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# SPECTRUM POLICY FOR THE 21<sup>ST</sup> CENTURY – THE PRESIDENT’S SPECTRUM POLICY INITIATIVE: REPORT 2

RECOMMENDATIONS FROM STATE AND LOCAL GOVERNMENTS  
AND PRIVATE SECTOR RESPONDERS



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# EXECUTIVE SUMMARY

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## INTRODUCTION

In today's era of modern communications, radio frequency spectrum is vital to our nation's economic growth, national security, homeland security, public safety, law enforcement, federal transportation infrastructure, and scientific research. However, access to this spectrum resource can be artificially restrained when spectrum management policies fail to keep pace with advances in spectrum technologies. To ensure that our spectrum management policies are capable of harnessing the promise of beneficial, new technologies, yet meet our nation's security goals, President George W. Bush established the *Spectrum Policy Initiative* (the Initiative) to develop a United States spectrum policy for the 21<sup>st</sup> century.<sup>1</sup>

New, innovative wireless technologies offer improved capabilities that can both propel our economy and satisfy critical government missions. Wireless technologies and innovation led by the private sector are driving competition and providing consumers with an increasingly wide array of wireless telephony and broadband services. In March 2004, the President announced a national goal that all Americans should have universal access to affordable broadband technology by 2007. Some of the most promising new broadband technology is wireless. Expanding the amount of spectrum available for commercial uses will support high speed Internet access and therefore is integral to helping meet this goal.

The Administration has laid down a challenge for these technologies to assist in this

objective. In addition, the role of spectrum in assuring public safety is incalculable. State and local governments rely on spectrum so that public safety responders can communicate in times of attack or natural disaster.

The recommendations in this report build upon the recent experiences of the federal spectrum community in its efforts to implement new technologies – third generation (3G) wireless, unlicensed broadband, and ultrawideband (UWB). Commercial access to spectrum has been achieved through balancing the critical spectrum needs of the federal agencies (including the Departments of Defense, Transportation, Homeland Security, Justice, and the National Aeronautics and Space Administration) with the economic benefits to the nation.

In light of the significance of spectrum to the national economy and critical federal government missions and against a background of positive accomplishment, the President directed the Secretary of Commerce to chair the Initiative and to conduct a comprehensive review to develop recommendations for improving spectrum management policies and procedures for the federal government and to address state, local, and private spectrum use. The goal of the Initiative is to promote the development and implementation of a U.S. spectrum policy for the 21<sup>st</sup> century that will foster economic growth; ensure our national and homeland security; maintain U.S. global leadership in communications technology development and services; and satisfy other vital U.S. needs in areas such as public safety, scientific research, federal transportation infrastructure, and law enforcement.

Specifically, the President charged the Secretary of Commerce to prepare recommendations to:

- (a) facilitate a modernized and improved spectrum management system;
- (b) facilitate policy changes to create incentives for more efficient and beneficial use

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<sup>1</sup> Memorandum for the Heads of Executive Departments and Agencies, *Spectrum Policy for the 21st Century*, 69 Fed. Reg. 1569 (Jan. 9, 2004) (hereinafter *Presidential Memorandum*) (Appendix A).

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of spectrum and to provide a higher degree of predictability and certainty in the spectrum management process as it applies to incumbent users;

(c) develop policy tools to streamline the deployment of new and expanded services and technologies, while preserving national security, homeland security, and public safety, and encouraging scientific research; and

(d) develop means to address the critical spectrum needs of national security, homeland security, public safety, federal transportation infrastructure, and science.

The President directed the Secretary of Commerce to initiate two courses of action:

(a) to establish a Federal Government Spectrum Task Force (the “Task Force”) consisting of the heads of affected executive branch agencies, departments, and offices to address improvements in policies affecting spectrum use by federal agencies; and

(b) to schedule a series of public meetings to address improvements in policies affecting spectrum use by state and local governments and the private sector, as well as improvements in policies for the spectrum management process as a whole.

The President further directed the Secretary of Commerce to prepare two separate reports containing the recommendations developed in the two respective courses of action. This report presents recommendations affecting spectrum use by state and local governments and the private sector developed through the public meetings and written comments submitted to the Department of Commerce. Section 1 of the report provides a brief introduction. Section 2 provides a summary description of the current spectrum management system used by the United States to satisfy its domestic and international requirements for using the spectrum. Section 3 details each of the recommendations and provides the rationale for these recommendations.

FACILITATE A MODERNIZED AND IMPROVED SPECTRUM MANAGEMENT SYSTEM.

## Recommendations

### 1. Establish the Department of Commerce Spectrum Management Advisory Committee

The National Telecommunications and Information Administration (NTIA) should establish the Department of Commerce Spectrum Management Advisory Committee, consistent with the Federal Advisory Committee Act and the NTIA Organization Act.<sup>2</sup> This Committee would report to the Assistant Secretary for Communications and Information, Department of Commerce. The Committee would be comprised of a broad range of stakeholders including representatives from state, regional and local sectors, industry, academia, and consumer groups. The Federal Communications Commission (FCC) and the Department of Homeland Security (DHS) would be invited and encouraged to participate as appropriate. The Committee would advise the Assistant Secretary on needed reforms to domestic spectrum policies and management to enable the introduction of new spectrum-dependent technologies and services, including policy reforms for expediting the American public's access to broadband services.

### 2. Review and Improve International Spectrum Management Policies

**(a) Coordinate and Review International Spectrum Policy and Framework.** NTIA, in coordination with other federal agencies, including the Department of State,

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<sup>2</sup> 5 U.S.C. App. 2; 47 U.S.C. §§ 901-904.

the FCC, and industry, should review (1) policies and related international approaches regarding regional and global harmonization and interoperability of spectrum; and (2) the international regulatory and procedural framework to remove barriers that prevent the timely implementation of new spectrum-dependent technologies and services.

**(b) Improve U.S. Processes for World Radiocommunication Conferences (WRCs).** NTIA, in coordination with the Department of State and other federal agencies, should recommend improvements to the United States WRC preparatory process, including (1) establishing U.S. delegations and appointing the head of the delegation earlier; (2) improving the process for gaining international support for U.S. proposals to the conference; and (3) establishing a schedule for domestic implementation of decisions reached at WRCs.

### 3. Develop and Promote the Use of Spectrum Management Tools for Coordinating New Services and Managing Interference

**(a) Develop Spectrum Management Tools.** NTIA, in conjunction with the federal agencies, the FCC, and industry should develop modern spectrum management tools. These tools would reduce the time required to coordinate new spectrum uses with incumbents and to perform required analyses of potential interference associated with emerging spectrum dependent technologies and services. These tools would inform and assist future spectrum management decision-making by both NTIA and the FCC.

**(b) Promote the Use of Spectrum Management Tools.** NTIA, in conjunction with the FCC, should promote the use of these tools by federal agencies, state and local

agencies, industry, and regulators in other countries.

### 4. Promote Spectrum Management Training

The FCC and NTIA should jointly develop training programs for new spectrum management personnel. These training programs and materials should be made available to spectrum managers in federal government agencies, to non-federal agencies (state, regional, and local), and to those organizations designated by the FCC to coordinate uses of the spectrum.

CREATE INCENTIVES FOR MORE EFFICIENT AND BENEFICIAL USE OF SPECTRUM AND POLICIES TO PROVIDE A HIGHER DEGREE OF PREDICTABILITY AND CERTAINTY FOR INCUMBENT SPECTRUM USERS.

### Recommendations

#### 5. Establish Economic and Efficiency Incentives

**(a) Encourage Congress to Enact Legislation to Increase Incentive Authority.** The Administration should continue to encourage Congress to enact legislation that provides the FCC with permanent authority to conduct spectrum auctions for licenses and to collect fees for spectrum use. This proposed legislation would support incentives for efficient use of the spectrum. The Administration should also continue to support legislation that would establish a spectrum relocation fund that would streamline the process for reimbursing government spectrum users and facilitate their relocation to comparable spectrum.

**(b) Establish Economic Incentives.** Once enacted into law, the FCC and NTIA

should use the statutory authorities described in (a) to develop increased economic incentives for efficient spectrum use. In addition to market-based incentives like auctions and lease fees, the FCC should consider expanding the application of secondary markets across services.

**(c) Examine Spectrum Rights as Incentives.** NTIA, in conjunction with the FCC, should, through appropriate rulemaking processes, examine the possibility of modifying spectrum rights as a means to encourage the deployment of spectrally efficient technologies. These rulemakings should consider, among other things: (i) granting access to new bands of spectrum to users deploying demonstrably non-interfering technology, and (ii) limiting the interference protection afforded to incumbents using inefficient technologies.

DEVELOP POLICY TOOLS TO STREAMLINE THE DEPLOYMENT OF NEW AND EXPANDED SERVICES AND TECHNOLOGIES WHILE PRESERVING NATIONAL AND HOMELAND SECURITY, AND PUBLIC SAFETY, AND ENCOURAGING SCIENTIFIC RESEARCH.

## Recommendations

### 6. Support Emerging Technologies and Innovation

**(a) Identify and Analyze New Technologies.** NTIA, working with the FCC and research and development laboratories in the federal government and industry, should develop improved approaches for assessing the potential impact of emerging technologies and expanded services in a timely manner. This activity would include the identification of emerging technologies and expanded opportunities for government/industry cooperation.

**(b) Develop Spectrum Sharing and Innovation Test-Bed.** The FCC and NTIA, in coordination with the federal agencies, should develop a plan to increase sharing of spectrum between federal government and non-federal government users. Within two years of this report's publication, NTIA and the FCC should establish a pilot program to allow for increased sharing between federal and non-federal users. NTIA and the FCC should each identify a segment of spectrum of equal bandwidth within their respective jurisdiction for this program. Each segment should be approximately 10 MHz for assignment on a shared basis for federal and non-federal use. The spectrum to be identified for this pilot program could come from bands currently allocated on either an exclusive or shared basis. Two years after the inception of the pilot program, NTIA and the FCC should provide reports outlining the results and suggesting appropriate procedures for expanding the program as appropriate.

### 7. Improve the Use of Information Technology to Modernize Spectrum Management

NTIA and the FCC should promote the use of advanced information technology (IT) capabilities to replace existing manual procedures used in the coordination and licensing processes, including the coordination of NTIA and FCC certification and licensing databases. Improving these spectrum management operations would result in more timely responses to proposals from both the federal agencies and the commercial sector for new spectrum uses.

ADDRESS CRITICAL SPECTRUM NEEDS OF NATIONAL SECURITY, HOMELAND SECURITY, PUBLIC SAFETY, FEDERAL TRANSPORTATION INFRASTRUCTURE, AND SCIENCE.

## RECOMMENDATIONS

### 8. Encourage Long-Range Spectrum Planning

State, regional, and local government agencies should be encouraged to establish long-range spectrum planning processes and to take into account the federal long-range plans. The Department of Commerce Spectrum Management Advisory Committee, identified in Recommendation 1, would assist with this activity, ensuring that NTIA, DHS, and participating entities remain appropriately informed about current spectrum trends and issues.

### 9. Identify and Address Unsatisfied Spectrum Requirements for Public Safety

**(a) Identify Unsatisfied Spectrum Requirements.** NTIA, in conjunction with the FCC, DHS, officials from regional, state, and local governments, and representatives from the private-sector public safety community

should inventory spectrum use by the public safety community; identify the major public safety requirements for spectrum-dependent services that are not being satisfied by facilities owned and operated by regional, state, and local government agencies; and determine if current spectrum use is efficient and identify ways to make public safety use more effective.

### **(b) Develop a Federal/Non-Federal Public Safety Demonstration Program.**

NTIA should examine the feasibility of sharing spectrum among commercial, federal and local public safety and critical infrastructure applications, including the possibility of leasing services. NTIA should develop and implement one or more demonstration programs to test the operational and cost effectiveness of sharing spectrum and communications infrastructure between federal, state, and/or local governments and private users.

**(c) Address Public Safety Spectrum Shortage, Interference, New Technology and Security Issues.** Based on the results of the examination in (a), DHS, in coordination with NTIA, the FCC, regional, state, and local governments, and representatives from the private-sector public safety community, should develop a comprehensive plan to address the fragmentation, shortage, interference, and security issues related to communication spectrum used by the public safety community.

