



Saving Lives and Property Through Improved Interoperability

***Spectrum Issues and Analysis Report –
National Telecommunications and
Information Administration (NTIA)
Spectrum Summit***

FINAL

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EXECUTIVE SUMMARY

This report provides an analytical review of the National Telecommunications and Information Administration (NTIA) Spectrum Summit, conducted April 4–5, 2002, in Washington, DC. The purpose of the summit was to “explore new ideas to develop and implement spectrum policy and management approaches that will make more efficient use of the spectrum; provide spectrum for new technologies; and improve the effectiveness of domestic and international spectrum management processes.” The summit was open to the public.

The agenda included Secretary of Commerce, Donald L. Evans as the keynote speaker, remarks by Michael K. Powell, Chairman of the Federal Communications Commission (FCC), and Nancy J. Victory, Assistant Secretary for Communications and Information and NTIA Administrator, followed by six separate panel sessions. The panel session discussions covered—

- (1) Views From Spectrum Users
- (2) Views From Economists and Analysts
- (3) Views From Technologists and Futurists
- (4) Spectrum Efficiency and New Technologies
- (5) Spectrum Management Issues
- (6) International Issues.

Discussions specifically focused on the current capabilities and methodologies in spectrum applications and management, and then addressed the need or potential for change.

The spectrum summit was designed as a first step for initiating a working dialog among all spectrum users and the federal regulatory agencies responsible for the management and control of spectrum resources (i.e., NTIA and FCC). Although the summit actually generated more questions than answers, it did provide an effective venue for identifying the issues, perspectives, and concerns of a broad array of users dependent on access to, and the application of, national spectrum resources. The participants highlighted how the inflexibility of current spectrum policy and management is contrary to the flexibility being provided by evolving technical capabilities. In addition, participants also saw flexibility in user authority and management of the spectrum as instrumental in achieving improved spectrum efficiencies, sharing, and use. There was also a strong inclination expressed by most summit participants to allow market forces to play a larger role in influencing and impacting overall spectrum management, policy, and procedures. Participants saw market influences as capable of providing the greatest incentives for continued modernization in spectrum-dependent systems. This report also captures other salient information and content derived from the panel discussions.

The NTIA Spectrum Summit reinforced the perception that change is necessary within current national spectrum management, policy, and processes. The NTIA and FCC recognize this fact and are making a sincere effort to initiate dialog and solicit ideas and proposals from all spectrum users to effect appropriate change. This report captures and comments on the salient information derived from the summit panel discussions and establishes a foundation for understanding the issues and perspectives now under review by the NTIA and FCC. Because further dialog will continue with the NTIA and FCC on these issue(s), spectrum users must remain engaged in the process to articulate and advocate management changes that will support and protect their future interests, access, and use of national spectrum resources.

1. INTRODUCTION

With the relatively recent explosion of new wireless applications being made available in the market today, society is facing a new era in potential modernization that could rival achievements made during the previous industrial and automation revolutions. New wireless methodologies promise to provide connection, detection, information, instruction, communication, convenience, and economy—all at a level far above that previously achievable under hard-wired technology. Wireless applications have essentially eliminated many of the functional distinctions and limitations previously associated with fixed and mobile applications. The worlds of business, entertainment, communication, and research are now accessible down to the individual level, anytime, anywhere. Because wireless implementation is not dependent on traditional physical infrastructures for support, new capabilities can also be fielded, expanded, and networked much more quickly. The ease of implementation has even allowed third-world and rural areas, which had been devoid of many modern services due to a lack of physical infrastructure, to rapidly acquire 21st century capabilities in months rather than decades. However, today's wireless applications do possess one critical limitation—their service capabilities are totally dependent on appropriate spectrum access. The ability to acquire that spectrum access is becoming increasingly difficult under current national spectrum management policies and procedures for its use.

The greatest challenge for spectrum management within the United States is that it has not evolved in its ability to consistently support the realities of capability and demand in today's technical and operational environment. In essence, technical capability and associated service demand is unnecessarily constrained by the outdated processes and controls of traditional spectrum management. As technology continues to improve, fueling an ever-expanding demand for improved service capabilities, the demand for spectrum access will also dramatically increase. To keep pace with demand, a cooperative and proactive engagement by both federal and commercial activities will be necessary to change the traditional paradigms associated with the use and management of the Nation's spectrum resources. In recognition of this situation, the National Telecommunications and Information Administration (NTIA) hosted a summit on April 4-5, 2002, in Washington DC, to help identify the best solutions to the challenges posed by the current management practices applied to the Nation's airwaves.

This report offers a detailed recapitulation of all the issues, ideas, and proposals discussed throughout the NTIA Summit. The report then presents a distillation of the summit content to assess the merits and potential of each issue, idea, and/or proposal for the future of spectrum management and users. Conclusions are then drawn that identify the potential for new and innovative approaches that should be pursued for achieving improved spectrum management and processes in allocation, efficiency, and effectiveness within the overall national arena.

