IEEE-USA recommends that the U.S. government improve its decision-making process for spectrum management in order to stimulate technical innovation, encourage the private capital formation key to technical innovation, improve U.S. competitiveness in the international telecommunications marketplace, and ensure reliable availability of spectrum for disaster response and national defense.

As the U.S. society and economy are becoming more mobile and more information centric, radio spectrum policy is becoming increasing important to ensure maximum economic growth and to balance that growth with critical national security, public safety, and socially important uses. While key parts of spectrum management require an understanding of technical issues (e.g. How much will spectrum use X disrupt with spectrum use Y through various interference mechanisms?), other aspects require more subjective considerations dealing with the relative impact to society of competing uses.

Federal spectrum use is the responsibility of the President, and is delegated by statute to the Department of Commerce’s National Telecommunications and Information Administration (NTIA). No formal mechanism exists to resolve domestic policy disagreements in this bifurcation of functions although historically such issues have been resolved adequately.

To improve the functioning of spectrum management and stimulate the economy IEEE-USA recommends several changes. Some of these changes can be implemented by the FCC and the Executive branch without legislation while others would require legislation. These recommendations are divided into three groups:

1) Process improvements
2) Improved technical resources for FCC and NTIA
3) Issues to stimulate innovation
This statement was developed by the IEEE-USA Committee on Communications Policy and represents the considered judgment of a group of U.S. IEEE members with expertise in the subject field. IEEE-USA advances the public good and promotes the careers and public policy interests of more than 200,000 engineers, scientists, and allied professionals who are U.S. members of IEEE. The positions taken by IEEE-USA do not necessarily reflect the views of IEEE or its other organizational units.

BACKGROUND

The basic mechanisms for spectrum management in the U.S. government have changed little since the Communications Act of 1934 which in turn was based heavily on earlier legislation. The Federal Communications Commission (FCC), an independent agency with five commissioners appointed for staggered 5-year terms by the President and confirmed by the Senate, has responsibility for spectrum use by the private sector, as well as state and local governments. Federal spectrum use is the responsibility of the President and is delegated by statute to the Department of Commerce’s National Telecommunications and Information Administration (NTIA). No formal mechanism exists to resolve domestic policy disagreements in this bifurcation of functions although historically they have been resolved adequately.

Some of these IEEE-USA recommendations require additional funding. It is clear that new federal expenditures will be closely examined in the next four years in view of the overall federal budget situation. However, it should also be noted that the cost of present or even expanded expenditures discussed below for regulation is minuscule in comparison with the telecommunications industry marketplace. The potential positive impact that improved regulation would have on the industry will likely dwarf such modest regulatory increases. Further, since the telecom industry is a basic infrastructure of the US economy, efficiency spurs economic growth in both telecom users and new entities that exploit new telecom features, e.g. app developers. Finally, both FCC and NTIA spectrum regulation are mostly user fee supported, so these costs could be recovered through modest increases in such user fees.

Process Improvement:

FCC and NTIA should explicitly acknowledge the role of Section 7 of the Communications Act of 1934, as amended, and the intent of Congress to encourage new communications technology and services. These agencies should adopt transparent procedures for determining which innovations are subject to this statute and should make readily available information on such proceedings. The FCC and NTIA should recommend changes in the statute in a timely way, if the current terms of Section 7 are deemed not practical.
Section 7 of the Communications Act\(^1\) was passed in 1982 to facilitate the approval and introduction of new technology in FCC-regulated industries. Since the passage of this legislation FCC has consistently ignored its provisions. FCC Commissioner Ajit Pai recently called Section 7 “the neglected stepchild of communications law.”\(^2\) Since NTIA shares jurisdiction with FCC over bands that are shared with federal systems, or where use could impact federal systems, some of the provisions of Section 7 also apply to NTIA.

FCC and NTIA should develop explicit policy statements regarding how they will make determinations of whether Section 7 applies to a proposed new technology, and what procedures they will use to meet the statutory guideline. The present techniques of tracking corporate merger review\(^3\) at FCC might be a model for keeping the public informed about the status of Section 7 determinations.

If NTIA and FCC decide that the provisions of Section 7 need to be revised to make them more practical, they should include proposed changes in their annual legislative requests.

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**Petitions for rule changes and clarifications are key issues in the regulation of the dynamic telecommunications industry. FCC should act on such petitions in a more transparent way, and make available information on petitions and their status on a consistent timely schedule.**

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In spectrum regulation new innovations often require a rule change or interpretation for their commercial use. This practice has been a long-time problem for FCC, with respect to responsiveness.