# SECTION 1 – INTRODUCTION

## BACKGROUND

The radio frequency spectrum is a vital national resource essential to a safe and economically healthy society. Effective and efficient use of the spectrum underpins efforts to ensure homeland security, national defense, public safety, law enforcement, domestic and international transportation, and scientific exploration. In addition, wireless technologies, driven by the private sector innovation, are fueling competition and providing consumers with a vast array of telephony services and broadband applications, thereby adding value to our national economy. As the following demonstrates, their value to the United States and to the global economy, while not entirely quantifiable, is demonstrably immense.

- As of the end of 2003, capital investment in cellular and similar mobile technologies in the United States cumulatively totaled approximately \$146 billion, and generated about \$88 billion in revenues.<sup>3</sup>
- Broadcast television garnered \$41.4 billion in advertising revenues in 2002. As of June 2003, over 100 million U. S. households received broadcast TV service.<sup>4</sup>
- The satellite industry estimates world revenues in that sector at \$101 billion for 2002.<sup>5</sup>

- Globally, the International Telecommunications Union (ITU) estimates that mobile services generated \$364 billion in revenues, and that 1.129 billion persons subscribed to cellular service in 2002.<sup>6</sup>

Moreover, the role of spectrum in assuring safety and quality of life is inestimable. Uses of spectrum such as the communications of public safety responders and various science applications confer important societal benefits, but do not occur in a market context that would measure their economic value. The tremendous value of the spectrum makes it imperative that U.S. spectrum management policies keep pace with developing new technologies, so that the nation can continue to benefit from the services these new technologies can provide.

For example, this Administration has laid down a challenge for wireless services as a key component of the President's goal of universal, affordable access to broadband technology by 2007.<sup>7</sup> New wireless broadband services like Wireless Fidelity (WiFi) and WiMAX have the potential to make broadband available in hard-to-serve areas to meet the President's goal. Because these and other similar technologies are rapidly developing and changing, our spectrum management policies must be flexible enough to ensure that new technologies continue to have access to spectrum.

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<sup>3</sup> Cellular Telecommunications and Internet Association, *Semi-Annual Wireless Survey Industry Results* (2004) (hereinafter CTIA survey), available at [http://www.ctia.org/public\\_policy/statistics/index.cfm/AID/10030](http://www.ctia.org/public_policy/statistics/index.cfm/AID/10030).

<sup>4</sup> Federal Communications Commission, *Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming, Tenth Annual Report*, FCC 04-5, MB Docket No. 03-172, at 63, 115 (Jan. 29, 2004).

<sup>5</sup> Satellite Industry Association & Futron Corp., *2001-2002 Satellite Industry Indicators Survey*, available at

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<http://www.sia.org/papers/Satellite%20Indicators%20Survey-02.pdf>.

<sup>6</sup> International Telecommunications Union, "Key Global Telecom Indicators for the World Telecommunication Service Sector," available at [http://www.itu.int/ITU-D/ict/statistics/at\\_glance/KeyTelecom99.html](http://www.itu.int/ITU-D/ict/statistics/at_glance/KeyTelecom99.html).

<sup>7</sup> The White House, *A New Generation of American Innovation* (April 2004), available at [http://www.whitehouse.gov/infocus/technology/economic\\_policy200404/innovation.pdf](http://www.whitehouse.gov/infocus/technology/economic_policy200404/innovation.pdf) (last visited June 4, 2004) (hereinafter *American Innovation*).



Significant amounts of spectrum have already been made available by the Administration for a wide variety of wireless broadband services. Working in conjunction with the federal agencies and the Federal Communications Commission (FCC), the Administration has made several new bands of spectrum available for innovative new private-sector applications. Examples include:

- 255 MHz in the 5 GHz band for wireless broadband networks (*e.g.*, WiFi);
- 90 MHz in the 1.7 and 2.1 GHz bands for advanced wireless mobile services (*e.g.*, 3G wireless services); and
- The entire 3-10 GHz band for ultrawide-band (UWB) devices.

To accommodate these new spectrum allocations, spectrum managers had to integrate an understanding of powerful new technologies into their decision-making processes.

The new wireless broadband technologies that will be deployed in the 5 GHz band utilize spread-spectrum technology that is designed to “hop” across a large number of frequencies. When combined with Dynamic Frequency Selection (DFS) capability, this technology can sense the presence of other operators before transmitting. When this technology is demonstrated to be effective and certified by the FCC, it can co-exist without interference in bands previously reserved for government radar systems. Similarly, UWB technologies combine very short transmission pulses (typically less than a nanosecond) with very wide bandwidths (*e.g.* 1-3 GHz) for new applications for radar and communications. Although UWB technologies operate at power levels low enough to operate as unlicensed devices, the bandwidths are so wide that they must emit portions of their signals in bands unavailable for unlicensed use. The rulemakings necessary to authorize these new services, while ultimately successful, were fiercely debated and time consuming. To continue to accommodate new technologies in a more organized and

timely manner and to ensure that critical government radio systems are protected from interference, U.S. spectrum management policies need to be modernized.

## THE PRESIDENT’S SPECTRUM POLICY INITIATIVE

In June 2003, the President issued an executive memorandum outlining the Administration’s initiative for spectrum management reform. The Presidential Memorandum stated that:

The existing legal and policy framework for spectrum management has not kept pace with the dramatic changes in technology and spectrum use. Under the existing framework, the Government generally reviews every change in spectrum use, a process that is often slow and inflexible, and can discourage the introduction of new technology. Some spectrum users, including Government agencies, maintain that the existing spectrum process is insufficiently responsive to the need to protect current critical uses.<sup>8</sup>

The President further stated that:

My Administration is committed to promoting the development and implementation of a U.S. spectrum policy for the 21st century that will: (a) foster economic growth; (b) ensure our national and homeland security; (c) maintain U.S. global leadership in communications technology development and services; and (d) satisfy other vital U.S. needs in areas such as public safety, scientific research, Federal transportation infrastructure, and law enforcement.<sup>9</sup>

To meet these goals, the President established the “Spectrum Policy Initiative” to promote the development and implementation of a U.S. spectrum policy for the 21<sup>st</sup> century. He directed the Secretary of Commerce to chair the Initiative and to conduct a comprehensive review to identify recommendations for improving spectrum management policies

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<sup>8</sup> See *Presidential Memorandum*, *supra* note 1.

<sup>9</sup> *Id.*

and procedures for the federal government and to address state, local, and private spectrum use. The President charged the Secretary of Commerce to prepare legislative and other recommendations to:

- (a) facilitate a modernized and improved spectrum management system;
- (b) facilitate policy changes to create incentives for more efficient and beneficial use of spectrum and to provide a higher degree of predictability and certainty in the spectrum management process as it applies to incumbent users;
- (c) develop policy tools to streamline the deployment of new and expanded services and technologies, while preserving national security, homeland security, and public safety, and encouraging scientific research; and,
- (d) develop means to address the critical spectrum needs of national security, homeland security, public safety, federal transportation infrastructure, and science.<sup>10</sup>

The Presidential Memorandum also established the Federal Government Spectrum Task Force (Task Force) to focus on improving spectrum management policies and procedures to stimulate more efficient and beneficial federal use of the spectrum. The President also directed the Secretary of Commerce to hold a series of meetings to obtain the views of the public on these issues. The meetings were designed to assist the Secretary in developing recommendations for revising policies and procedures to promote more efficient and beneficial use of spectrum without harmful interference to critical incumbent users. Participants were to include spectrum users, equipment vendors, financial and industry analysts, economists, technologists, consumer groups, and interested federal, state, and local government agencies. Moreover, the President encouraged the FCC to participate and provide input to NTIA.

The Presidential Memorandum also required the Secretary of Commerce to prepare

two reports for the President with recommendations based on this comprehensive review process. This report provides recommendations based on information gathered during the public meetings called for in the Initiative as well as a *Notice of Inquiry* proceeding initiated by NTIA. A companion report has been prepared which contains the recommendations of the Task Force.<sup>11</sup>

## PROCESS

In order to allow commentary from as wide a range of stakeholders as possible, NTIA convened four public meetings and issued a *Notice of Inquiry* in the Federal Register:<sup>12</sup>

- December 9, 2003, a meeting addressing issues regarding spectrum efficiency and the implementation of new spectrum dependent technologies and services.
- February 10-11, 2004, a meeting addressing issues regarding spectrum uses for public safety (Public Safety Meeting).
- February 12-13, 2004, a meeting at the National Academy of Sciences addressing issues regarding United States spectrum uses as a whole (National Academy of Sciences Forum).
- March 8, 2004, a meeting addressing recommendations by service providers, entrepreneurs, and venture capitalists for improving the deployment of new spectrum-dependent technologies and services (Santa Clara Forum).

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<sup>11</sup> *Spectrum Policy for the 21<sup>st</sup> Century-The President's Spectrum Policy Initiative: First Report*, U.S. Department of Commerce, Recommendation 4, at ii-iii and 18-20 (hereinafter referred to as the "First Report").

<sup>12</sup> Information about the public meetings is available at <http://www.ntia.doc.gov/osmhome/spectrumreform/puBOut.htm>. The Notice of Inquiry and comments received are available at <http://spectrumreform.ntia.doc.gov>. See also, NTIA, *United States Spectrum Management Policy for the 21<sup>st</sup> Century*, Notice of Inquiry, 69 Fed. Reg. 4923 (Feb. 2, 2004).

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<sup>10</sup> *Id.*

- NTIA also published a comprehensive *Notice of Inquiry* in the Federal Register. Twenty responses were received from a broad cross-section of state and local government, and private sector entities.

Based on the record compiled and in response to the concerns articulated in the *Presidential Memorandum*, this report presents recommendations affecting spectrum

use by state and local governments and the private sector. Section 1 of the report provides a brief introduction. Section 2 provides a summary description of the current spectrum management system used by the United States to satisfy its domestic and international requirements. Section 3 details each of the recommendations and provides the rationale for these recommendations.

# SECTION 2 – SPECTRUM MANAGEMENT IN THE UNITED STATES

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## BACKGROUND

The history of spectrum management is as old as the advent of radio communications. In 1906, the year when speech and music were first broadcast using radio, the first international radio conference was held. In the United States, widespread interference caused by unchecked transmission resulted in the Radio Act of 1912. The 1912 Act required the registration of transmitters with the Department of Commerce, but did not provide for the control of their frequencies, operating times, or station output powers. Thus, the 1912 Act was largely unsuccessful.

In 1922, U.S. government users of the spectrum gathered under the Secretary of Commerce to form the Interdepartment Radio Advisory Committee (IRAC) to coordinate U.S. Government use of the spectrum. The Government's use of the spectrum was more easily coordinated than the public's because the IRAC represented all federal users and such cooperation was mutually beneficial.

The Radio Act of 1927 established the Federal Radio Commission, which was shortly replaced by the FCC under the Communications Act of 1934 (the Act).<sup>13</sup> The FCC is authorized to develop classes of radio service, allocate frequency bands to the various services, and authorize frequency use to non-federal users.

In addition, Section 305 of the Act preserves for the President the authority to assign frequencies to all federal government owned and operated radio stations,<sup>14</sup> as well as the authority to assign frequencies to foreign em-

bassies in Washington, DC, and to regulate the characteristics and permissible uses of the government's radio equipment.<sup>15</sup> The President has delegated these powers to the Assistant Secretary for Communications and Information who is also the Administrator of NTIA.<sup>16</sup>

As shown in Figure 1, the result of the Act is that spectrum management in the United States is split between NTIA and the FCC, with inputs from other agencies in certain circumstances. NTIA manages the federal government's use of the spectrum while the FCC manages all other uses. However, the Act does not mandate specific allocations of bands for exclusive federal, non-federal, or shared use; all such allocations stem from agreements between NTIA and the FCC.

## U.S. SPECTRUM MANAGEMENT GOALS

Section 1 of the Act provides guidance regarding spectrum management objectives. It states that the FCC is to regulate:

so as to make available . . . a rapid, efficient, Nationwide, and worldwide wire and radio communication service with adequate facilities at reasonable charges, for the purpose of the national defense, [and] for the purpose of promoting safety of life and property. . . .<sup>17</sup>

Title III of the Act authorizes the FCC to regulate generally the "channels of radio transmission," including the licensing and operation of radio stations.<sup>18</sup> Title III, however,

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<sup>13</sup> 47 U.S.C. § 151 *et seq.*

<sup>14</sup> See 47 U.S.C. § 305(a).

