49. See GAO-11-352, *supra* note 22, at 27, 38.

50. *Id.* at 24.

51. *Id.* at 24-25.

method, which involves clearing government-held spectrum and auctioning it off for commercial use, but it is not always possible to apply this method.⁵² The method of clearing and reallocating moves spectrum from one exclusive use to another exclusive use.⁵³ It runs into difficulties when government operations cannot be moved to another frequency because it is unavailable or moving the operation would be too expensive.⁵⁴ Under the current “command and control” approach the FCC and the NTIA set aside specific bands for specific services.⁵⁵ Sharing provides a new advantage over the command and control structure because sharing could accommodate “transient spectrum demand.”⁵⁶

Some advocate for creating an agency like the General Services Administration (GSA) to lease spectrum to federal users.⁵⁷ Proponents believe leasing spectrum will incentivize more efficient use on behalf of federal spectrum holders.⁵⁸ Such an agency would operate in the same manner as the current GSA does in leasing out office space to federal agencies.⁵⁹ Some believe a Base Realignment and Closure (BRAC) process is also a possibility for removing spectrum from the hands of the federal government.⁶⁰ The process would take a method used to close military bases and attempt to apply the method to the vastly different field of spectrum management.⁶¹ Meanwhile, a market approach towards spectrum policy would be based on a “ghost” market because prices for spectrum could not be set by the market, but instead would be determined by an agency.⁶²

52. See PCAST REPORT, *supra* note 15, at iii.; see also Patrick Welsh, *Spectrum Sharing in the 3.5 GHz Band*, VERIZON POL. BLOG (Jul. 11, 2014), <http://publicpolicy.verizon.com/blog/entry/spectrum-sharing-in-the-3.5-ghz-band>.

53. See Skorup, *supra* note 21, at 107 (“Rather than seeking permission from regulators and incumbent federal users—as they would in shared bands—wireless firms can win bandwidth at auction and intensively utilize spectrum for mobile broadband and other services.”).

54. *Id.* at 102; See also Welsh, *supra* note 52.

55. ROBERT MATHESON & ADELE C. MORRIS, BROOKINGS INST., *THE TECHNICAL BASIS FOR SPECTRUM RIGHTS: POLICIES TO ENHANCE MARKET EFFICIENCY* 19 (2011), http://www.brookings.edu/~media/research/files/papers/2011/3/03-spectrum-rights-matheson-morris/0303_spectrum_rights_matheson_morris.pdf.

56. *Id.* at 25.

57. See DOROTHY ROBYN, BROOKINGS, *BUILDINGS AND BANDWIDTH: LESSONS FOR SPECTRUM POLICY FROM FEDERAL PROPERTY MANAGEMENT* 1, 8 (2014), <http://www.brookings.edu/research/papers/2014/09/23-buildings-bandwidth-spectrum-property>.

58. *Id.*

59. See PCAST REPORT, *supra* note 15, at 55.

60. See ROBYN, *supra* note 57, at 8.

61. *Id.*

62. T. Randolph Beard et al., *Market Mechanisms and the Efficient Use and Management of Scarce Spectrum Resources*, 66 FED. COMM. L.J. 263, 285 (2014).

Market approaches include spectrum fees on licensed spectrum in the hopes that it will cause federal users to take the price of spectrum into account.⁶³

C. *Methods of Spectrum Allocation: Auctions*

In the 1993 Budget Act, Congress provided the FCC with the authority to conduct auctions for spectrum licensees.⁶⁴ The Act gave the FCC “authority to use competitive bidding to choose from among two or more mutually exclusive applications for an initial license.”⁶⁵ Auctions are now obligatory for commercial spectrum services.⁶⁶ Auctions demonstrate the theory that the entities that value spectrum the most will put it to the best and highest usage.⁶⁷ Auctions are a market-driven approach to spectrum allocation,⁶⁸ and the spectrum auctions arose when there was a need to boost the United States economy.⁶⁹ To date, the FCC has raised tens of billions of dollars through spectrum auctions.⁷⁰ The “auctions are open to any eligible company or individual that submits an application and upfront payment, and is found to be a qualified bidder by the Commission.”⁷¹ The FCC believes that spectrum auctions are far more effective means of distributing radio licenses than previously utilized methods, and the FCC attempts to use auctions to award licenses to those who will use it the most effectively.⁷²

63. See FCC, CONNECTING AMERICA: THE NATIONAL BROADBAND PLAN 82 (2010), <http://download.broadband.gov/plan/national-broadband-plan.pdf> [hereinafter 2010 NATIONAL BROADBAND PLAN].

64. See Omnibus Budget Reconciliation Act of 1993, Pub. L. No. 103-66, § 6002, 107 Stat. 312, 387-392.

65. *Id.*

66. See Balanced Budget Act of 1997, Pub. L. No. 105-33, § 3002, 111 Stat. 251, 258 (1997) (codified at 47 U.S.C. § 309(j) (2012)).

67. See Ellen P. Goodman, *Spectrum Auctions and the Public Interest*, 7 J. TELECOMM. & HIGH TECH. L. 343, 352-53 (2009).

68. See Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. No. 112-96, § 6412, 125 Stat. 156, 234-35 (2012).

69. See WHITE HOUSE, ECONOMIC REPORT OF THE PRESIDENT 23-25, 251-52 (2012), https://www.whitehouse.gov/sites/default/files/microsites/ERP_2012_Complete.pdf.

70. See Skorup, *supra* note 21, at 99.

71. *About Auctions*, FCC,

http://wireless.fcc.gov/auctions/default.htm?job=about_auctions (last visited May 17, 2016).