The First Amendment guarantees the right “to petition the Government for a redress of grievances,” a right also stated more recently in the Administrative Procedures Act (APA).\(^4\) Yet, for decades FCC has had minimal transparency, with respect to petitions in both technical and nontechnical matters. Filed petitions can sit for years without any acknowledgement that they were filed, or without public access to their content at FCC. For example, a November 2007 petition\(^5\) filed by CTIA, a major trade association, did not receive any public attention at FCC until January 2010, when a Public Notice\(^6\) was issued addressing comment on some, but not all, of the issues in the petition. If a major trade association cannot get transparency on a petition that it classified as “urgent,” the challenges facing a startup company needing an answer on a possible rule change, or clarification for a new product or service seem daunting.

FCC should use its website to announce the filing and status of petitions within a few months of their filing to meet the intent of the First Amendment and APA. The Commission should review its backlog of petitions on a regular basis, to resolve such issues more expeditiously.
**Improved technical resources for FCC and NTIA to improve decision making:**

In selecting presidential appointments to FCC, NTIA, and the State Department in communications policy functions consideration should be given to individuals with experience in the information and communications technology (ICT) industries, to balance the backgrounds of the officials in these key positions.

While the ICT industries have been major contributors to recent economic growth, the presidential appointees in the three major agencies that deal with national and international telecommunications issues have not included anyone with actual ICT industry experience in recent memory. Many types of experience are necessary in communications policy deliberations, but the consistent lack of individuals with ICT industry experience may have been detrimental to recent deliberations.

**FCC commissioners should consider appointing individuals with experience in the information and communications technology (ICT) industries. as one of their three assistants, allowed by law**

FCC commissioners have three “professional assistants” that they can appoint independent of civil service laws. The original legislation required one of these assistants to be an engineer. In practice today, all three assistants in FCC commissioners’ offices are usually lawyers with no experience in ICT industries. While the FCC’s jurisdiction is quite large, and includes issues from broadcast ownership and content to corporate mergers of telecom carriers, technical realities remain a key part of this jurisdiction from spectrum management to the technical evolution of “wired” networks. An individual with ICT industry experience would add new insight to the impact of current and proposed regulations on both ongoing businesses and new businesses, whose access to capital often depends on capital markets’ perceptions of regulations.

While there have been various legislative proposals to require specific academic background for some of the commissioners’ assistants, a more flexible approach would be to urge commissioners to consider at least one assistant with actual experience in the ICT industries.
FCC and NTIA should supplement their existing Technological Advisory Council (TAC) and Commerce Spectrum Management Advisory Committee (CSMAC), which consist mainly of representatives of major communications firms, with a new advisory committee that serves both agencies and focuses on independent review of options for resolving spectrum conflicts and identifying outdated policies. The new group should be modeled on the EPA Science Advisory Board and the NRC Advisory Committee on Reactor Safeguards and members should have the necessary security clearances to deal with issues involving classified federal government spectrum users, if so requested.

Both FCC’s TAC and NTIA’s CSMAC have been implemented with members who are in most cases representatives of affected parties. While this representation is beneficial in many cases -- in reviewing what affected parties want and how they might be impacted by possible decisions -- it does not give the agencies all the options that are possible with today’s and future technologies. FCC has never even asked the TAC to recommend or evaluate options on pending docketed proceedings. On the NTIA side, the CSMAC charter has no provisions for classified deliberations showing that NTIA is not using it for reviewing pending government/federal spectrum policy matters.

FCC and NTIA should supplement the existing committees with a new advisory committee patterned after the prestigious committees that serve NRC and EPA consisting of distinguished members without immediate conflicts (e.g., academics and retirees who have agreed to limit their consulting activities, in exchange for payment as special government employees). A committee that advises both agencies will be a cost-effective way to make sure both are presented with technology policy options, and that their impacts have been evaluated in an objective fashion. The FCC commissioners and the NTIA administrator can then combine this input with more subjective factors in making national interest determinations and policy decisions.

FCC and NTIA should have the resources to contract with the National Academy of Science’s National Research Council (NAS/NRC), Federally Funded Research and Development Centers (FFRDCs) and private analysis contractors, to supplement their internal staffs on novel technical policy questions where they lack the appropriate internal resources.

Other federal regulatory agencies with technical jurisdiction have resources that can be used to supplement their permanent staff capabilities, with studies on new technologies and their policy issues. Both FFRDCs and NAS/NRC are often used by other agencies, yet FCC and NTIA lack the funds to use these resources. As a result proceedings in innovative technologies often drag on for years. Also the two agencies lack the resources to review regularly existing technical policies to see if they have become anachronistic with today’s technologies. While NTIA has the Institute for
Telecommunications Sciences (ITS) as an internal resource, most ITS activities are actually studies for other agencies, while FCC and NTIA have minimal resources to use this “internal FFRDC.”

An example of how outside resources have been used to resolve contentious technical policy issues and guide US policy on to a new path in the past is the 1970 NAS/NRC study that recommended a technical solution to the telephone interconnection issue. This NAS/NRC study set the basic framework for Part 68 of the Commission’s Rules, which in turn, was the foundation for telephone interconnection rules in many other countries.