<sup>15</sup> See 47 U.S.C. § 305(c).

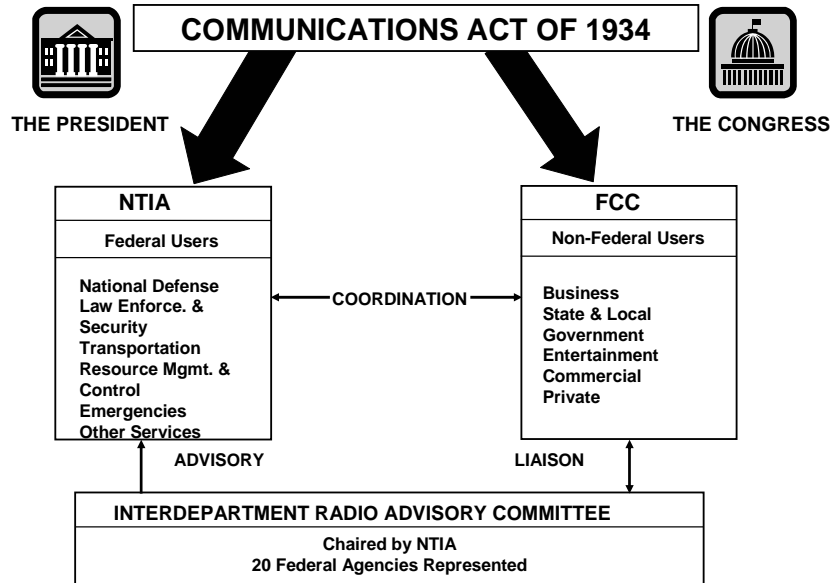
<sup>16</sup> See Section 103(b)(2) of the NTIA Organization Act (codified at 47 U.S.C. § 902(b)(2)); see also Executive Order 12046 (1978).

<sup>17</sup> See 47 U.S.C. § 151.

<sup>18</sup> See 47 U.S.C. § 301.

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**Figure 1. National Spectrum Management**



provides few details on the FCC’s objectives for spectrum management. In general, the Act directs the FCC to act consistent with the “public interest, convenience, or necessity.”<sup>19</sup> The “public interest” standard is the primary criterion for apportioning spectrum in the United States to non-federal users, although the Act mentions the goals of preventing interference among stations, promoting the efficient use of spectrum, and promoting public safety. The Act does not define “public interest,” but instead gives the FCC broad discretion to elucidate and give specific content to the public interest standard.

NTIA is similarly charged with managing the federal government’s use of the radio spectrum in the public interest. The NTIA Organization Act requires the agency to:

... foster full and efficient use of telecommunications resources, including effective use of the radio spectrum by the federal government in a manner that encourages the most beneficial uses thereof in the public interest.<sup>20</sup>

NTIA interprets this mandate to encompass the overall benefits the American public de-

rives from radio communication services, federal and non-federal, as well as the needs of various federal users and choices among competing users.

The FCC and NTIA jointly manage the nation’s radio spectrum resources in the public interest. Both agencies are committed to performing their respective responsibilities in a cooperative, diligent, and professional manner to ensure that the spectrum is used for its highest and best purpose, whether by the private sector, state and local government, or federal agencies. The FCC and NTIA are required to work together to ensure that spectrum policy decisions promote efficient use of the spectrum consistent with both the economic interests and national security of the nation. To accomplish these goals, the Chairman of the FCC and the Assistant Secretary for Communications and Information signed a Memorandum of Understanding (MOU) in January 2003 that formalized their long-standing cooperative relationship.

Under the MOU, the Chairman of the FCC and the Assistant Secretary for Communications and Information agree to meet at least twice each calendar year to conduct joint spectrum planning. Further, they agree that their staffs will meet regularly to exchange

<sup>19</sup> See e.g., 47 U.S.C. § 303.

<sup>20</sup> See 47 U.S.C. § 901(c)(4)

# SPECTRUM MANAGEMENT IN THE UNITED STATES

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information of mutual interest concerning spectrum management. Both agencies will give notice to each other of all proposed actions that could potentially cause interference to operations authorized by the other. Where possible, such notice will be given a minimum of 15 business days prior to final action for the other agency to comment. NTIA's Associate Administrator for Spectrum Management and the FCC's Chief of the Office of Engineering and Technology may agree to a different review period. Final action by the either agency, however, does not require approval of the other.

## EXECUTIVE BRANCH ORGANIZATIONS

In addition to NTIA, several other Executive Branch agencies are heavily involved in some aspects of spectrum management. The Department of State (State Department) is responsible for formulation, coordination, and oversight of foreign policy related to international communications and information policy. The Department of the Interior manages the use of the spectrum in the Trust Territories.

In addition, within the Executive Office of the President, the Office of Science and Technology Policy (OSTP) provides technical expertise and helps resolve differences between federal agencies, and develops communication support for continuity of operations of telecommunications for the federal government. (The Director of OSTP serves as the nation's telecommunications services manager during wartime settings, and performs other operational telecommunications functions during non-wartime emergencies.) The Office of Management and Budget (OMB) provides budgetary oversight and policy coordination with respect to federal spectrum matters. In addition to the involvement of OSTP and OMB, the staffs of the National Economic Council (NEC), the National Security Council (NSC), and the Homeland Security Council (HSC), who report to the President, have a role in reviewing national spec-

trum policy on national security, public safety, homeland security, and economic development. For example, with respect to 3G wireless technical study, the NSC and NEC used an existing telecommunications Policy Coordinating Committee to establish a process by which NTIA in conjunction with the FCC and DOD were tasked to examine the technical feasibility of making spectrum available for 3G wireless services. HSC reviews spectrum policy for its effects on first responders, interoperability, and telecommunications support of homeland security and emergency preparedness.

## THE NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION

Executive Order 12046 established NTIA in the Department of Commerce in 1978. Subsequently, Congress codified these functions in the National Telecommunications and Information Administration Organization Act.<sup>21</sup> Among other responsibilities, NTIA is the principal telecommunications policy advisor to the President and the manager of federal government use of the spectrum. NTIA divides its responsibilities among five offices and four staff groups, which work together to investigate the changing field of telecommunications and develop appropriate Administration policies and regulations.

NTIA's authority in spectrum management policy is broad. The NTIA Organization Act provides NTIA with the authority to assign frequencies and approve the spectrum uses proposed for new federal government systems. Federal users must obtain frequency assignments before they can operate transmitters.

Pursuant to delegations from the President and the Secretary of Commerce, the Administrator of NTIA is the ultimate authority in all spectrum management decisions for the federal government, except frequency assign-

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<sup>21</sup> Public Law No. 102-538, 106 Stat. 3533 (1992) (codified at 47 U.S.C. § 901 et seq.).

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ment decisions, which can be appealed to the OMB Director. The Administrator, in turn, has delegated the responsibility for day-to-day spectrum management decisions and for developing proposals for spectrum management policies to the Associate Administrator for NTIA's Office of Spectrum Management (OSM).

Some of the spectrum management work of OSM and NTIA involves classified radio-communication systems used by the DOD, DOE, DOJ, DHS, and others to support public safety and national defense missions. These systems, although they are a relatively small proportion of the total number of federal government systems, (about 1% of all federal frequency assignments and 20% of all new radiocommunication systems reviewed by NTIA are classified) are of overwhelming importance to the safety and security of the United States. Because these systems are classified, NTIA may not be able to share pertinent spectrum management data with other users of the spectrum. However, OSM very carefully considers both the impact of new technologies and systems on the existing classified systems that must be protected and the economic needs of the industry and the people of the United States.

OSM formulates and establishes plans and policies that ensure the effective, efficient, and equitable use of the spectrum. To achieve this broad objective, OSM: develops long-range spectrum plans to meet future federal government spectrum requirements; develops plans for managing radio communications during emergencies; coordinates and registers federal government satellite networks internationally; satisfies the frequency assignment needs of the federal agencies; provides spectrum certification for new federal agency radio communication systems; performs the necessary engineering analysis for evaluating and planning spectrum use; and provides the necessary automated information technology capability to perform these activities.

Interdepartment Radio Advisory Committee (IRAC): The IRAC advises NTIA on the development of spectrum policy and procedural matters, develops federal government positions on international radio-treaty conference issues, and provides recommendations for conflict resolution.<sup>22</sup> The IRAC is composed of the representatives of 20 federal agencies and an FCC liaison. As shown in Figure 2, the IRAC has six subcommittees, which have representatives from the federal agencies, and are chaired by OSM staff, and four *ad hoc* groups that address various aspects of spectrum management policy. NTIA provides to the IRAC executive secretariat support and technical advice.

The IRAC Bylaws indicate that its primary function is to:

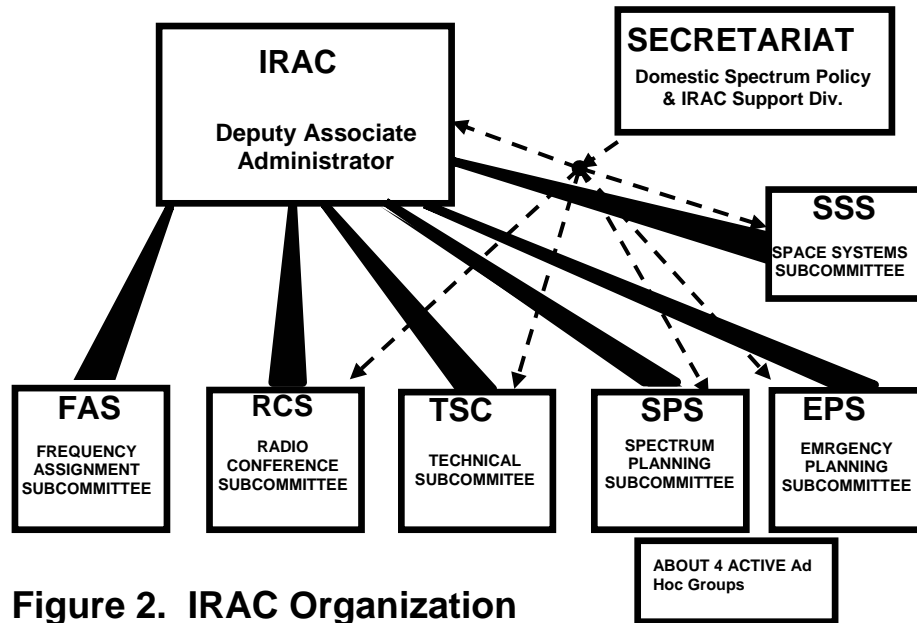
assist the Assistant Secretary for Communications and Information, through the Deputy Associate Administrator of OSM, in assigning frequencies to U.S. Government radio stations and in developing and executing policies, programs, procedures and technical criteria pertaining to the allocation, management, and use of the spectrum. The basic role of representatives appointed to serve on the IRAC shall be to function, when in Committee, in the interest of the United States as a whole.<sup>23</sup>

In addition, the IRAC provides a mechanism for coordinating federal use of the spectrum and resolving interference conflicts among the federal agencies. NTIA may accept, reject, or modify the recommendations of the IRAC on agency proposals for new frequency assignments, new radiocommunication systems, and spectrum management issues of interest to their agencies.

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<sup>22</sup> Section 103(b)(2)(T) of the NTIA Organization Act enables the Secretary of Commerce to establish inter-agency advisory committees, such as the IRAC. See 47 U.S.C. § 902(b)(2)(T); see also 47 U.S.C. § 904(b), (c)(2).

<sup>23</sup> See, *NTIA Manual of Regulations and Procedures for Federal Radio Frequency Management*, at ¶ 1.3.4 (May 2003 Edition, January 2004 Revisions).



**Figure 2. IRAC Organization**

Spectrum Management Decision-Making at NTIA: NTIA reaches its decisions by using the consensus advice from the IRAC, NTIA staff technical and policy analyses, and, when appropriate, public input.<sup>24</sup> This allows each federal spectrum-using agency to review proposals for new radio services and stations from other federal users (and non-federal users in bands where regulatory jurisdiction is shared by NTIA and the FCC) to determine if the new proposals will have an adverse impact on existing and planned operating systems. The affected users can then negotiate directly and develop a timely technical resolution to the potential problem. NTIA decisions are thus broadly debated with a strong emphasis on rational, technical, and analytic bases to provide maximum flexibility and support for the needs of new systems while protecting the rights of the existing users.