72. See William Kummel, *Spectrum Bids, Bets, and Budgets: Seeking an Optimal Allocation and Assignment Process for Domestic Commercial Electromagnetic Spectrum Products, Services, and Technology*, 48 FED. COMM. L.J. 511, 512-514 (1996). Previously, the government issued spectrum licenses through comparative hearings and later lotteries. See JENNIFER A. MANNER, *SPECTRUM WARS: THE POLICY AND TECHNOLOGY DEBATE*, 119-25 (2002). Comparative hearings looked for applicants that had the best capabilities and were the best for the public interest. However, the comparative hearing process was long and drawn out. *Id.* Additionally, there were often few differences between the applicants. *Id.* Lotteries for licenses followed comparative hearings as a method for issuing spectrum. *Id.* Lotteries were intended to get spectrum into the hands of individuals who would use it as quickly as possible by assigning licenses randomly to members of the applicant pool. *Id.* However, lottery winners would turn and sell it to everyone else. *Id.*

The Balanced Budget Act of 1997 both extended and expanded the FCC's auction authority.⁷³ The Budget Act amended Section 309(j) of the Communications Act to require the FCC to use competitive bidding to grant licenses "when mutually exclusive applications for initial licenses are filed, unless certain specific statutory exemptions apply."⁷⁴ The Budget Act provided exemptions from auctions only for wireless services applicable to "public safety radio services," which was defined as public and private services that protect "the safety of life, health, and property."⁷⁵ Section 309(j) also articulated which licenses should be subject to competitive bidding.⁷⁶ The FCC also concluded it should consider alternative procedures under Section 309(j), including the use of a band manager.⁷⁷

The 2010 National Broadband Plan posited that "Congress should consider expressly expanding the FCC's authority to enable it to conduct incentive auctions."⁷⁸ Then Congress gave the FCC authority to conduct spectrum incentive auctions in the Middle Class Tax Relief and Job Creation Act of 2012.⁷⁹ Congress defines the term "incentive auction" as an auction where "the Commission may encourage a licensee to relinquish voluntarily some or all of its licensed spectrum usage rights in order to permit the assignment of new initial licenses subject to flexible-use service rules by sharing with such a licensee a portion, based on the value of the relinquished rights"⁸⁰ In the winter of 2015, the FCC finished the AWS-3 auction, or Auction 97, that fulfilled economic incentives by raising billions of dollars in revenue for the government.⁸¹ Auction 97's revenue-raising effect indicates the scarcity of spectrum, and the commercial sector's need for the resource in order to better serve consumers. Additionally, auction revenues demonstrate that the federal government has had an economic incentive to use spectrum auctions for allocating spectrum.⁸²

Auctions, such as incentive auctions where participants voluntarily relinquish spectrum, depend on the participation of large spectrum holders,

73. See Balanced Budget Act of 1997, Pub. L. No. 105-33, § 3002, 111 Stat. 251, 258 (1997) (codified at 47 U.S.C. § 309(j) (2012)); see also *About Auctions*, *supra* note 71.

74. FCC Implements Changes to Auction Authority Pursuant to the Balanced Budget Act of 1997, *News Release*, WT 99-87 (2000), http://transition.fcc.gov/Bureaus/Wireless/News_Releases/2000/nrw10041.html.

75. *Id.*

76. *Id.*

77. *Id.*

78. 2010 NATIONAL BROADBAND PLAN, *supra* note 63, at 75.

79. See Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. No. 112-96, § 6412, 125 Stat. 156, 234-35. (2012) (Spectrum Act). See also Expanding Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, *Notice of Proposed Rulemaking*, 27 FCC Rcd 12357, para. 3 (2012).

80. 47 U.S.C § 309(j)(8)(G)(i) (2012).

81. See Auction 97, *Advanced Wireless Services (AWS-3)*, FCC: AUCTIONS, http://wireless.fcc.gov/auctions/default.htm?job=auction_summary&id=97 (last visited May 16, 2016).

82. See GEORGE S. FORD & LAWRENCE J. SPIWAK, PHOENIX CTR. FOR ADVANCED LEGAL & ECON. PUB. POLICY STUDIES, AUCTION 97 AND THE VALUE OF SPECTRUM (2015), <http://www.phoenix-center.org/perspectives/Perspective15-02Final.pdf>.

and political complications often affect the auction revenues.⁸³ The value of spectrum to potential buyers and sellers affects the success of an auction, and incumbents receive a portion of the proceeds, creating economic incentives for incumbents to engage with the FCC in reallocating their spectrum by participating in auctions.⁸⁴ As FCC Chairman Tom Wheeler acknowledges, the approach involves marrying wireless providers' demand for spectrum with economics of current holders of spectrum.⁸⁵ "Robust participation" is fundamental to the successes of spectrum auctions⁸⁶ as revenues help to measure the success of auctions.

D. Methods of Spectrum Allocation: Sharing

The GAO defines spectrum sharing as the "cooperative use of common spectrum that allows disparate missions to be achieved."⁸⁷ Sharing allows an opportunity to open up to 1000 MHz for both federal and non-federal purposes.⁸⁸ Sharing represents a shift from an exclusive method of allocation to a non-exclusive one as it allows multiple users to access the same frequencies while avoiding adverse interference.⁸⁹ Spectrum sharing allows government agencies to maintain control of their spectrum while allowing commercial use when or where the government does not need it.⁹⁰ Spectrum sharing is a particularly feasible option for lightly-used military spectrum that could be put to important commercial uses.⁹¹ Time Division Multiple Access (TDMA) enables spectrum sharing by transmitting frequencies in distinct time slots.⁹² Sharing military spectrum would preempt commercial users from using the spectrum when the federal holder demands it, which protects the needs of incumbent users.⁹³ Improved technology for spectrum sharing has recently developed.⁹⁴ Methods such as a centralized system for mobile devices that would scan for available radio frequencies and choose the best one would help enable spectrum sharing.⁹⁵

83. See George S. Ford, *Will Net Neutrality Politics Scuttle the FCC's Upcoming Incentive Auction?*, HILL (Sept. 3, 2014, 6:30 AM), <http://thehill.com/blogs/pundits-blog/technology/216462-will-net-neutrality-politics-scuttle-the-fccs-upcoming>.