2. SUMMIT RESULTS AND ANALYSIS

The spectrum summit was an important first step for initiating a working dialog among all spectrum users and the federal agencies (i.e., NTIA and FCC) responsible for the management and control of this vital resource. It highlighted the fact that spectrum as a national resource should be dedicated to the service of providing security and support to the public. Public security and support are multifaceted and include economic security, homeland security and national security, as well as serving government, commercial and private interests. To accomplish this effectively, spectrum management and policy need to evolve in their ability to consistently meet the needs and requirements of the people, commensurate with the demands and technical capabilities of the time. However, the spectrum summit highlighted that national spectrum management has not kept pace with the evolutionary demands of modern society. Changes are needed in both spectrum management process and policy to effectively support the growth and vital interests of the Nation.

2.1 Policy

It was widely recognized throughout the summit that current national spectrum policy was insufficient in its ability to support the modern spectrum demands, capabilities, applications, and growth prevalent in today's society. "Policy," within the context of this report summary, is inclusive of or a derivative of the current spectrum allocation, planning, management, and regulatory processes. Based in the Communications Act of 1934, spectrum management authority, control, and processes have changed little since its enactment, despite a parallel revolution in spectrum-dependent services, capabilities, and demand. To date, a national strategic plan that identifies and balances the requirements and use of spectrum within the national arena still does not exist. The availability at the national level of an accurate database of current spectrum uses and licenses is also questionable. Several summit attendees pointed out that without a centralized plan and established methodology for gathering and updating spectrum use at the national level, the ability to make the best and most responsive plans and decisions regarding national spectrum applications was compromised.

The overall outdated and inflexible nature of current spectrum management policy drew the most comments from all the summit panelists and attendees. Again, these problems are a direct result of processes and perspectives dating back to the Communications Act of 1934. At that time, the ability to provide adequate protection and control of the spectrum was dependent on the approval and enforcement of rigid guidelines and standards that dictated the specific performance capabilities allowable for spectrum-dependent systems. This suited the applications of the day because most equipment was single service oriented and hardware limited in its construction and capabilities. In addition, spectrum use was not generally problematic in its availability in the required amounts, based on the predominant management criteria used involving power, time, and geographic limitations. The spectrum-dependent systems and applications of today, however, are much more dynamically capable and complicated. Summit panelists and attendees felt that the multiple service and broad operational capabilities made possible by today's technology in spectrum-dependent systems were effectively being stifled by outdated spectrum management policies and control. Current spectrum management is based on the outdated thresholds of time, geography, service, modulation, frequency band, and others. These types of measurement criteria no longer provide any added value for overall spectrum control except to reduce the spectrum access, flexibility, and possible application of modern state-of-the-art systems. The ability to effectively field and employ modern spectrum-dependent

systems, both those available now and in the future, depends on improving the flexibility of spectrum use now possible within national spectrum management and policy.

Current management policies also define, establish, and support many processing requirements and guidelines that detract from effective user exploitation of national spectrum resources. The processing for allocation and assignment authority on new systems or capabilities is protracted, unresponsive, and fragmented within a myriad of bureaucratic management levels and reviews. Once allocations and assignments are made, they are permanent, requiring a repeat of the authorization process to permit any changes in the system's use of spectrum, its performance parameters, or service. This inflexibility, which hampers independent user spectrum management despite users' understanding of the limitations on frequency band use and responsibilities for noninterference, has discouraged potential user initiatives to pursue improvements in system capabilities, provide "in-demand" service, and coordinate potential spectrum sharing with other users. In addition, summit participants believed that a level playing field did not exist for all users in the areas of spectrum access and standards, especially between federal and nonfederal users. Despite the focus of public policy on the highest and best use of the spectrum, all too often the decisions for spectrum allocation and use have been influenced by money and politics. It was suggested that the development of spectrum user "rights," similar to property rights, would provide users more latitude in their effective management and use of the spectrum, and enhance the ability to protect and enforce rules regarding its use.

2.2 Economy

Economy was a factor of great interest to the summit participants and surfaced in almost all major issues under discussion. Although a separate issue from policy, it is a direct product or capability derived from effective spectrum policy and management. It encompasses both the concepts of efficiency and modernization, which were important concerns targeted by the summit for improvement and support.

The summit participants almost universally believed that a stronger market-oriented approach must be incorporated into the overall spectrum management process. Because, in general, the market is more prone to self-regulation based on the commercial forces of supply and demand, participants believed that industry would be more reactive and flexible in satisfying current or projected market needs in spectrum availability, efficiency, and use. Spectrum would become more of a real-time commodity in support of real-time user demands and applications. Ultimate control of the resource could still rest at the national level, but policies governing its application could be based in approaches potentially as simple as "use it or lose it."