<sup>24</sup> The FCC is a liaison member of the IRAC and is expected to represent the views of the FCC during IRAC policy debates. Further, since many bands are shared by both non-federal and federal users, the NTIA and FCC work closely to resolve potential conflicts resulting from policy initiatives.

With regard to day-to-day authorization of radio stations and certification of new major federal systems, the decisions are made via technical review with agency comment and coordination. NTIA generally bases its decisions on the consensual advice of the agencies with technical review of the applications by NTIA staff. Routine authorization requests take 14 working days or less, while those requiring additional information and inter-agency coordination can take considerably longer. Certification of new systems takes about four to six months on the average, depending on the complexity of the system, the environment in which it will operate, the completeness of the application information, and the need for interagency coordination.

Technical Analyses: NTIA and the federal agencies have long relied on the use of engineering analyses and technical standards to select and authorize operating frequencies for radio stations of all types. These practices have taken the form of minimum standards for transmitters and receivers and the use of minimum separation criteria for siting systems as well as analyses of all potential interference interactions to ensure compatible op-



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erations. The U.S. Government uses complex computer databases and entry validation routines to screen proposals for conformance to appropriate standards and to ensure that users of systems potentially subject to interference are provided a chance to coordinate operations.

*System Review Process and the Application of Information Technologies:* As the spectrum has become more densely used over time, the technical rigor of the analyses and screening of new services has become increasingly complex. Since the U.S. Government uses radio frequencies for many different services over the entire range of the spectrum, any screening program must be sufficiently complex to consider all possible interactions between the various radio services. This analysis requires the ability to predict reliably propagation losses in all types of terrains and environments at all frequencies.

This system review process seeks to ensure that federal agencies procure only equipment that is in conformance with all applicable standards and capable of operating within the existing environment without causing or suffering interference. The system review process is needed partly because of the long lead times for the development and implementation of complex telecommunication systems and partly because of the rapid advances of telecommunications in general. The system review process was formalized by the OMB Circular A-11, which requires federal agencies to obtain certification from NTIA of spectrum availability before requesting funds for development or procurement of major systems. The process has always used state-of-the-art interference analyses to assess proposals and has been successful in ensuring that deployed equipment would operate properly.

The analyses and approval process often requires four to six months for completion and resolution of problems. However, DOD and NTIA have begun developing improvements to Spectrum XXI, an advanced Win-

dows-based, PC-oriented program that assists agencies in preparing information for both the spectrum certification and frequency assignment portions of the federal spectrum management process. Spectrum XXI should permit near instant approval of proposals in full conformance with all applicable federal regulations.

## THE DEPARTMENT OF STATE

The State Department is involved in all international aspects of spectrum management, including bilateral discussions with neighboring countries about operations of radio systems near the borders. Their role is to ensure that the United States speaks with one voice and that all applicable precedents and treaties are followed. The State Department, along with NTIA and the FCC, oversees U.S. preparations for meetings of international telecommunications bodies, such as the International Telecommunication Union (ITU), and the Inter-American Telecommunications Commission (CITEL).

The State Department also prepares the U.S. Ambassador to head the U.S. delegation to the World Radiocommunication Conferences (WRCs) of the ITU, which occur every 3-4 years to update the International Radio Regulations, the treaty governing the cooperative use of the radio spectrum among member states. The State Department is responsible for beginning WRC preparations and, under the appointed ambassador, leads the U.S. delegation.

The International Telecommunication Advisory Committee (ITAC), a General Services Administration-chartered advisory committee under the Federal Advisory Committee Act, is central to the Department of State's process for managing the U.S. preparations for international spectrum policy forums. The ITAC-Radiocommunication Activity (ITAC-R) process seeks to reconcile differences among various competing interests of federal and non-federal spectrum users in preparing the formal submissions by the

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United States to the ITU Radiocommunication Sector (ITU-R) or CITELE. The ITAC submits its recommendations to the State Department, which, in coordination with NTIA and the FCC, determines the appropriate U.S. policy on the international telecommunications issues and forwards that determination to the ITU-R or CITELE as the formal United States submission.

National views and proposals on WRC agenda items are originated by NTIA and the FCC, and represent the potentially conflicting views of their constituents. The State Department presents the results of NTIA and FCC deliberations and negotiations internationally and where necessary assists in resolving conflicts. The ITAC-R develops technical inputs for the conference and submits them in a report to the WRC.

The State Department also initiates a "core delegation group" to lead the preparatory activities. The core delegation group is comprised of the U.S. WRC Head of Delegation, the vice-chairs, agency principals and representatives from the State Department, the FCC, NTIA, NASA, and DOD. The group assists in the development and implementation of U.S. goals and objectives, the development of U.S. policy positions, and the resolution of conflicts with U.S. proposals.

Finally, the State Department uses its worldwide network of embassies to garner support for U.S. positions and proposals. The Department of State's U.S. Mission in Geneva supports the U.S. delegation both before and during the conferences and meetings.

## THE FEDERAL COMMUNICATIONS COMMISSION

The FCC is an independent federal regulatory agency established by the Communications Act of 1934. Its mission includes regulating interstate and international communications by radio, television, wire, satellite, and cable. Its jurisdiction covers the 50 states, the District of Columbia, and U.S. possessions.

The FCC staff is organized by function. There are currently six operating bureaus and ten staff offices. The bureaus' responsibilities include processing applications for licenses and other filings; analyzing complaints; conducting investigations; developing and implementing regulatory programs; and collecting information via public meetings and hearings. Bureaus have been delegated a significant level of responsibility to carry out the day-to-day authority and decisions of the FCC in their specific areas of telecommunications service. The offices provide technical and staff support services to all bureaus to ensure continuity. Even though the bureaus and offices have their individual functions, they regularly work together and share expertise in addressing FCC issues.

NTIA works closely with the spectrum management components of the FCC, which are found in the Office of Engineering and Technology (OET), the Wireless Telecommunications Bureau (WTB), the International Bureau (IB), and the Enforcement Bureau (EB). The spectrum management responsibilities of these groups are discussed below.

**Office of Engineering and Technology (OET):** The OET advises the FCC on technical and policy issues pertaining to wireless and wireline proceedings. In cooperation with other organizations in the FCC, the OET directs staff work with respect to general frequency allocation proceedings and other proceedings. In addition, the OET prepares recommendations for legislation, and reviews recommendations for rule changes and rule-making technical proposals initiated by other offices.

The OET also serves as the primary contact point between the spectrum management activity of NTIA and the FCC by maintaining a liaison with the IRAC.

**The Wireless Telecommunications Bureau (WTB):** The WTB handles all FCC domestic wireless telecommunications programs and policies -- except those involving satellite

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communications or broadcasting -- including licensing and regulatory functions. Wireless communications services include cellular telephone, paging, personal communications services, public safety, and other commercial and private radio services. The WTB is also responsible for implementing the FCC's statutory authority to assign spectrum licenses by competitive bidding.

The goals of the WTB include fostering competition among different services, promoting universal service, public safety, and service to individuals with disabilities, maximizing efficient use of spectrum, developing a framework for analyzing market conditions for wireless services, minimizing regulation where appropriate, and facilitating innovative service and product offerings, particularly by small businesses and new entrants.

**International Bureau (IB):** The IB serves as the focal point within the FCC for cooperation and consultation on international telecommunications matters with other federal agencies, international or foreign organizations, and appropriate regulatory bodies and officials of foreign governments. The IB advises the Chairman and Commissioners on matters of international telecommunications policy. The IB develops, recommends, and administers policies, rules, and procedures for the authorization and regulation of international telecommunications facilities and services and domestic and international satellite systems. The IB represents the FCC on international telecommunications matters at both domestic and international conferences and meetings, and directs and coordinates the FCC's preparation for such conferences and meetings.

The IB also coordinates the international coordination of spectrum allocations and frequency and orbital assignments to minimize cases of international radio interference involving U.S. licensees.

**Enforcement Bureau (EB):** The EB is the primary organizational unit within the FCC

responsible for enforcement of provisions of the Communications Act, FCC rules, FCC orders, and terms and conditions of station authorizations. Major areas of enforcement handled by the EB are: (1) consumer protection enforcement, (2) local competition enforcement, and (3) public safety/homeland security enforcement.

The EB investigates alleged violations of the FCC's technical, operational, and competitive rules, and recommends or issues appropriate enforcement actions. The bureau also adjudicates and mediates disputes between telecommunications industry entities.

The EB also enforces rules designed to protect safety of life such as the Emergency Alert System, construction, marking and lighting of antenna structures and radiofrequency radiation.

**Spectrum Management Decision-Making at the FCC:** The FCC's day-to-day decisions in assigning frequencies and licensing stations are made in several different ways. The FCC will issue licenses directly to qualified applicants when non-exclusive use of the spectrum is possible.

The FCC is required to use auctions to resolve mutually exclusive applications for initial licenses unless certain exemptions apply, including exemptions for public safety radio services, digital television licenses to replace analog licenses, and non-commercial educational and public broadcast stations.

In arriving at new policies, regulations, and procedures, the FCC generally reaches its decisions after public notice and comment proceedings. In some cases, the FCC will file a notice of inquiry to gain information for developing a new policy. However, when it has the information needed, the FCC, in a notice of proposed rulemaking, will propose specific procedures or policies for comment by the interested public. Parties affected by an FCC proposal may file formal documents commenting on the FCC's proposed actions and inquiries, as well as on the comments submitted by other affected parties.

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The FCC reviews the material provided by the various commenters from technical, legal, and policy standpoints and reaches a

decision on whether to seek more information or to issue a new rule in an order.

# SECTION 3 – RECOMMENDATIONS AND ANALYSIS

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**The following recommendations are based on suggestions and comments from commercial, state and local government, and other spectrum users; academics and other experts; and the general public received in a series of public hearings and filings with the Department of Commerce. These recommendations have been refined by the Department of Commerce and reviewed by agencies across the federal government.**

FACILITATE A MODERNIZED AND IMPROVED SPECTRUM MANAGEMENT SYSTEM.

**Recommendation 1. Establish the Department of Commerce Spectrum Management Advisory Committee**

The National Telecommunications and Information Administration (NTIA) should establish the Department of Commerce Spectrum Management Advisory Committee, consistent with the Federal Advisory Committee Act and the NTIA Organization Act.<sup>25</sup> This Committee would report to the Assistant Secretary for Communications and Information. The Committee would be comprised of a broad range of stakeholders including representatives from state, regional, and local sectors, industry, academia, and consumer groups. The Federal Communications Commission (FCC) and the Department of Homeland Security would be invited and encouraged to participate as appropriate. The Committee would also advise the Assistant Secretary on needed reforms to domestic spectrum policies and management to enable the introduction of new spectrum-dependent technologies and services, including policy reforms for

expediting the American public's access to broadband services.

## *Rationale*

As described in Section 2, NTIA and the FCC share jurisdiction over radio frequency spectrum management. Commenting parties differed on whether centralized oversight would produce a more coordinated and efficient spectrum management system.<sup>26</sup> Some commenters expressed concern that Executive Branch control over commercial spectrum would reduce transparency and politicize decisions.<sup>27</sup> Other commenters stressed that the existing dual-jurisdiction system could be enhanced by improving coordination between the FCC and NTIA.

A broad-based Department of Commerce Advisory Committee (Committee) established and operated under the provisions of the Federal Advisory Committee Act would satisfy many stakeholder concerns with the existing process. Because a federal advisory committee operates according to notice and public participation requirements, such a committee would satisfy stakeholder concerns that the spectrum management process be as transparent and open as possible.

The Committee would provide private-sector input to inform NTIA's decision-making on spectrum matters that affect commercial interests. The Committee would recommend reforms to the extent they are needed, and promote increased understanding among government and non-government users about their different interests. Receiving

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<sup>26</sup> Compare Comments of Motorola, Inc., and Comments of Wayne Longman (favoring structural reform), with Comments of Cingular Wireless LLC (opposing change).