84. See 2010 NATIONAL BROADBAND PLAN, *supra* note 63, at 81.

85. See Tom Wheeler, *The Incentive Auction: Helping Broadcasters Make Informed Decisions*, FCC BLOG (June 25, 2014, 2:45 PM), <https://www.fcc.gov/news-events/blog/2014/06/25/incentive-auction-helping-broadcasters-make-informed-decisions-0>.

86. *Id.*

87. GAO-13-7, *supra* note 34, at 7.

88. See PCAST REPORT, *supra* note 15, at 6.

89. *Id.* at viii.

90. See Skorup, *supra* note 21, at 115.

91. *Id.*

92. See PCAST REPORT, *supra* note 15, at 30, n.62.

93. See Brian X. Chen, *How Spectrum Sharing Would Work*, NY TIMES: BITS (May 29, 2012, 4:02 PM), <http://bits.blogs.nytimes.com/2012/05/29/how-spectrum-sharing-would-work/>.

94. See PCAST REPORT, *supra* note 15, at 30.

95. See Chen, *supra* note 93.

There are different types of spectrum sharing, including dynamic sharing, geographic sharing, and temporal sharing. The PCAST Report recommends dynamic sharing as a remedy for the current frequency challenges in the United States.⁹⁶ Much of the spectrum held by licensees remains unused at various given locations and times.⁹⁷ “Dynamic Spectrum Access” or “opportunistic use” would find spectrum that is not being used and operate radio devices without causing interference.⁹⁸ Dynamic Spectrum Access (DSA) systems find spectrum that is unused and organizes the users to operate within it.⁹⁹ Geographic sharing means that “multiple users agree to access the same spectrum at different times or locations, as well as negotiate other technical parameters, to avoid adversely interfering with one another.”¹⁰⁰ Temporal sharing can occur because federal users are not transmitting across frequencies at all times, so commercial users can access the frequencies during times when the federal users are not transmitting.¹⁰¹ When the government or other primary user is not using the spectrum, a commercial or secondary user could utilize the frequencies even if both users are in close proximity.¹⁰² The FCC and the NTIA both oversee the process leading to sharing radio frequencies between federal and non-federal users.¹⁰³ Spectrum sharing occurs in unlicensed bands by FCC-certified Part 15 wireless equipment devices.¹⁰⁴ The FCC prohibits unlicensed devices from causing interference, and the operators of these devices must accept potential interference by other unlicensed and licensed devices.¹⁰⁵ Spectrum sharing provides a method of handling spectrum scarcity that is not tied to federal economic incentives.

III. SPECTRUM VALUATION AND INCENTIVES

Determining the value of a band of spectrum depends on the sum of the value of its use and differs in the public sector versus the private sector.¹⁰⁶ The private sector determines the value of spectrum as the derived

96. PCAST REPORT, *supra* note 15, at 30.

97. See Ann Gallagher, Int’l Bureau, FCC, Opening Keynote at the Dynamic Spectrum Alliance Global Summit: The State of TV White Space in the United States 2-4 (May 2014), http://dynamicspectrumalliance.org/assets/DSA_Presentations/DSASummit_May2014_Day2_OpeningKeynote_AnnGallagher.pdf.

98. *Id.* at 2-3, 7.

99. See PCAST REPORT, *supra* note 15, at 30-31.

100. GAO-13-7, *supra* note 34, at 7.

101. See Skorup, *supra* note 21, at 115-16.

102. See GAO-13-7, *supra* note 34, at 7.

103. *Id.*

104. Cf. 47 C.F.R. § 15.5(a) (2015) (“Persons operating intentional or unintentional radiators shall not be deemed to have any vested or recognizable right to continued use of any given frequency . . .”).

105. *Id.* § 15.5(b).

106. See COLEMAN BAZELON & GIULIA MCHENRY, BRATTLE GROUP, SPECTRUM SHARING: TAXONOMY AND ECONOMICS 24 (2014), http://www.brattle.com/system/publications/pdfs/000/004/983/original/Spectrum_Sharing_-_Taxonomy_and_Economics_Bazelon_McHenry_020614.pdf.

profitability of the wireless devices utilizing the bandwidth.¹⁰⁷ In contrast, the public sector values spectrum based on “the public welfare gained from its use.”¹⁰⁸ Shared spectrum value comes from the shared value of each user.¹⁰⁹ In “The Economics of Spectrum Sharing,” Coleman Bazelon and Giulia McHenry define a matrix showing how valuation affects the method of allocation chosen:

First, if value of the spectrum to a new user is greater than the cost of clearing the incumbent user, reallocating the spectrum increases welfare. Second, if the costs of moving an incumbent user from a band exceed the value created by a new user, there is no reason to reallocate. Third, when introducing new user(s) creates more value than what is lost to the incumbent user(s) sharing enhances welfare. Finally, when the loss to the incumbent user(s) exceeds the value created by the users, sharing is not welfare enhancing.¹¹⁰

It is hard to determine the exact value derived from the social welfare of public policies utilizing spectrum.¹¹¹ Developments in telecommunications policy cause shifts along the Bazelon and McHenry matrix as policy changes affect how actors value spectrum.¹¹²

A. *Federal Agencies’ Incentives for Efficient Use*

Policy makers believe creating new availabilities of spectrum to be key in promoting wireless innovation and economic growth,¹¹³ but in order to create new availabilities one must understand what incentivizes efficient spectrum usage by federal holders. A federal spectrum holder:

[D]ecides, in the light of policies, rules, regulations, frequency allocations, and availability of frequencies, whether, what, and how many mission requirements can be fulfilled by using telecommunications systems. Each agency makes the necessary technical studies, selects potential frequencies, coordinates with

107. See BAZELON & MCHENRY, *supra* note 4, at 2.

108. *Id.*

109. *See id.* at 2.