More recently the MITRE Corporation, an FFRDC, did a study in 2001 for FCC, ordered by special legislation, to recommend alternatives for resolving the contentious unprecedented technical issues in the 12 GHz terrestrial/direct broadcast satellite spectrum sharing proceeding (often referred to as “Northpoint”), ET Docket 98-206. These MITRE recommendations then formed the basis for the Multichannel Video Distribution and Data Service rules that FCC adopted in 2002, some of the most technically complex rules FCC has ever adopted.

Thus, in both the Part 68 and MVDDS cases, outside independent resources were used to resolve technically complex, contentious issues in a timely way.

The NTIA and FCC technical staffs are key to the long-term success of U.S. spectrum policy. Recruiting and developing the careers of these personnel should be done using the best practices of other agencies involved in technical policy development.

The FCC legal and technical staffs are roughly comparable in size, and both are key resources in the agency’s mission. However, FCC for many years has given low priority to recruiting and career development for entry level technical staff. Indeed, while legal staff recruiting starts at the beginning of the academic year, technical staff recruiting has often had to wait until all budget issues were resolved, typically near the end of the academic year when top students have already selected employers. FCC should follow best practices of other federal agencies that have significant technical staffs, with respect to both timing of recruiting and later career development activities.

All technical staff, not just new hires, should be encouraged to continue their education by making the resources and time available for them to do so. This education could include attending and participating in technical conferences, as well as more formal education at colleges and universities. In addition the staff should be encouraged to participate in outside professional organizations.
Other Issues to Stimulate Innovation:

The executive branch should act to review and implement the recommendations for federal spectrum management reform in Sections 5.2 – 5.6 of the July 2012 President’s Council of Advisors on Science and Technology (PCAST) report, “Realizing the Full Potential of Government-Held Spectrum,” to facilitate the reallocation and sharing of federal spectrum for private sector use.

The PCAST spectrum report\(^\text{12}\) is controversial in some areas. But the findings and recommendations in Sections 5.2-5.6\(^\text{13}\) of the report have attracted no controversy. These sections deal with improving the implementation of spectrum management for federal users pursuant to Sections 305 and 902 of the Communications Act of 1934, as amended.\(^\text{14}\) As the report clearly states, the players in federal spectrum management lack both the incentives and resources to ensure that wireless spectrum is used for the maximum national benefits. Incumbent federal spectrum users lack the financial resources to explore alternatives to their present spectrum use that might make more spectrum available to other federal and nonfederal users. The report proposes an increased White House role in strategic spectrum policy, one that has been lacking for several decades. The recommendations for improved federal spectrum management in the PCAST report deserve serious consideration and implementation.

FCC and NTIA should review, and consider adopting the IEEE-USA recommendations for clarifying harmful interference.

Many spectrum policy decisions dealing with innovative wireless technology and service have as a key component--whether the new technology or service will cause “harmful interference” to existing users. FCC, NTIA, and the International Telecommunications Union (ITU) use the same definition of harmful interference:

Interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs, or repeatedly interrupts a radiocommunication service operating in accordance with these [Radio] Regulations.\(^\text{15}\)

In practice, interpreting these 31 words in the context of modern technology has been very controversial, and is often quite time consuming. Recently IEEE-USA released a white paper\(^\text{16}\) “Clarifying Harmful Interference Will Facilitate Wireless Innovation,” which addresses possible approaches for making harmful interference determinations more transparent. The white paper suggests breaking the issue into six sub-problems, and clarifying acceptable approaches for dealing with these sub problems.

The white paper also stresses the importance of both FCC and NTIA using comparable general approaches in making harmful interference determinations to improve transparency.
It is hoped that improved transparency, and more timely determinations in this area, will encourage capital formation in wireless R&D and bring technical innovation more rapidly to the US economy.

**FCC should complete action in a timely way on Docket 09-157, which deals with wireless technical innovation.**

In August 2009 FCC initiated a Notice of Inquiry dealing with “Fostering Innovation and Investment in the Wireless Communications Market”, Docket 09-157. This proceeding was intended to identify issues that affect wireless innovation and to consider changes to FCC policies that might facilitate such innovation. It recognized “Policies that foster continued innovation have helped to encourage capital investment in wireless, and to deliver new and empowering technologies and applications to American consumers.”

Unfortunately, FCC has not acted on this proceeding, and this inaction may be sending signals to capital markets that are the exact opposite of the original intent of the proceeding. This issue is key in spectrum policy, and FCC should finish its deliberations, and develop an action plan to encourage innovation to stimulate economic growth. The action plan should address the industries that develop and operate wireless technologies, the industries that build on new developments (e.g., “app” developers), and the non-communications industries whose productivity is improved through the use of innovative technologies.