<sup>27</sup> See, e.g., Comments of Nickolaus E. Leggett; Comments of Association of Public-Safety Communications Officials-International (APCO).

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<sup>25</sup> 5 U.S.C. App. 2; 47 U.S.C. §§ 901-904.

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## RECOMMENDATIONS AND ANALYSIS

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information from a broad cross-section of stakeholders in an organized and coordinated manner would be essential for the implementation of the recommendations of this report and the resolution of important domestic spectrum policy issues. Issues that could be addressed by the Committee include:

- **Broadband:** Wireless local area services such as WiFi and wireless backbone services like Wi-MAX have the potential to make broadband available in hard-to-serve areas, an important step in meeting the President's goal of universal, affordable broadband for every American by 2007. However, introduction of these and other unlicensed services often requires resolution of complex technical issues affecting both federal and non-federal spectrum. The Committee would provide a forum for identifying and discussing resolution of these technical issues in a timely and proactive manner.
- **Public Safety:** The Committee could address public-safety spectrum management issues of common concern to state and local governments and the federal agencies.
- **Digital Television (DTV) Transition:** The Committee could serve as a useful forum for all stakeholders to present issues affecting the DTV transition. The current deadline for the DTV transition is December 31, 2006, at which time 24 MHz of spectrum will be available for public safety services and 36 MHz of spectrum will be available for commercial wireless applications. Developing wireless broadband technologies, as well as the ever-pressing need for additional spectrum for public safety, make the need for the rapid conclusion of this transition critical. The Committee could serve as a forum for stakeholders to present and resolve the issues that could delay this transition.

### **Recommendation 2. Review and Improve International Spectrum Management Policies**

(a) **Coordinate and Review International Spectrum Policy and Framework.** NTIA, in coordination with other federal agencies, including the State Department, the FCC, and industry, should review (1) policies and related international approaches regarding regional and global harmonization and interoperability of spectrum, and (2) the international regulatory and procedural framework to remove barriers that prevent the timely implementation of new spectrum-dependent technologies and services.

(b) **Improve U.S. Processes for World Radiocommunication Conferences (WRCs).** NTIA, in coordination with the Department of State and other federal agencies, should recommend improvements to the United States WRC preparatory process, including (1) establishing U.S. delegations and appointing the head of the U.S. delegation earlier; (2) improving the process for gaining international support for U.S. proposals to the conference; and (3) establishing a schedule for domestic implementation of the decisions reached at WRCs.

### *Rationale*

#### **International Spectrum Policy Framework**

Many U.S. commercial and government operations are international in scope. The DOD, and other federal agencies increasingly rely on global communications systems, and U.S. manufacturing and technology companies rely on international markets as the world moves towards a seamless global marketplace. Thus, the U.S. approach to the international aspects of spectrum management is important to achieving U.S. goals of economic well-being and national security. The manner

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in which the United States develops positions, proposals, and strategies and interacts with other administrations and regional and international bodies is critical to achieving success in supporting U.S. Government spectrum requirements and maintaining U.S. leadership in communications technology and service development.

### *Harmonization and Interoperability*

Two key components of international spectrum policy that must be reviewed are U.S. policies regarding global and regional spectrum harmonization and technical interoperability. Spectrum harmonization refers to consistent spectrum allocations for like services across geographic regions (*e.g.*, allocating the same frequencies for 3G mobile services in the United States and Europe). Interoperability refers to the identification of technical standards (as well as frequency allocations) that permit the operators of standardized equipment to communicate with one another (*e.g.*, all equipment built to the APCO 25 public safety standard that operates in the same frequency bands can interconnect and communicate).

Given the increasing globalization of economic and trade activity, U.S. Government and commercial interests often need to operate on a worldwide basis. Harmonization of spectrum allocations, regulations, and standards for implementation of spectrum-dependent technologies may serve U.S. interests by enabling economies of scale and increased sales through international markets.

However, there are instances where harmonization may disadvantage the developers of U.S. technology and, at times, federal government entities. For example, some of the frequency bands used by the U.S. Government for radar systems do not require international allocations. Requiring those systems to be designed and built to an international frequency standard can reduce deployment flexibility.

Similar to spectrum harmonization, system interoperability generally requires frequency and technology harmonization. Moreover, as with spectrum harmonization, requirements for interoperability of equipment present both benefits and costs for U.S. interests. For example, the United States has worked within organizations such as the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO) to ensure that telecommunications systems supporting aviation and maritime safety can interoperate on an international basis. However, in the commercial context, the United States has consistently supported technological neutrality. U.S. manufacturers have maintained consistent support for technical flexibility to allow evolution of technologies and services, some of which afford more efficient use of the spectrum and/or better quality service.

The attendant costs and benefits of harmonization and interoperability only become manifest on a case-by-case basis. Establishing a set policy towards interoperability and harmonization, therefore, would unnecessarily constrain U.S. advocacy in international forums. Accordingly, U.S. spectrum policy should coordinate the interests of federal agencies and industry in international spectrum policy decision-making and balance the costs and benefits of harmonization and interoperability in a flexible manner.

### *Barriers to Implementation of New Technology*

The principal goals of U.S. international spectrum policy are identifying and removing barriers to the global implementation of U.S. communications technology, increasing U.S. consumer access to technologies, avoiding harmful interference, and satisfying the requirements for U.S. Government missions globally. International and regional organizations are the fora where U.S. technologies will be supported or hindered. The United States has traditionally led the way in spectrum

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technology innovation, and many new technologies require new spectrum allocations and/or regulations, both domestically and internationally. Many of these innovations are comprised of new ideas that may fall outside the international framework successfully used in the past to develop support for the introduction of new spectrum uses.

Internationally, the need for review of the international regulatory framework for spectrum allocations was recognized in the adoption of WRC-03 Resolution 951. This Resolution called for review of the existing radio regulations, with respect to the evolution of existing, emerging, and future applications, systems, and technologies. The United States needs to assume an active role in this review and seek to have the recommendations generated by the Initiative adopted by international regulators, to the extent applicable.

### U.S. Preparations for World Radiocommunication Conferences

The *Notice of Inquiry* sought comment regarding the U.S. WRC preparatory process. Comments called for increased high-level government participation, including additional staff expertise and greater inter-agency cooperation.<sup>28</sup> Some parties recommended establishing early timelines for resolving disputed items that arise in formulating a U.S. position.<sup>29</sup> Many parties called for more continuity in WRC representation, advocating either a permanent WRC ambassador, the appointment of an ambassador earlier in the WRC preparatory process, or a permanent senior-level State Department WRC position. On the other hand, one party questioned whether a government official is always the best qualified to head a delegation.<sup>30</sup> Other

comments suggest the importance of outreach to industry before the WRC meetings to obtain support for U.S. objectives.<sup>31</sup>

The comments received in response to the *Notice of Inquiry* parallel comments received last year in response to a separate *Request for Comments* on improvements to the U.S. WRC preparation process.<sup>32</sup> NTIA is completing a comprehensive report containing recommendations for improvements to the WRC preparatory process based on comments received in response to its requests.

### Recommendation 3. Develop and Promote the Use of Spectrum Management Tools for Coordinating New Services and Managing Interference

(a) **Develop Spectrum Management Tools.** NTIA, in conjunction with the federal agencies, the FCC, and industry should develop modern spectrum management tools. These tools would reduce the time required in coordinating new spectrum uses with incumbents and in performing required analyses of potential interference associated with emerging spectrum dependent technologies and services. The results produced through the use of these tools would inform and assist future spectrum management decision-making by both NTIA and the FCC.

(b) **Promote the Use of Spectrum Management Tools.** NTIA, in conjunction with the FCC, should promote the use of these tools by federal agencies, state and local agencies, industry, and regulators in other countries.

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<sup>28</sup> See, e.g., Comments of the Satellite Industry Association (SIA Comments); Comments of the United States International Telecommunication Union Association (USITUA Comments).

<sup>29</sup> See, e.g., USITUA Comments.

<sup>30</sup> Comments of American Radio Relay League (ARRL).

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<sup>31</sup> USITUA Comments.

<sup>32</sup> See NTIA, *Improvements to the U.S. Preparation Process for World Radiocommunication Conferences*, Request for Comment, 68 Fed. Reg. 60,646 (2003). The comments received are available at <http://www.ntia.doc.gov/ntiahome/frnotices/2003/wrcrfc/index.html>.



### *Rationale*

Consumer demand for spectrum is exploding and new wireless services, many with broadband potential, are proliferating. To accommodate this rapid expansion of spectrum uses, spectrum managers require effective tools that allow them to perform their tasks effectively and efficiently. The use of these tools will allow spectrum managers to accommodate new technologies resulting in further innovation to allow consumers to reap still new benefits from spectrum use.

Both the FCC and NTIA have been studying and applying new approaches to measure and mitigate interference interactions. Interested parties also offered a variety of perspectives on how to characterize and measure potential interference.<sup>33</sup> Some commenters felt that measurement and mitigation tools would clarify interference issues and increase the regulatory certainty that parties seek and that spectrum users need to expand services and innovate.<sup>34</sup> Some parties recommend that state-of-the-art interference mitigation techniques be considered as part of any long-term spectrum planning process.<sup>35</sup>

NTIA should examine these new technologies in a systematic fashion together with the FCC, other federal agencies, and industry. Developing these tools and techniques would support a regulatory environment that provides needed certainty for the development and expansion of new and existing services. These efforts should consider the latest techniques, such as the following:

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<sup>33</sup> See e.g., SIA Comments (advocating use of “permissible interference” standard); Motorola Comments (interference mitigation must be addressed from an overall system perspective).

<sup>34</sup> See, e.g., Motorola Comments (favoring a more quantitative approach to interference); Industrial Telecommunications Association (ITA) Comments (favoring interference standards); APCO Comments (more robust and sophisticated interference measurements would allow greater spectrum sharing).

<sup>35</sup> ARRL Comments.

### *Improve Receiver Standards*

NTIA adopted receiver interference immunity standards for many receivers used by federal agencies.<sup>36</sup> These standards provide minimum receiver performance levels which can be used in planning and coordinating new services. NTIA has advocated that the FCC establish similar interference immunity standards for commercial services for receivers operating in portions of the spectrum that are allocated for use by several radio services. However, a “one-size-fits-all” receiver standard is not possible since receiver standards are often tailored to specific user requirements. For example, in aviation, there are unique certification standards necessary for safety-of-life and other mission requirements. NTIA and others have recognized that receiver standards cannot replace interference protection rules or active spectrum management of other performance factors.<sup>37</sup> However, receiver standards, judiciously implemented, can potentially mitigate adjacent band interference and expedite the introduction of new services.<sup>38</sup>

NTIA and the FCC should work together to formulate common approaches to interference mitigation techniques. For example, receivers should be designed with a receiver bandwidth no greater than that required for signal reception. In addition, receivers should operate satisfactorily in the expected and intended radio frequency (RF) environment. In creating receiver standards, consideration

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<sup>36</sup> This does not refer to any particular receiver design standard. Rather, it refers to the environment within which the receiver must be able to fully perform. This environment includes the physical placement and RF emissions of all systems likely to be in operational range, as well as the spectrum over which the receiver can receive energy. See generally *Interference Immunity Performance Specifications for Radio Receiver*, Notice of Inquiry, ET Docket No. 03-65, 18 F.C.C. Rcd. 6039 (2003).

<sup>37</sup> See, e.g., Motorola Comments; Comments of Lucent Technologies (Lucent Comments).

<sup>38</sup> See Lucent Comments (advocating voluntary receiver standards, with performance characteristics tailored to specific service situations).

## RECOMMENDATIONS AND ANALYSIS

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should be given as to whether they should be voluntary or mandatory and service-specific or generic.

### *Employ Cognitive Radios*

Some interest has been shown in exploring the use of cognitive radios, including setting aside a spectrum band for this purpose, as a means of solving interference issues and promoting spectrum efficiency.<sup>39</sup> These technologies include the ability of devices to sense spectrum use by neighboring devices, change frequency, adjust output power, and even alter transmission parameters and characteristics. Cognitive radio technologies enable a radio device and its antenna to adapt spectrum use in response to the operating environment. The technology provides a way for a radio device/antenna to operate on otherwise unusable spectrum. The FCC has recognized that cognitive radio technologies can make possible more intensive and efficient spectrum use within a licensee's network or between users who share spectrum. NTIA and FCC spectrum managers should combine efforts to better understand the promise and limitations of this new technology.