110. *Id.* at 3.

111. *See id.* at 10.

112. *See id.* at 2 n.4 (noting that the FCC has considered policies that would limit spectrum value, which would logically create shifts along Bazelon and McHenry’s matrix).

113. *See* Memorandum on Expanding America’s Leadership in Wireless Innovation, 2013 DAILY COMP. PRES. DOC. 421 (June 14, 2013), <https://www.gpo.gov/fdsys/pkg/DCPD-201300421/pdf/DCPD-201300421.pdf>.

other agencies involved, and prepares and files an application with the NTIA . . . ¹¹⁴

Currently, federal users do not have a market incentive to indicate the value of the spectrum they hold.¹¹⁵ Price signals or market factors could encourage more efficient spectrum use by federal holders.¹¹⁶ As the GAO states, “Typically, paying the market price for a good or service helps to inform users of the value of the good and provides an incentive for efficient use.”¹¹⁷ Even if federal users wanted to share spectrum with commercial users for monetary reasons, federal users would not profit from such an arrangement.¹¹⁸ As most federal agencies with vast spectrum holdings belong to the executive branch of the federal government, Congress has budgetary control over them, so the agencies cannot create independent financial relationships such as a spectrum sharing arrangement.¹¹⁹ If federal spectrum users could create a spectrum sharing agreement with non-federal users, the revenue received from such agreements would go back to the United States Treasury or be deducted from agency budgets.¹²⁰

B. Private Sector Valuation and Incentives

Wireless providers value spectrum based on how much profit they will make through deploying wireless services on the bandwidth.¹²¹ Efficient use of federal spectrum would make more available for the commercial sector to increase innovation and economic growth.¹²² Increased availability of spectrum for the commercial sector is linked to increases in innovation.¹²³ For wireless companies, increased spectrum holdings create more capability for data services and decreased congestion on the networks.¹²⁴ Companies need to be able to predict the amount of capacity

114. NAT’L TELECOMM. & INFO. ADMIN., MANUAL OF REGULATIONS AND PROCEDURES FOR FEDERAL RADIO FREQUENCY MANAGEMENT, at § 8.1.1 (2014), http://www.ntia.doc.gov/files/ntia/publications/redbook/2014-05/8_14_5.pdf.

115. See Skorup, *supra* note 21, 104 (2013).

116. See Brent Skorup, *Getting Away from Gosplan*, REGULATION, Winter 2013-2014, at 14, <http://object.cato.org/sites/cato.org/files/serials/files/regulation/2014/1/regulation-v36n4-7.pdf>.

117. GAO-12-1018T, *supra* note 27, at i, 1.

118. See BAZELON & MCHENRY, *supra* note 4, at 9.

119. *Id.*

120. *Id.*

121. See BAZELON & MCHENRY, *supra* note 4, at 2.

122. See Tom Power, *Promoting Collaboration to Advance Wireless Spectrum for Economic Growth*, WHITE HOUSE BLOG (Apr. 1, 2014, 2:59 PM ET), <http://www.whitehouse.gov/blog/2014/04/01/promoting-collaboration-advance-wireless-spectrum-economic-growth>.

123. See Welsh, *supra* note 52.

124. See *Mobile Networks May Improve as AT&T, Verizon Spend Big at Airwaves Auction*, FOX BUS. (Jan. 30, 2015), <http://www.foxbusiness.com/technology/2015/01/30/mobile-networks-may-improve-as-att-verizon-spend-big-at-airwaves-auction/>.

necessary to meet demands of spectrum usage by consumers.¹²⁵ Wireless service providers also weigh the costs of buying spectrum against the costs of improving existing infrastructure and technology.¹²⁶ As John Stankey, chief strategy officer for AT&T, stated, “Our need for spectrum is no less but our economic willingness to pay has limits.”¹²⁷ More airwaves in the hands of commercial sector actors equals less congested networks for consumers.¹²⁸ As a scarce resource, the economic value generated from the use of spectrum determines its value in the private sector.¹²⁹

C. Federal Government Valuation and Incentives for Repurposing Agency Spectrum

The federal government has financial incentives for repurposing federal spectrum, and it has a stated goal of finding a spectrum policy that maximizes economic value.¹³⁰ The 2012 Spectrum Act set a congressional goal of debt reductions through spectrum auctions.¹³¹ Specifically, the Spectrum Act demonstrates congressional economic motivations for spectrum auctions in the creation of a Public Safety Trust Fund with funds from an incentive auction of broadcast television spectrum.¹³² Congress already planned the allocation of auction proceeds, demonstrating an economic incentive for the auction.¹³³ Agencies do not want to relinquish their spectrum, but commercial users, Congress, and the FCC want an increased availability of spectrum.¹³⁴ Technological innovations such as wireless broadband bring increased innovation and new ways for the industry to deliver services to consumers.¹³⁵ The United States government views mobile broadband as a big economic opportunity, with domestic wireless carriers investing billions of dollars into networks and as major companies “export innovation globally.”¹³⁶ Therefore, the federal

125. See Thomas Gryta & Gautham Nagesh, *FCC to Hold Major Auction of Wireless Airwaves*, WALL ST. J. (Jan. 21, 2014, 7:39 PM ET), <http://www.wsj.com/articles/SB10001424052702304027204579335181451959904>.

126. See *id.*

127. *Id.*

128. See Associated Press, *AT&T, Verizon Get More Airwaves: Expect More Mobile Capacity*, DAILY MAIL (Jan. 30, 2015, 17:28 EST), <http://www.dailymail.co.uk/wires/ap/article-2933717/AT-T-Verizon-airwaves-Expect-mobile-capacity.html>.

129. See BAZELON & MCHENRY, *supra* note 4, at 12.

130. See Letter from the H. Comm. on Energy & Commerce to the FCC 1 (Apr. 19, 2013), <https://ecfsapi.fcc.gov/file/7022289507.pdf> [hereinafter 2013 Energy & Commerce Comm. Letter].