**ENDNOTES**

1 47 USC 157:
   a) It shall be the policy of the United States to encourage the provision of new technologies and services to the public. Any person or party (other than the Commission) who opposes a new technology or service proposed to be permitted under this chapter shall have the burden to demonstrate that such proposal is inconsistent with the public interest.
   b) The Commission shall determine whether any new technology or service proposed in a petition or application is in the public interest within one year after such petition or application is filed. If the Commission initiates its own proceeding for a new technology or service, such proceeding shall be completed within 12 months after it is initiated.

3 http://www.fcc.gov/encyclopedia/transaction-team-office-general-counsel
4 5 USC 553(e)
5 This petition was not made available at the FCC website until 2010, but was available on the CTIA site: http://files.ctia.org/pdf/filings/FINAL--CTIA--Jammers_Petition_for_Declaratory_Ruling.pdf
7 47 USC 154(f)(2)

10 The FCC’s Fiscal Year (FY) 2001 budget authorization contained a requirement that the FCC select an independent engineering firm to perform an analysis to determine whether these two services can share the band without any interference to DBS systems.

11 47 CFR 101.1401,1440


13 The findings and recommendations involved are given on p. 49-50 of the report:

**Finding 5.1:** There is no incentive system today for federal government agencies to be efficient in their use of spectrum or to share spectrum allocated to them with the non-Federal sector.

**Finding 5.2:** A public private partnership (PPP) is the best mechanism to ensure that optimal use is made of the federally-held spectrum and of related investments in spectrum research and testing.

**Finding 5.3:** International harmonization of spectrum policies is essential to product innovation, interoperability and roaming, spectrum efficiency, and cross-border frequency coordination.

**Recommendation 5.1:** PCAST recommends that the White House Chief Technology Officer (CTO) with senior officials at an equivalent level from the National Security Staff (NSS), the Office of Management and Budget (OMB), and the National Economic Council (NEC) formalize a Spectrum Management Team (SMT) to work with the National Telecommunications and Information Administration (NTIA), the Federal Communications Commission (FCC), and the major federal agencies that use spectrum to carry out the President’s directive.

**Recommendation 5.2:** PCAST recommends that the NTIA, working with the SMT and Federal agencies, reexamine the partitioning of federal spectrum usage in light of current and emerging technology. One objective of this reexamination is to aggregate current spectrum partitions to create substantial frequency blocks in order to facilitate sharing through common technical use rules.

**Recommendation 5.3:** PCAST recommends that the President indicate that all federal agencies should cooperate with the SMT and NTIA to establish and implement a government-wide process and mechanism to share federally-held spectrum. Within one year, the SMT working with the NTIA should formulate concrete 5-year and 10-year goals for federal spectrum sharing opportunities in order to recommend to the President how to appropriately update his 2010 goal of making 500 MHz of federal and non-federal spectrum available over the next 10 years.

**Recommendation 5.4:** PCAST recommends that OMB, working with the SMT and NTIA, take steps to implement a mechanism that will give federal agencies incentives to share spectrum. Such a mechanism would accurately internalize the opportunity cost of federal spectrum resources and manage them over long time horizons using a “currency-like” accounting, allocation, and incentive system (“Spectrum Currency”).
Recommendation 5.5: PCAST recommends that OMB should implement a sustainable funding mechanism to foster a federal spectrum sharing system. The existing Spectrum Relocation Fund should be redefined as a revolving “Spectrum Efficiency Fund” that recycles private sector payments for use of federal spectrum into reimbursements to federal agencies for investments that facilitate spectrum sharing and enhance spectrum efficiency. Congress should allow the Fund to reimburse qualifying costs by any Federal service, not just those in revenue-generating bands.

Recommendation 5.6: PCAST recommends that the President appoint an advisory committee of industry executives (e.g. CEOs), to be known as the Spectrum Sharing Partnership Steering Committee (SSP), to advise the SMT on a policy framework to maximize commercial success, centered on a public private partnership for sharing federally-held spectrum, and implementation milestones that lay the groundwork for the first spectrum superhighways.

Recommendation 5.7: The United States, represented by the Department of State with advice from NTIA and the FCC, should make international harmonization of spectrum allocations to wireless broadband, particularly in bands used or planned to be used for mobile broadband applications in the United States, a key element of the U.S. position at the 2015 World Radiocommunication Conference (WRC-15) and in bilateral and regional discussions with its own neighbors, Mexico and Canada.

14 47 USC 305 gives the President, not FCC, responsibility for spectrum management of federal agencies. 47 USC 902 delegates this authority to the Department of Commerce’s National Telecommunications and Information Administration. This basic bifurcation predates the creation of FCC in 1934.
15 47 C.F.R. 2.1