### *Clarify Interference Temperature*

Interference temperature is an approach for addressing interference that takes into account the cumulative radio frequency energy from transmissions of spectrum-based devices. Current interference analyses focus on specifying and limiting the transmission power of individual spectrum-based devices as the primary method for avoiding interference. In contrast, an interference temperature approach quantifies interference levels at the user's receiver and sets a maximum cap on the aggregate of these transmissions. The interference temperature approach may facilitate more intensive use of the radio spectrum,

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<sup>39</sup> *But cf.* APCO Comments (cognitive radios should not be authorized for critical public safety applications until they have successful operational records in other services).

creating the opportunities for new services and improving the predictability of any interference to existing services.

The interference temperature concept holds potential for permitting some promising new technologies to coexist with some incumbent services. The FCC is conducting a rulemaking on this concept.<sup>40</sup> NTIA, along with the federal agencies, is developing comments in this proceeding in light of the potential impact to federal government operations and the immaturity and complexity of the concept. NTIA believes that a significant amount of study will be required before any implementation of this concept can be made. It is apparent that the FCC, NTIA, the federal agencies, and industry will have to work together to clarify, and if appropriate, resolve any difficulties that may arise in applying the interference temperature concept and related approaches in concrete situations.

### *Characterize New Technologies*

A systematic approach to analyzing the potential interference interactions associated with new spectrum-dependent technologies would expedite their implementation. NTIA and the FCC should cooperate to clarify for new entrants what information is essential to obtaining an expedited analysis of the potential interference associated with proposed spectrum uses. This essential information should include a description of the physical architecture, and the new technology's physical and operational characteristics. Once developed, proponents of new technologies would be required to submit this essential information prior to receiving approval for implementation.

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<sup>40</sup> *See Establishment of an Interference Temperature Metric to Quantify and Manage Interference and to Expand Available Unlicensed Operation in Certain Fixed, Mobile and Satellite Frequency Bands*, Notice of Inquiry and Notice of Proposed Rulemaking, ET Docket No. 03-237, 18 F.C.C. Rcd. 25309 (2003).

### *Protect Passive Scientific Uses*

Unlike many communications applications that can operate in more than one band of spectrum, passive scientific uses are often limited by laws of physics to operate in a specific band of spectrum. These receive-only services such as Radio Astronomy Service (RAS) or Earth Exploration Satellite Service (EESS) “listen” for emissions from deep space and nature that are emitted at a particular frequency. They are acutely vulnerable to out-of-band and spurious emissions from neighboring services. Spectrum managers need to take steps to protect these frequencies, particularly from developing technologies, such as cognitive radios, that “listen” for other users of the spectrum before operating. Because passive sensor systems are “receive-only,” they may not be identified by cognitive radios, which may then transmit in these bands causing interference to scientific systems.

### **Recommendation 4. Promote Spectrum Management Training**

The FCC and NTIA should jointly develop training programs for new spectrum management personnel. These training programs and materials should be made available to spectrum managers in federal government agencies, to non-federal government agencies (state, regional, and local), and to those organizations designated by the FCC to coordinate uses of the spectrum.

#### *Rationale*

Spectrum managers throughout the federal agencies, state and local government, and in the frequency coordinator organizations designated by the FCC, are responsible for ensuring their agency or their constituents accomplish their mandated missions through an efficient use of the radio frequency spectrum resource. To satisfy this responsibility, spectrum managers must not only understand cur-

rent spectrum-dependent technologies, but also understand the likely interference interactions between the services provided by incumbent spectrum users and the services envisioned to be provided through the use of cutting-edge technologies. Developing modernized training programs for federal government spectrum managers, and making these programs available to state and local governments as well as private-sector entities would ensure that all spectrum managers operate from a common frame of technical and analytical reference.<sup>41</sup>

Spectrum managers must be able to use the latest spectrum management analysis tools. Spectrum managers must also be aware of the commercial services available that could satisfy their functional requirements for spectrum services.

There is also a need for additional spectrum management expertise. The FCC Chairman, recognizing the need for a highly-trained staff capable of adapting to technological change, instituted engineering recruitment and training programs.<sup>42</sup> There is a similar need for such training throughout the spectrum management community. Indeed, expansion of the engineering training at both the FCC and NTIA would enhance the ability of these agencies to respond quickly to and, indeed, anticipate the implementation of new technologies.

In response to these requirements, some parties have suggested common training programs for federal, state, regional, and local spectrum managers under NTIA’s auspices, as well as the development of model best practices.<sup>43</sup> Participants in NTIA’s Public

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<sup>41</sup> In recognition of the importance of proper training for spectrum management personnel, the *First Report* recommends that the FCC and NTIA jointly develop such programs. See *First Report, supra* note 13, Recommendation 4, at ii.

<sup>42</sup> Michael K. Powell, FCC Chairman, Testimony before the Subcommittee on Commerce, Justice, State and the Judiciary of the Committee on Appropriations, United States Senate (Mar. 7, 2002).

<sup>43</sup> See e.g., AARL Comments (NTIA should sponsor a training program for new entrants similar to the pro-

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Safety meeting stressed the need for additional spectrum management expertise at the state, regional, and local levels. Some noted that the pool of knowledgeable spectrum managers has dwindled. Many stated that the user community, particularly smaller public safety agencies, lack knowledge of spectrum planning and processes, and the ability to perform long-range spectrum planning. By building in-house expertise, local agencies can make more informed choices on equipment purchases and on other spectrum management issues. Many participants at the Public Safety Meeting called for increased education, training, and outreach to help develop a new generation of knowledgeable spectrum managers. Local agencies could also explore partnerships and cooperative programs with universities as additional education options.

### CREATE INCENTIVES FOR MORE EFFICIENT AND BENEFICIAL USE OF SPECTRUM AND POLICIES TO PROVIDE A HIGHER DEGREE OF PREDICTABILITY AND CERTAINTY FOR INCUMBENT SPECTRUM USERS

#### Recommendation 5. Establish Economic and Regulatory Incentives

(a) **Encourage Congress to Enact Legislation to Increase Incentive Authority.** The Administration should continue to encourage Congress to enact legislation that provides the FCC with permanent authority to conduct spectrum auctions for licenses and to collect fees for spectrum use. This proposed legislation would support incentives for efficient use of the spectrum. The Administration should also continue to support legislation that would establish a spectrum reloca-

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gram it runs with the U.S. Telecommunications Training Institute for foreign officials); FCCA Comments (NTIA should provide spectrum management training to FCC-designated state and local frequency coordinators).

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tion fund that would streamline the process for reimbursing government spectrum users to facilitate their relocation to comparable spectrum.

(b) **Establish Economic Incentives.** Once enacted into law, the FCC and NTIA should use the statutory authorities described in (a) to develop increased economic incentives for efficient spectrum use. In addition to market-based incentives, like auctions and lease fees, the FCC should consider expanding the application of secondary markets across services.

(c) **Examine Spectrum Rights as Incentives.** NTIA, in conjunction with the FCC should, through appropriate rulemaking processes, examine the possibility of modifying spectrum rights as a means to encourage the deployment of spectrally efficient technologies. These rulemakings should consider, among other things: (i) granting access to new bands of spectrum to users deploying demonstrably non-interfering technology; and (ii) limiting the interference protection afforded to incumbents using inefficient technologies.

#### *Rationale*

#### **Economic Incentives**

Auctions for commercial spectrum leverage market forces to encourage more efficient spectrum use and recover the value of the spectrum for the U.S. Treasury. The FCC's current auction authority expires in 2007. The President's Fiscal Year 2005 Budget proposes legislation that would make that auction authority permanent and also grant the FCC authority to use other economic mechanisms, such as fees, as a spectrum management tool. The President's Budget proposes that the FCC initiate a rulemaking to determine the appropriate application and level of fees, and phase them in over time. Fees are a means of approximating the opportunity cost of using

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spectrum in a free market, and ensuring effective and efficient spectrum use.

In addition, the Administration supports legislation that would expedite the transfer of 45 MHz of federal government spectrum in the 1710 to 1755 MHz band for advanced wireless services by creating a spectrum relocation fund. Advanced wireless services have extraordinary potential, including the offering of mobile broadband services to consumers. The bill would create a fund from the auction proceeds of this spectrum to pay the costs necessary to relocate federal government users to other means of transmission, thus facilitating the transition to commercial use.

### Regulatory Incentives

NTIA and the FCC can also create regulatory incentives for more efficient uses of spectrum. These incentives would include offering access to otherwise unavailable spectrum to entities deploying demonstrably non-interfering technologies, as well as limiting the interference protection and spectrum rights afforded to incumbents using inefficient technologies. The following recent experiences demonstrate the effectiveness of these regulatory incentives.

In February 2003, NTIA reached an agreement with the private sector and the DOD on a technical solution that will permit unlicensed broadband services to operate in bands previously assigned to government radar systems in the 5 GHz band. This agreement requires any private-sector entity seeking access to the 5 GHz band to demonstrate effective Dynamic Frequency Selection (DFS) capabilities. DFS capability enables the unlicensed systems to sense the presence of government radar emissions and shut down or change frequencies when the government systems are in operation.

As long as the demonstration of non-interference is made with rigorous, verifiable technical support, this type of regulatory incentive could be expanded. Rulemakings in this regard should not be limited to granting

commercial access to government spectrum. Non-interfering federal government technologies should be considered for access to non-federal allocations, including commercial bands.

NTIA has also established a plan to ensure that federal agencies deploy land mobile technologies that are at least as efficient as currently available commercial systems. This plan requires the federal agencies to transition from equipment employing 25 kHz channels to equipment employing 12.5 kHz channels – effectively doubling the number of channels available for future use. Agencies that fail to make the transition to narrowband equipment will revert to secondary status and will not be afforded protection from narrowband systems.

Because most commercial licenses are granted for a ten-year period, new technology has often developed by the time licenses are due for renewal. The FCC should consider requiring licensees to transition to more efficient technology as a condition of license renewal, where appropriate. Such a requirement would not necessarily require licensees to replace useful equipment, but rather could require licensees to transition to more efficient equipment when existing equipment is replaced at the end of its useful life-cycle.

DEVELOP POLICY TOOLS TO STREAMLINE THE DEPLOYMENT OF NEW AND EXPANDED SERVICES AND TECHNOLOGIES WHILE PRESERVING NATIONAL AND HOMELAND SECURITY, AND PUBLIC SAFETY, AND ENCOURAGING SCIENTIFIC RESEARCH.

### Recommendation 6. Support Emerging Technologies and Innovation

(a) **Identify and Analyze New Technologies.** NTIA, working with the FCC and research and development laboratories in the federal government and industry, should develop improved approaches for assessing the potential impact of emerging technologies and

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expanded services in a timely manner. This activity would include the identification of emerging technologies and expanded opportunities for government/industry cooperation.

**(b) Develop Spectrum Sharing and Innovation Test-Bed.** The FCC and NTIA, in coordination with federal agencies, should develop a plan to increase sharing of spectrum between federal government and non-federal government users. Within two years of this report's publication, NTIA and the FCC should establish a pilot program to allow for increased sharing between federal and non-federal users. NTIA and the FCC should each identify a segment of spectrum of equal bandwidth within their respective jurisdiction for this program. Each segment should be approximately 10 MHz for assignment on a shared basis for federal and non-federal use. The spectrum to be identified for this pilot program could come from bands currently allocated on either an exclusive or shared basis. Two years after the inception of the pilot program, NTIA and the FCC should provide reports outlining the results and suggesting appropriate procedures for expanding the program as appropriate.

### *Rationale*

Responsible spectrum management should recognize the power of new technologies. Innovative wireless services, such as ultra-wideband, WiFi, and Wi-MAX, promise to make broadband more universally accessible. Other pioneering technologies will certainly develop. U.S. spectrum policy must balance the benefits to commerce and industry that result from the introduction of such cutting-edge technologies with the benefits that protection for incumbents affords.

Spectrum policymakers must not only anticipate, but must also help create an environment for important new technology developments. NTIA should take the lead in coordinating a network of laboratories in the federal government and in the private sector.