131. See MOORE, *supra* note 9, at 3.

132. See Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. No. 112-96, § 6402, 125 Stat. 156, 224-25.

133. See MOORE, *supra* note 9, at 1.

134. See 2013 Energy & Commerce Comm. Letter, *supra* note 130, at 1.

135. See 2010 NATIONAL BROADBAND PLAN, *supra* note 63, at 75.

136. *Id.*

government has an incentive to drive agencies to relinquish spectrum to the commercial sector.

Deficit reduction drives the government to push for the repurposing of federal spectrum. Congressmen Fred Upton and Greg Walden declared that bipartisan “solutions to free this valuable spectrum without harming the Defense Department’s . . . ability . . . to keep Americans safe” was a “remarkable success” because it raised \$20 billion to be put towards debt reduction.¹³⁷ “President Obama’s Plan to Win the Future through the Wireless Innovation and Infrastructure Initiative” emphasized that it would reduce the deficit by \$9.6 billion in part through “more efficient use of government spectrum.”¹³⁸ Further economic incentives for repurposing federal spectrum highlighted in the plan include \$3 billion to “go to research and development of emerging wireless technologies and applications.”¹³⁹

IV. RECLASSIFICATION OF BROADBAND INTERNET ACCESS PROVIDERS UNDER TITLE II

In February 2015, the FCC voted to approve an Order for the adoption of open Internet rules that in part reclassify “broadband Internet access service” as a telecommunications service under Title II of the Communications Act.¹⁴⁰ Under such a classification, both service to the end user and to the edge provider are classified as telecommunications services.¹⁴¹ The rules also apply to mobile broadband.¹⁴² The Order outlined bright-line rules, including a “no blocking” rule prohibiting broadband providers from blocking access to legal content, applications, services, or non-harmful devices; a “no throttling” rule prohibiting broadband providers from impairing or degrading lawful Internet traffic on the basis of content, applications, services, or non-harmful devices; and a “no paid prioritization” rule stating that broadband providers are not allowed to favor particular lawful Internet traffic over other lawful traffic and prohibiting Internet service providers from prioritizing content and services of their affiliates.¹⁴³ The provisions allow less flexibility for companies in delivering services to

137. Press Release, H. Comm. on Energy & Commerce, BOOM! Auction Raises \$35 Billion and Counting (Nov. 24, 2014), <https://energycommerce.house.gov/press-release/boom-auction-raises-35-billion-and-counting>.

138. Press Release, White House Office of the Press Secretary, President Obama Details Plan to Win the Future Through Expanded Wireless Access (Feb. 10, 2011), <https://www.whitehouse.gov/the-press-office/2011/02/10/president-obama-details-plan-win-future-through-expanded-wireless-access>.

139. *Id.*

140. See FCC, FACT SHEET: CHAIRMAN WHEELER PROPOSES NEW RULES FOR PROTECTING THE OPEN INTERNET (2015), https://apps.fcc.gov/edocs_public/attachmatch/DOC-331869A1.pdf. See generally Protecting and Promoting the Open Internet, *Report and Order on Remand, Declaratory Ruling, and Order*, 30 FCC Rcd 5601 (2015) [hereinafter *Open Internet Order*].

141. *Id.*

142. See *id.*

143. *Id.*

consumers utilizing “reasonable network management.”¹⁴⁴ Some refer to this *Open Internet Order* as preserving net neutrality.¹⁴⁵ This Note focuses specifically on the spectrum implications of reclassification under Title II.

A. *Reclassification Under Title II: Creating Uncertainty*

The FCC’s effort to protect the open Internet through reclassification affects spectrum policy in key ways.¹⁴⁶ Uncertainty in the future of the regulatory framework represents the first challenge to spectrum policy, as the open Internet rules face legal attacks and interpretation issues.¹⁴⁷ Some believe the FCC should not have taken the approach of regulating broadband providers as utilities under Title II.¹⁴⁸ Entities arguing against the FCC’s decision to reclassify under Title II have regarded the decision as “risky” and as potentially putting “innovation and development” in jeopardy.¹⁴⁹ Additionally, stakeholders have made arguments that the FCC lacked the authority to act as it did in the *Open Internet Order*, which led to litigation causing further uncertainty for providers.¹⁵⁰ Other questions arise from the potential for net neutrality legislation as Republicans in Congress disagree with the approach that applies Title II to wireless providers.¹⁵¹

B. *Reclassification Under Title II: Spectrum Valuation Impacts*

Because of the ever-increasing demand for spectrum, the successes of spectrum incentive auctions depend largely on the participation of spectrum

144. Phil Goldstein, *Zero-Rating, Throttling and Other Wireless Practices Targeted by the FCC’s Net Neutrality Rules*, FIERCE WIRELESS (Feb. 4, 2015), <http://www.fiercewireless.com/story/zero-rating-throttling-and-other-wireless-practices-targeted-fccs-net-neutr/2015-02-04>.

145. *Open Internet Order*, *supra* note 140, at paras. 1-6.

146. See GEORGE S. FORD & LAWRENCE J. SPIWAK, PHOENIX CTR. FOR ADVANCED LEGAL & ECON. PUB. POLICY STUDIES, *THE UNPREDICTABLE FCC: POLITICIZING COMMUNICATIONS POLICY AND ITS THREAT TO BROADBAND INVESTMENT 5* (2014), <http://www.phoenix-center.org/perspectives/Perspective14-05Final.pdf>.

147. See *e.g.*, Monica Allevan, *Net Neutrality: Long-Term Implications Loom for Internet of Things*, FIERCE WIRELESS, (Feb. 26, 2015), <http://www.fiercewireless.com/tech/story/net-neutrality-long-term-implications-loom-internet-things/2015-02-26> (“[S]ome of the provisions of Title II will need to be applied and probably tested in the courts to determine what might be considered ‘fair and reasonable’”).

148. See *Open Internet Order*, *supra* note 140, at paras. 1-6 (Comm’r Pai, dissenting).

149. Libby Jacobson, *Verizon CFO Fran Shammo reiterates the dangers of Title II for jobs and investment*, VERIZON (Jan. 22, 2015), <http://www.verizon.com/about/news/verizon-cfo-fran-shammo-reiterates-the-dangers-of-title-ii-for-jobs-and-inv>.

150. See Lawrence J. Spiwak, *The FCC’s Legal Gymnastics: Why Wheeler’s Title II Approach to Network Neutrality Will Lead to Litigation*, MULTICHANNEL NEWS (Feb. 22, 2015, 6:00 PM), <http://www.multichannel.com/blog/mcn-guest-blog/fccs-legal-gymnastics/388213>.

151. See Ted Johnson, *Democrats Skeptical that GOP Net Neutrality Bill Will Protect Open Internet*, VARIETY (Jan. 21, 2015, 1:13 PM PT), <http://variety.com/2015/biz/news/democrats-skeptical-that-gop-net-neutrality-bill-will-protect-open-internet-1201411073/>.

holders including, for example, broadcasters.¹⁵² Title II reclassification debates and potential regulations previously played a role in spectrum auctions. In the 2007 Broadcast Television Auction for instance, companies such as Google and AT&T battled for and against net neutrality rules and additional regulations impacting the auction.¹⁵³ Some strongly believe that the 2015 increased regulation of net neutrality will decrease broadcast spectrum's value, resulting in decreased auction revenue.¹⁵⁴ George Ford of the Phoenix Center for Advanced Legal & Economic Public Policy Studies cites the 2007 auction as evidence that the net neutrality rules will devalue spectrum:

In [the 2007] auction, the agency imposed “network neutrality” encumbrances on the auction's 20 MHz C-Block (the largest block in the auction). As a result, despite its high intrinsic value, almost no one was interested in the block. In the end, Verizon scooped it up for only \$4.7 billion. Based on the other blocks sold in this auction and prior auction results, *econometric models* predicted that the C-Block would have sold for about \$9 billion without the encumbrances. That's a 40% loss in value attributable to network neutrality.¹⁵⁵

Some economists estimate decreases of billions of dollars in investment for data services in wireline and wireless networks.¹⁵⁶ If the reclassification under Title II impacts the spectrum holders in a similar manner and limits the flexibility of use, spectrum revenues and the supply of spectrum available to the commercial sector through auctions will decrease.¹⁵⁷

V. ANALYSIS: SPECTRUM SHARING WILL RESULT

The government holds a large amount of spectrum that could be repurposed for commercial use to increase innovation and economic

152. See Ford, *supra* note 83.

153. See Anne Broache, *Google Lobbies for 'Open' Wireless Networks*, CNET (June 14, 2007, 5:21 AM PDT), http://news.cnet.com/Google-lobbies-for-open-wireless-networks/2100-1039_3-6190863.html.

154. See FORD & SPIWAK, *supra* note 146.

155. Ford, *supra* note 83.

156. See KEVIN A. HASSETT & ROBERT J. SHAPIRO, *THE IMPACT OF TITLE II REGULATION OF INTERNET PROVIDERS ON THEIR CAPITAL INVESTMENTS* 16 (2014), http://www.sonecon.com/docs/studies/Impact_of_Title_II_Reg_on_Investment-Hassett-Shapiro-Nov-14-2014.pdf.

157. *Id.*; Anna-Maria Kovacs, *At Painful Odds: Spectrum Auctions and Title II Reclassification*, BLOOMBERG BNA (Nov. 12, 2014), <http://www.bna.com/painful-odds-spectrum-n17179911497/> (“[Auction] success depends on broadcasters’ willingness to sell their spectrum. That, in turn, will depend on the price offered by mobile broadband providers for the spectrum.”).

growth.¹⁵⁸ The exploding consumer demands for wireless technology make tackling the issue of federal spectrum use increasingly important. Federal spectrum that is not being efficiently used should be reallocated for commercial uses.

Some have argued that spectrum will be devalued as a result of reclassifying ISPs under Title II.¹⁵⁹ The uncertainties created by this theory and its proponents will decrease economic incentives for Congress and government agencies pushing federal users to relinquish spectrum.¹⁶⁰ As a result, spectrum sharing will become a more dominant approach. As FCC Commissioner Mignon Clyburn noted, traditional means for increasing the availability of spectrum, “such as removing unnecessary restrictions in our rules, allowing flexible use, encouraging efficient use of the existing spectrum holdings, and holding traditional spectrum auctions” will not be sufficient.¹⁶¹

The spectrum policy in the United States going forward will likely center around spectrum sharing because while the federal government will doubtlessly always need spectrum, it may not need the entire amount of spectrum it possesses all of the time. The FCC’s reclassification of Internet access providers under Title II creates both regulatory uncertainty and beliefs that the value of spectrum had decreased.¹⁶² As a result, auctions are negatively affected and are a less reliable source for increasing the availability of spectrum.¹⁶³ Where the FCC cannot incentivize the holders of spectrum to sell in auctions, spectrum sharing should be utilized as a way of making more bandwidth available to facilitate innovation and economic growth. Whether or not the belief that the FCC’s reclassification under Title II will devalue spectrum comes to fruition, the debate about its accuracy leads to uncertainty in the future of spectrum policy.

A. *The Move to Sharing: Impact of Reclassification Under Title II*

Spectrum allocation is about deciding among competing interests for a finite resource.¹⁶⁴ To date, auctions have been effective in putting spectrum to their highest value use.¹⁶⁵ The auction revenues derived from repurposing

158. See Skorup, *supra* note 21, at 90.

159. See, e.g., Kovacs, *supra* note 157.

160. *Id.*

161. Mignon L. Clyburn, Comm’r, FCC, Keynote Presentation at the 4th Annual Americas Spectrum Management Conference 2 (Nov. 13, 2014), https://apps.fcc.gov/edocs_public/attachmatch/DOC-330471A1.pdf.