Coordinating information developed in private and federal laboratories would provide the technical information necessary to allow standards committees, regulators, and policymakers to make meaningful decisions regarding the interference and sharing potential of new technologies.

Based on experience gained from this government/industry coordinated effort, the federal government should consider other methods of increasing government/industry research into new technologies.

In order to explore the real-world potential of increased technical cooperation between government and industry, NTIA and the FCC should establish a pilot program to allow for sharing in two segments of spectrum of approximately 10 MHz. This approximately 20 MHz of spectrum would provide a field to test the potential of new technologies that increase the efficient use of spectrum through increased sharing.

### **Recommendation 7. Improve Information Technology to Modernize Spectrum Management**

NTIA and the FCC should promote use of advanced information technology (IT) capabilities to replace existing manual procedures used in the coordination and licensing processes, including the coordination of NTIA and FCC certification and licensing databases. Improving these spectrum management operations would result in more timely responses to proposals from both the federal agencies and the commercial sector for new spectrum uses.

### *Rationale*

Many aspects of spectrum coordination, assignment, and licensing involve computational analyses and methodical cross-checks. Computerization and automation would help streamline these functions. Indeed, most license applications are now filed electronically, and online databases permit access to

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most license information. Automated frequency coordination systems have been installed in some cases and are under development in others. Although not every case or every facet of spectrum management lends itself to electronic processing, maximum practical use of current information technology would save spectrum managers and users time and money. The following are specific courses of action that should be taken to modernize spectrum management processes.

### *Standardize Web-Based Coordination of Frequency Assignments*

NTIA and the FCC have recently begun a demonstration project for web-based coordination of frequency assignments in the 70, 80, and 90 GHz bands. NTIA and the FCC opened these bands for commercial use in 2003. When fully operational, non-federal providers can use this web-based coordination system to obtain approvals to operate in minutes.

This model of web-based interagency coordination should be expanded to shared frequency bands whenever practical, with the goal of making web-based coordination the standard model. NTIA and the FCC should work together to develop jointly accepted models and methodologies to assess and test the impact of new technologies. Where bands are exclusively assigned to federal government or non-federal uses, the respective oversight agencies or voluntary coordinators should use online coordination practices for intra-band or adjacent frequency coordination to the extent practicable.

### *Improve the Universal Licensing System (ULS) and Other FCC Filing Systems*

The FCC currently uses on-line application systems, including the Universal Licensing System (ULS) for wireless licensees and the International Bureau Filing System (IBFS) for satellite systems. These systems can be improved. First, to ensure accuracy, the FCC should update application status on a weekly basis. Second, the FCC should reform the

ULS system to make it easier and simpler to use for entities with limited resources. Public safety agencies have pointed out that the FCC license application is difficult for small to medium-sized agencies to complete. Third, the FCC should endeavor to make the ULS more responsive to routinely received waiver requests.

### *Encourage the FCC to Consider Computer Assisted Pre-Coordination Resource and Database System (CAPRAD)*

Current law requires that television broadcasters switch from analog to digital broadcasting television by the end of 2006, or when 85 percent of the households in a market are capable of receiving a digital signal, whichever is later. To facilitate public safety planning for the digital television (DTV) transition, public safety entities have participated in a voluntary pre-clearance coordination system, also known as CAPRAD, for the 700 MHz band at issue. The National Institute of Justice administers CAPRAD. Because it is voluntary, however, CAPRAD lacks some of the data necessary for frequency coordination, interference prevention, and spectrum planning. Some public safety users recommend that use of CAPRAD be mandatory. In light of the importance of the DTV transition to public safety interoperability and to national broadband deployment, the FCC should consider this recommendation.

### *Standardize Federal and Non-Federal Frequency Assignment Databases*

Currently, the ULS and the federal government's frequency assignment system, SPECTRUM XXI, are incompatible. Because the majority of all spectrum is allocated on a shared basis for both federal and non-federal use, many frequency assignments require coordination between NTIA and the FCC. Integration of ULS, IBFS, and other FCC filing systems with SPECTRUM XXI would yield obvious advantages.

NTIA should work with the FCC and the Joint Spectrum Center (JSC) of the Defense

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Information Systems Agency (DISA) to form a partnership to coordinate the ULS and SPECTRUM XXI systems. NTIA and the FCC should strive towards a longer-term goal of creating a single, overarching spectrum management automation architecture for FCC and NTIA frequency assignment and licensing processes. This single architecture could include electronic preparation of all frequency assignment and license applications; electronic exchange of standardized common data elements; automated analysis including engineering tools, interference analysis, and spectrum occupancy; and standardized edit and validation checks.

### ADDRESS CRITICAL SPECTRUM NEEDS OF NATIONAL SECURITY, HOMELAND SECURITY, PUBLIC SAFETY, FEDERAL TRANSPORTATION INFRASTRUCTURE, AND SCIENCE.

#### **Recommendation 8. Encourage Long-Range Spectrum Planning**

State, regional, and local government agencies should be encouraged to establish long-range spectrum planning processes and to take into account the federal long-range plans. The Department of Commerce Spectrum Management Advisory Committee would assist with this activity, ensuring that NTIA, DHS, and participating entities remain appropriately informed about current spectrum trends and issues.

#### ***Rationale***

The United States needs to manage its spectrum resources in the most effective and efficient way possible. The *Notice of Inquiry* sought comment on using a long-range spectrum planning process to accomplish this goal. Responding parties were near unanimous in their approval.

Improving the long-range spectrum planning of federal, state, and local governments and the private sector is an essential compo-

nent for improving overall federal spectrum management policies. The *First Report* contains recommendations for improved long-range planning by the federal agencies, as well as the development of a National Strategic Spectrum Plan.<sup>44</sup> The *First Report* also encourages the FCC to adopt similar long-range planning processes to allow structured evaluation and timely deployment of newly evolving spectrum dependent technologies.

The separate plans of federal agencies and those of state, regional, and local agencies, and the private sector as outlined by the FCC, should be harmonized and coordinated. This would ensure that both the federal government and non-federal frameworks for spectrum complement each other.

#### **Recommendation 9. Identify and Address Unsatisfied Spectrum Requirements for Public Safety**

(a) **Identify Unsatisfied Spectrum Requirements.** NTIA, in conjunction with the FCC, DHS, officials from regional, state, and local governments, and representatives from the private-sector public safety community should inventory spectrum use by the public safety community: identify the major public safety requirements for spectrum-dependent services that are not being satisfied by facilities owned and operated by regional, state, and local government agencies; and determine if current spectrum use is efficient and identify ways to make public safety use more effective.

(b) **Develop a Federal/Non-Federal Public Safety Demonstration Program.** NTIA should examine the feasibility of sharing spectrum among commercial, federal and local public safety, and critical infrastructure applications, including the possibility of leasing services. NTIA should develop and implement one or more demonstration programs

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<sup>44</sup> See, *First Report*, supra note 11 (discussion of Recommendations 5, 6 and 9).



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to test the operational and cost effectiveness of sharing spectrum and communications infrastructure between federal, state, and/or local governments and private users.

(c) **Address Public Safety Spectrum Shortage, Interference, New Technology and Security Issues.** Based on the results of the examination in (a), DHS, in coordination with NTIA, the FCC, regional, state, and local governments, and representatives from the private-sector public safety community, should develop a comprehensive plan to address the fragmentation, shortage, interference, and security issues related to communication spectrum used by the public safety community.

### *Rationale*

Many public safety and first responder groups face communication and interoperability challenges. It is an important first step to inventory public safety spectrum use, determine what needs are not being met, and identify ways to make public safety spectrum use more efficient. A coordinated plan to address the fragmentation, shortage, interference, and security issues identified through the inven-

tory will allow the public safety community, federal and non-federal, to reach interoperable solutions. These challenges include constraints on the ability to expand existing systems as well as the ability to deploy new broadband technologies. Because federal public-safety agencies and their state and local counterparts often rely on similar technologies operating in adjacent or near-adjacent bands, there may be the potential for increased sharing across federal and non-federal bands.

Beyond frequency sharing, there may also be opportunities for federal, state, and local public safety entities to construct shared systems. By pooling spectrum, fiscal, and technical resources, these public safety entities may realize significant efficiencies. Such shared systems may be expanded beyond governmental entities to include private-sector entities with critical infrastructure protection responsibilities. The FCC has authorized several systems around the country that operate on both non-federal government public safety and critical infrastructure frequencies. Expanding these systems to include federal government public-safety frequencies could increase the efficiencies gained.

**APPENDIX A – PRESIDENT’S  
MEMORANDUM AND FACT  
SHEET**



For Immediate Release  
Office of the Press Secretary  
June 5, 2003

## **Presidential Memo on Spectrum Policy**

Memorandum for the Heads of Executive Departments and Agencies

Subject: Spectrum Policy for the 21st Century

The radio frequency spectrum is a vital and limited national resource. Spectrum contributes to significant technological innovation, job creation, and economic growth, and it enables military operations, communications among first responders to natural disasters and terrorist attacks, and scientific discovery.

Recent years have witnessed an explosion of spectrum-based technologies and uses of wireless voice and data communications systems by businesses, consumers, and Government. Today there are over 140 million wireless phone customers and, increasingly, businesses and consumers are installing systems that use unlicensed spectrum to allow wireless data, called Wireless Fidelity (WiFi), on their premises. The Federal Government makes extensive use of spectrum for radars, communications, geolocation/navigation, space operations, and other national and homeland security needs. We must unlock the economic value and entrepreneurial potential of U.S. spectrum assets while ensuring that sufficient spectrum is available to support critical Government functions.

The existing legal and policy framework for spectrum management has not kept pace with the dramatic changes in technology and spectrum use. Under the existing framework, the Government generally reviews every change in spectrum use, a process that is often slow and inflexible, and can discourage the introduction of new technology. Some spectrum users, including Government agencies, maintain that the existing spectrum process is insufficiently responsive to the need to protect current critical uses.

My Administration is committed to promoting the development and implementation of a U.S. spectrum policy for the 21st century that will: (a) foster economic growth; (b) ensure our national and homeland security; (c) maintain U.S. global leadership in communications technology development and services; and (d) satisfy other vital U.S. needs in areas such as public safety, scientific research, Federal transportation infrastructure, and law enforcement. My Administration has already proposed several legislative changes or program initiatives to improve elements of the spectrum management process. These proposals would greatly enhance the Government's ability to efficiently manage spectrum. To further promote the development and implementation of a U.S. spectrum policy for the 21st century, I hereby direct the following:

Section 1. Establishment. There is established the "Spectrum Policy Initiative" (the "Initiative") that shall consist of activities to develop recommendations for improving spectrum management policies and procedures for the Federal Government and to address State, local, and private spectrum use. The Secretary of Commerce shall chair and direct the work of the Initiative. The Initiative shall consist of two courses of spectrum-related activity: (a) an interagency task force that is created by section 3 of this memorandum; and (b) a series of public meetings consistent with section 4 of this memorandum. The interagency task force and the public meetings shall be convened under the auspices of the Department of Commerce and used by the Department to develop spectrum management reform proposals.

Sec. 2. Mission and Goals. The Initiative shall undertake a comprehensive review of spectrum management policies (including any relevant recommendations and findings of the study conducted pursuant to section 214 of the E-Government Act of 2002) with the objective of identifying recommendations for revising policies and procedures to promote more efficient and beneficial use of spectrum without harmful interference to critical incumbent users. The Department of Commerce shall prepare legislative and other recommendations to:

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- (a) facilitate a modernized and improved spectrum management system;
  - (b) facilitate policy changes to create incentives for more efficient and beneficial use of spectrum and to provide a higher degree of predictability and certainty in the spectrum management process as it applies to incumbent users;
  - (c) develop policy tools to streamline the deployment of new and expanded services and technologies, while preserving national security, homeland security, and public safety, and encouraging scientific research; and
  - (d) develop means to address the critical spectrum needs of national security, homeland security, public safety, Federal transportation infrastructure, and science.

Sec. 3. Federal Government Spectrum Task Force. There is hereby established the Federal Government Spectrum Task Force (the "Task Force") to focus on improving spectrum management policies and procedures to stimulate more efficient and beneficial use of Government spectrum. The Secretary of Commerce, or the Secretary's designee under this section, shall serve as Chairman of the Task Force.