162. See Allevan, *supra* note 147.

163. See Ford, *supra* note 152.

164. See 2010 NATIONAL BROADBAND PLAN, *supra* note 63, at 75.

165. See Roger Sherman, *Putting Auction 97 in the History Books*, FCC BLOG (Jan. 29, 2015, 12:18 PM), <http://www.fcc.gov/blog/putting-auction-97-history-books>. Highlights from the single Auction 97 include: \$7 billion to fund the nation’s first nationwide broadband public safety network, \$300 million for public safety communications research, \$115 million in grants for 911, E911, and NextGen 911 implementation, and more than \$20 billion for deficit reduction.

spectrum have incentivized the federal government to get spectrum into the hands of commercial users.¹⁶⁶ One argument asserts that the reclassification under Title II will create a reduction in spectrum value.¹⁶⁷ Skepticism in the stability of spectrum value will produce a decrease in economic incentives, driving agencies to relinquish spectrum.¹⁶⁸ Congress will lose its demonstrated economic incentive to push federal agencies to give up spectrum holdings.¹⁶⁹ Spectrum sharing will arise as the dominant approach to address the dichotomy because it allows incumbent federal users to hold on to the spectrum they need for important public purposes.

While spectrum cannot be created, innovative ways to use it more efficiently can be developed.¹⁷⁰ To date, the government's economic interest has been the most important aspect of the trend of repurposing spectrum for commercial use.¹⁷¹ If the devaluing of spectrum as a result of the reclassification of Internet service providers under Title II argument is true, the balance is shifting. The trend moves away from exclusive reallocation (due to a lack of economic incentives) to shared uses that preserve incumbent users' interests while fostering innovation. In addition to economic incentives for repurposing spectrum, the federal government views commercial wireless broadband services as a "key platform for innovation in the United States."¹⁷² Spectrum sharing enlarges the amount of bandwidth available. Federal users do not need their spectrum all the time, so the spectrum could be put towards innovative purposes in the private sector while ensuring that agencies have access to it when needed. Developments in spectrum sharing will increase with the reduction in economic incentive for reallocation. One consequence of the reduction in the value of spectrum is that it forces exploration of the mechanisms that will be more persuasive than the economic incentive was to federal users. The decrease in the economic value of spectrum will create a move across the Bazelon and McHenry matrix from clearing and reallocating increasing welfare to such methods of spectrum management decreasing overall welfare.¹⁷³

166. *Id.*

167. See George S. Ford, *Is the FCC's Regulatory Revival Deterring Infrastructure Investment?*, BLOOMBERG BNA (Nov. 18, 2015), <http://www.bna.com/fccs-regulatory-revival-n57982063711/>.

168. See FORD & SPIWAK, *supra* note 146.

169. See Ford, *supra* note 167.

170. See BAZELON & MCHENRY, *supra* note 4, at 1.

171. See Sherman, *supra* note 165 (discussing the government's monetary gains from Auction 97).

172. 2010 NATIONAL BROADBAND PLAN, *supra* note 63, at 75.

173. See BAZELON & MCHENRY, *supra* note 4, at 3 (2013).

B. *Why Sharing Will Come to Dominate Modern Spectrum Management Policy*

Spectrum sharing most effectively tackles the spectrum management problem, which has led to a scarcity that is outpacing supply because it broadens service categories by opening blocks of spectrum to increased types of users.¹⁷⁴ Traditional methods of auctions, incentivizing efficient use by existing users, removing restrictions, and allowing flexible use are not enough.¹⁷⁵ Even supporters of auctioning spectrum for flexible, exclusive use recognize that such methods are not always feasible as some operations cannot be moved due to a lack of available frequencies or cost restraints.¹⁷⁶ Spectrum sharing represents a “new approach to [f]ederal spectrum architecture and policy by establishing large shared spectrum blocks, new effectiveness metrics, and coordinated and prioritized [f]ederal and commercial use.”¹⁷⁷

Rather than relying on a nonexistent spectrum marketplace, spectrum sharing relies on technology that has become feasible to allow multiple users, both federal and nonfederal, to share spectrum without interference.¹⁷⁸ Additionally, spectrum sharing circumvents the costs of completely clearing existing federal users.¹⁷⁹ Dynamic spectrum access comes from known technologies being put together.¹⁸⁰ Technological advances have made large steps in ensuring communications capabilities even in the face of considerable interference.¹⁸¹ White spaces are channels that are “unused” at any given location by licensed devices.¹⁸² Technological devices called white space radios use a database of spectrum usage to make unused spectrum available.¹⁸³ The FCC is already working to validate database services for sharing unused channels in white space.¹⁸⁴ Smart antennas that can increase spatial reuse have been rapidly increasing in the past few years.¹⁸⁵

Spectrum sharing will also protect incumbent government users who could still have priority for their important functions through a spectrum sharing hierarchy. The PCAST Report recommends giving federal systems

174. See PCAST REPORT, *supra* note 15, at xi, 11; NAT’L TELECOMM. & INFO. ADMIN., U.S. SPECTRUM MANAGEMENT POLICY: AGENDA FOR THE FUTURE (1991), <https://www.ntia.doc.gov/report/1998/us-spectrum-management-policy-agenda-future>.

175. See Clyburn, *supra* note 161, at 2.

176. See Welsh, *supra* note 52.

177. PCAST REPORT, *supra* note 15, at 15.

178. See *id.*

179. See BAZELON & MCHENRY, *supra* note 4, at 1.

180. See Brian X. Chen, *Q&A: Martin Cooper, Father of the Cellphone, on Spectrum Sharing*, N.Y. TIMES: BITS, (May 31, 2012 7:30 PM), <http://bits.blogs.nytimes.com/2012/05/31/qa-marty-cooper-spectrum-sharing/>.