(a) Membership of the Task Force. The Task Force shall consist exclusively of the heads of the executive branch departments, agencies, and offices listed below:

- (1) the Department of State;
- (2) the Department of the Treasury;
- (3) the Department of Defense;
- (4) the Department of Justice;
- (5) the Department of the Interior;
- (6) the Department of Agriculture;
- (7) the Department of Commerce;
- (8) the Department of Transportation;
- (9) the Department of Energy;
- (10) the Department of Homeland Security;
- (11) the National Aeronautics and Space Administration;
- (12) the Office of Management and Budget;
- (13) the Office of Science and Technology Policy;
- (14) such other executive branch departments, agencies, or offices as the Chairman of the Task Force may designate; and
- (15) subject to the authority of the Director of the Office of Management and Budget, the Office of Project SAFECOM.

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A member of the Task Force may designate, to perform the Task Force functions of the member, any person who is a part of the member's department, agency, or office, and who is a full-time officer or employee of the Federal Government.

(b) Functions of the Task Force. The functions of the Task Force are advisory and shall include, but are not limited to, producing a detailed set of recommendations for improving spectrum management policies and procedures to stimulate more efficient and beneficial use of spectrum by the Federal Government. The recommendations shall be consistent with the objectives set out in section 2 of this memorandum. The Task Force may hold meetings to obtain information and advice concerning spectrum policy from individuals in a manner that seeks their individual advice and does not involve collective judgment or consensus advice or deliberation. At the direction of the Chairman, the Task Force may establish subgroups consisting exclusively of Task Force members or their designees under this section, as appropriate.

Sec. 4. Recommendations to Address State, Local, and Private Spectrum Use. Consistent with the objectives set out in section 2 of this memorandum, the Department of Commerce, separately from the Task Force process, shall, in accordance with applicable law, conduct public meetings that will assist with that Department's development of a detailed set of recommendations for improving policies and procedures for use of spectrum by State and local governments and the private sector, as well as the spectrum management process as a whole. These meetings will involve public events to provide an opportunity for the input of the communications industry and other interested parties. Participants may include spectrum users, wireless equipment vendors, financial and industry analysts, economists, technologists, and consumer groups. Interested Federal, State,

and local government agencies will be welcome to attend and participate. The Federal Communications Commission is also encouraged to participate in these activities and to provide input to the National Telecommunications and Information Administration at the Department of Commerce on these issues.

Sec. 5. Reports. The Secretary of Commerce, or the Secretary's designee, shall present to me, through the Assistant to the President for Economic Policy and Director of the National Economic Council and the Assistant to the President for National Security Affairs, in consultation with the Assistant to the President for Homeland Security, two separate reports no later than 1 year from the date of this memorandum, one of which shall contain recommendations developed under section 3 of this memorandum by the Task Force and the other containing recommendations developed under section 4.

Sec. 6. General Provisions.

(a) The heads of Federal Government departments and agencies shall assist the Chairman of the Task Force established by section 3 and provide information to the Task Force consistent with applicable law as may be necessary to carry out the functions of the Task Force. Each Federal department and agency shall bear its own expense for participating in the Task Force. To the extent permitted by law and within existing appropriations, the Department of Commerce shall provide funding and administrative support for the Task Force.

(b) Nothing in this memorandum shall be construed to impair or otherwise affect the functions of the Director of the Office of Management and Budget relating to budget, administrative, or legislative proposals.

Sec. 7. Judicial Review. This memorandum is intended only to improve the internal management of the Federal Government and is not intended to, and does not, create any right or benefit, substantive or procedural, enforceable at law or equity by a party against the United States, its departments, agencies, instrumentalities or entities, its officers or employees, or any other person. Sec. 8. Publication. The Secretary of Commerce is authorized and directed to publish this memorandum in the Federal Register.

GEORGE W. BUSH

## Fact Sheet on Spectrum Management

### Taking Action to Improve Spectrum Management

#### Presidential Action

- President Bush signed an Executive Memorandum creating the Spectrum Policy Initiative to develop recommendations for improving spectrum management policies and procedures.
- The Department of Commerce will chair the Initiative.
- The purpose of the Initiative is to promote the development and implementation of a U.S. spectrum policy that will foster economic growth; ensure our national and homeland security; maintain U.S. global leadership in communications technology development and services; and satisfy other vital U.S. needs in areas such as public safety, scientific research, federal transportation infrastructure, and law enforcement.
- The existing legal and policy framework for spectrum management has not kept pace with the dramatic changes in technology and spectrum use. The Spectrum Initiative will help develop a U.S. spectrum policy for the 21st century.

#### The Importance of Spectrum

- Spectrum contributes to significant innovation, job creation, and economic growth. It is vital to scientific discovery and technological advances. It is critical to the ability of first responders to react to natural disasters and terrorist attacks and essential to the military's ability to fulfill its mission of protecting our nation.
- Recent years have witnessed enormous growth in spectrum-based technologies and uses of wireless voice and data communications systems by businesses, consumers, and government. Today, there are more than 140 million wireless phone customers and, increasingly, businesses and consumers are installing WiFi systems to allow wireless computing on their premises.
- The federal government makes extensive use of spectrum for radars, communications, geolocation/navigation, space operations, and other national and homeland security priorities.

#### How the Initiative Will Work

- The Initiative is comprised of two activities:
  1. The Federal Spectrum Task Force will produce a set of recommendations for improving spectrum management policies and procedures to increase the efficiency and beneficial use of spectrum by the federal government.
  2. The Department of Commerce will hold a series of public meetings to assist in its development of a set of recommendations for improving policies and procedures for use of spectrum by state and local governments and the private sector.
- Within one year, the Secretary of Commerce will provide the President recommendations to:
  - Facilitate a modernized and improved spectrum management system;
  - Facilitate policy changes to create incentives to increase the efficiency and beneficial use of spectrum and to provide a higher degree of predictability and certainty in the spectrum management process;

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- Develop policy tools to streamline the deployment of new and expanded services and technologies, while preserving national security, homeland security, public safety, and encouraging scientific research; and
  - Develop means to address the critical spectrum needs of national security, homeland security, public safety, federal transportation infrastructure, and science.

### **Building on a Foundation of Success**

While the Initiative will facilitate improvements in spectrum management, the Administration has achieved significant successes within the current system.

- The Administration has identified new spectrum for advanced third generation (3G) wireless services and technologies for consumers. In July 2002, the Department of Commerce released a plan in concert with the Federal Communications Commission (FCC) and the Department of Defense to make 90 MHz of spectrum available in the future for 3G wireless services while accommodating critically important spectrum requirements for national security.
- The Administration has identified how to make available additional spectrum at 5 GHz for wireless data communications, called Wireless Fidelity (WiFi). The Department of Commerce reached an agreement in February 2003 with the private sector and the Department of Defense on a technical solution that the United States is now able to present in international spectrum discussions.
- The Administration, in conjunction with the FCC, approved the use of ultrawideband (UWB) technology, which enables broadband connections and assists in the performance of critical safety services. During 2002, the Department of Commerce worked closely with the FCC to authorize mechanisms to accommodate UWB wireless technology without causing serious impact to critical radio communications services.
- The Administration has proposed several legislative changes and program initiatives to improve the spectrum management process, including: (1) providing the FCC with new authority to set user fees on unauctioned spectrum licenses; and (2) creating a Spectrum Relocation Fund to streamline the process for reimbursing government users, facilitate their relocation, and provide greater certainty to auction bidders and incumbents.

**APPENDIX B – QUICK LOOK:  
RECOMMENDATIONS FROM  
STATE AND LOCAL  
GOVERNMENTS AND PRIVATE  
SECTOR RESPONDERS**



**RECOMMENDATIONS FROM STATE AND LOCAL GOVERNMENTS AND PRIVATE SECTOR RESPONDERS FOR IMPROVING SPECTRUM MANAGEMENT POLICIES**

<b>FACILITATE A MODERNIZED &amp; IMPROVED SPECTRUM MANAGEMENT SYSTEM</b>	<b>Action Agencies</b>
<ol style="list-style-type: none"> <li>1. <b>Spectrum Management Advisory Committee</b> – Establish an advisory committee of representatives from state, regional and local sectors, industry, academia, and consumer groups along with an invitation to the FCC to advise the Assistant Secretary for Communications and Information, Department of Commerce on needed reforms to spectrum policies and management to enable introduction of new spectrum dependant technologies and services including expediting America’s access to broadband services</li> <li>2. <b>International Spectrum Management Policies</b>– Coordinate and review international spectrum policy and framework and improve U.S. processes for WRC.</li> <li>3. <b>Spectrum Management Tools for Coordinating New Services and Managing Interference</b> – Develop spectrum management tools that will reduce the coordination time for new spectrum uses with incumbents and perform analysis of potential interference interactions; and promote their use.</li> <li>4. <b>Spectrum Management Training</b> – Develop effective spectrum management training programs and a broad range of materials for use by all spectrum managers.</li> </ol>	<ol style="list-style-type: none"> <li>1. NTIA, FCC &amp; Federal Agencies</li> <li>2. NTIA, FCC, Federal Agencies, &amp; Industry</li> <li>3. NTIA, FCC, Federal Agencies, &amp; Industry</li> <li>4. NTIA, FCC, Federal Agencies, &amp; Industry</li> </ol>
<b>CREATE INCENTIVES FOR MORE EFFICIENT &amp; BENEFICIAL USE OF SPECTRUM &amp; POLICIES INCREASING PREDICTABILITY &amp; CERTAINTY FOR INCUMBENT SPECTRUM USERS</b>	<b>Action Agencies</b>
<ol style="list-style-type: none"> <li>5. <b>Economic and Efficiency Incentives</b> – Encourage Congress to enact legislation to provide FCC permanent auction authority and collect fees for spectrum use; to establish incentives for spectrum efficiency; and to establish spectrum relocation fund. Using this authority, develop increased economic incentives for spectrum efficiency and expand application of secondary markets across services. Examine spectrum rights through the rulemaking process as a means to encourage the deployment of spectrally efficient technologies.</li> </ol>	<ol style="list-style-type: none"> <li>5. Congress, Administration, NTIA, and FCC</li> </ol>
<b>DEVELOP POLICY TOOLS TO STREAMLINE DEPLOYMENT OF NEW &amp; EXPANDED SERVICES &amp; TECHNOLOGIES WHILE PRESERVING NATIONAL &amp; HOMELAND SECURITY &amp; PUBLIC SAFETY, &amp; ENCOURAGING RESEARCH</b>	<b>Action Agencies</b>
<ol style="list-style-type: none"> <li>6. <b>Emerging Technologies and Innovation</b> – Develop improved approaches for assessing the potential impact of emerging technologies; develop a plan to increase sharing of spectrum between federal government and non-federal government users; and establish a pilot program to allow sharing of two 10 MHz segments of spectrum and provide reports outlining the results of the pilot.</li> <li>7. <b>Information Technology to Modernize Spectrum Management</b> – promote advanced information technology (IT) capabilities that would replace existing manual procedures used in the coordination and licensing processes to make these processes more timely.</li> </ol>	<ol style="list-style-type: none"> <li>6. NTIA, Federal Government Laboratories, &amp; Industry</li> <li>7. NTIA and FCC</li> </ol>
<b>MEET CRITICAL SPECTRUM NEEDS: NATIONAL &amp; HOMELAND SECURITY, PUBLIC SAFETY, FEDERAL TRANSPORTATION INFRASTRUCTURE, &amp; SCIENCE</b>	<b>Action Agencies</b>
<ol style="list-style-type: none"> <li>8. <b>Long-Range Spectrum Planning</b> – Encourage state, regional, and local government agencies to establish long-range spectrum planning processes and to take into account the federal long-range plans.</li> <li>9. <b>Unsatisfied Spectrum Requirements for Public Safety</b> – Inventory public safety spectrum use, identify and address the major requirements for spectrum dependent services that are not being satisfied, determine spectrum efficiency and ways to make public safety more effective, and develop a federal/non-federal public safety demonstration program to test operational and cost effectiveness of sharing spectrum and communication infrastructure.</li> </ol>	<ol style="list-style-type: none"> <li>8. NTIA and State, Regional and Local Government Agencies</li> <li>9. NTIA, FCC, DHS, and State, Regional, Local Government Agencies</li> </ol>