181. See PCAST REPORT, *supra* note 15, at 30.

182. See Gallagher, *supra* note 97, at 2.

183. See PCAST REPORT, *supra* note 15, at 31.

184. *Id.*

185. *Id.* at 32.

the highest priority and protection from interference.¹⁸⁶ The Report also recommends procedures for safeguarding federal users, such as having the FCC require secondary users to achieve a certification to operate within state interference limits in order to share a bandwidth with federal users.¹⁸⁷ There is already a framework for exploring the expansion efforts in spectrum in certain bandwidths.¹⁸⁸ As devaluation of spectrum causes a shift along the Bazelon and McHenry matrix to the point where clearing and reallocating no longer increases overall welfare, spectrum sharing will result as a method for protecting the important functions of incumbent users.¹⁸⁹

C. Why Methods Other Than Spectrum Sharing Will Not Occur

As the economic incentive for spectrum auctions dissipates, the NTIA and FCC should continue exploring spectrum sharing methods as the primary means of handling the spectrum management problem because spectrum sharing has the most potential for maximizing the availability of spectrum, and the technology and regulatory framework are the most viable options. Clearing and reallocating spectrum is not always feasible, and a spectrum-sharing policy needs to be implemented to handle problems that clearing and reallocating spectrum cannot address.¹⁹⁰ Proponents of a market approach to spectrum allocation argue that prices demonstrate the cost of spectrum use, thereby incentivizing increased efficiency of use.¹⁹¹ On the other hand, there is the economic argument that the government should pay a price for its spectrum to reflect opportunity costs.¹⁹² Proponents put forth different potential market mechanisms, including spectrum fees in the form of a General Services Administration (GSA), a spectrum inventory approach limiting the amount of spectrum an agency buys, and a proposal to create artificial spectrum currencies to be traded among government users.¹⁹³ None of the market proposals provide a sustainable solution to the federal government's inefficient use of spectrum.

Clearing and reallocating spectrum is a less effective means of handling the spectrum scarcity issue than spectrum sharing. The President's

186. *Id.* at xi.

187. *Id.* at xii.

188. See generally Amendment of the Comm'n's Rules with Regard to Commercial Operations in the 3550- 3650 MHz Band, *Further Notice of Proposed Rulemaking*, 29 FCC Rcd 4273 (Apr. 23, 2014). For instance, in the April *Further Notice of Proposed Rulemaking (Further Notice)* the FCC proposes a Citizens Broadband Radio Service in the 3.5 GHz band. Additionally, the FCC sought public comment on the creation of a "Model City" with the purpose of exploring advanced spectrum sharing technologies.

189. See BAZELON & MCHENRY, *supra* note 4, at 1, 9.

190. See Welsh, *supra* note 52.

191. See Skorup, *supra* note 21, at 104, 111-12.

192. See J. SCOTT MARCUS ET AL., FINAL REPORT: OPTIMISING THE PUBLIC SECTOR'S USE OF THE RADIO SPECTRUM IN THE EUROPEAN UNION 52 (2008), http://www.plumconsulting.co.uk/pdfs/Plum_Optimising_public_sector_spectrum_use_April_2010.pdf.

193. See T. Randolph Beard et al., *supra* note 62, at 277.

Council of Advisors on Science and Technology found in their “Report to the President: Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth” that clearing and reallocating federal spectrum was not an economically sound or efficient mechanism for spectrum policy.¹⁹⁴ For instance, the NTIA estimated it would cost \$18 billion to accommodate commercial wireless broadband in the 1755-1850 MHz band.¹⁹⁵ Sometimes clearing and reallocating spectrum is not an option as moving some government activities to a different bandwidth is not always possible if alternative spectrum is not available or it is too costly.¹⁹⁶ For the aforementioned reasons, spectrum sharing will become the predominate policy.

VI. CONCLUSION

Despite the ever-increasing demand for spectrum, there is not enough of the resource to support the needs of both the public and the private sector. While federal government agencies hold large amounts of spectrum, the agencies often fail to utilize the spectrum in the most efficient manner. In order to spur innovation and economic growth, the United States government must find ways to increase the efficiency of federal spectrum. One option includes transferring spectrum from one exclusive use to another exclusive use through spectrum auctions or reallocation, but due to recent regulations and policy developments that method may no longer be sustainable. The federal government has economic incentives for encouraging the availability of federal spectrum for the private sector because reallocation and auction methods raise revenue for the government. However, such methods are not always feasible, and often “the costs of moving an incumbent user from a band [exceeds] the value created by a new user,” making reallocation to another exclusive use an unattractive option.¹⁹⁷ Spectrum sharing is the most likely method to resolve the spectrum crunch. Spectrum sharing, moving from exclusive use of spectrum to nonexclusive use, would protect the interests of incumbent federal users while allowing wireless service providers access to spectrum.

Net neutrality, involving the application of Title II of the Communications Act to Internet service providers, leads to less flexibility for the wireless industry. An existing theory states that, as a result of the decrease in flexibility, spectrum value will decrease. Spectrum devaluation eliminates the economic incentives to reallocate federal spectrum and spectrum auctions. Demand for spectrum in the commercial sector will continue to increase without regard to spectrum devaluation. As a result, the

194. See PCAST REPORT, *supra* note 15, at vi.

195. U.S. DEP’T OF COMMERCE, AN ASSESSMENT OF THE VIABILITY OF ACCOMMODATING WIRELESS BROADBAND IN THE 1755 – 1850 MHZ BAND, at iii (2012), <http://www.ntia.doc.gov/report/2012/assessment-viability-accommodating-wireless-broadband-1755-1850-mhz-band>.

196. See Welsh, *supra* note 52.

197. See BAZELON & MCHENRY, *supra* note 4, at 3.

United States will likely explore spectrum sharing as the answer to increasing the availability of the resource for innovation and economic growth.