It was also noted at the summit that market forces traditionally provided the greatest incentives for modernization and efficiency. As a market commodity, spectrum use would be routinely considered in light of its capability, efficiency (either existing or that achievable through system upgrades/modernization), and other alternative approaches or competitive applications. Participants speculated that, no matter what the result, the decision to use or not use a spectrum-dependent application would be made in accordance with the highest and best return possible. Although this would not guarantee continuous modernization of spectrum-dependent systems or optimized efficiency in spectrum use, it would, at a minimum, involve a review and consideration of those parameters—a review and consideration not currently performed in support of national level authorizations and decisions. In addition, it was suggested that spectrum could be better used if users were allowed to take advantage of the secondary

market potential for spectrum. By allowing users to sell or grant access to excess capacity in their licensed spectrum, more efficient use could be achieved across a broader user base.

The use of spectrum auctions within the overall spectrum management process was viewed favorably by most summit participants, but recognized as a method that did not ensure spectrum efficiency. Auctions only provided the “incentive” for the winning vendor to maximize application and use of the spectrum based on prevailing market requirements and cost. In addition, vendor incentives for auction capital recovery and profit maximization could result in vendor concentration of spectrum applications within high-density metropolitan areas. Based on the market value of spectrum, rural infrastructure investment and modernization could easily become cost prohibitive. This led to the suggestion that different rules and auction parameters might be required to level the playing field between urban and rural spectrum applications. Participants also viewed better use of auction proceeds as important because proceeds could be applied to stimulate more effective and efficient use of national spectrum resources. Instead of depositing the proceeds as a government budget offset, the proceeds would be better applied toward the modernization of spectrum-dependent infrastructures or as appropriate compensation for relocated spectrum users and applications.

3. CONCLUSIONS

The NTIA Spectrum Summit vividly reinforced the perception that change is necessary within current national spectrum management, policy, and processes. On the positive side, the NTIA and FCC recognize this fact, and are making a sincere effort to initiate a dialog and solicit ideas and proposals from all spectrum users to effect appropriate change. Although the summit actually generated more questions than answers, it did serve as an important first step in identifying the issues, perspectives, and concerns of a broad array of users dependent on access to, and the application of, national spectrum resources.

In general, the rigidity of current spectrum policy and management hinders consideration and review of the potential flexibility provided by evolving technical capabilities. Change however, cannot be predicated solely on the merits of either technology or policy, because technology and policy are not independent solution paths. Policy can elicit technical innovation and applications, while technical innovation can allow policy and procedural options. In addition, both technology and policy directly support economy, and as a consequence must work in concert with each other to satisfy the best interests of the Nation. Any changes in current spectrum policy and management must balance the status quo, demand, and requirements—what can be done, and what should be done. The key is to incorporate and/or accommodate the element of flexibility within the broader constraints of policy, capability, and control. The need for flexibility was an important underlying requirement in every issue discussed at the summit. Technology can (or will) provide flexibility—it is characteristic of demand, applications depend on it, it supports efficiency, it enhances predictability, and it allows for avenues of negotiation and accommodation. Current spectrum policy and management must embrace the concept to simplify its own guidance and procedures, and to work toward embedding flexibility as a responsibility of spectrum users within constraints that protect broader national control and interests.

There was also a strong inclination expressed by most summit participants to allow market forces to play a larger role in influencing and impacting overall spectrum management, policy, and procedures. The dynamics of the market place are more ideally suited to effectively respond to the dynamics of spectrum requirements, applications, and demand than typical bureaucratic government management. Although there is and should be a portion of the spectrum dedicated to and protected for exclusive use (both federal and nonfederal), the majority of the spectrum is in direct support of commercial applications. Market-driven forces also provide the best long-term incentives for modernization improvements and efficiency in spectrum applications. Views were unanimous in advocating that capital derived from the market, such as that from spectrum auctions, should be reapplied to the market to support broader modernization and user relocation efforts.

4. SUMMIT DETAILS w/TABLES

The NTIA hosted a spectrum summit on April 4–5, 2002, in Washington DC, to help identify the best solutions to the challenges posed by current management practices applied to the Nation’s airwaves. To that effect, key leaders in both government and industry were invited to participate in open discussion on a variety of critical spectrum issue areas.

The advertised purpose of the NTIA summit was to “explore new ideas to develop and implement spectrum policy and management approaches that will make more efficient use of the spectrum; provide spectrum for new technologies; and improve the effectiveness of domestic and international spectrum management processes.” Throughout the 2 days of the summit, a series of keynote speeches and panel sessions were conducted to fuel discussion within four main areas of interest (1) spectrum allocation and planning, (2) spectrum efficiency, (3) spectrum for new technologies, and (4) spectrum management policy and regulatory processes. Appendix A of this report contains a listing of the distinguished keynote speakers, panel session topics, and associated panel members.

The agenda of the summit consisted of introductory comments, a keynote speaker and remarks, followed by six separate panel sessions encompassing special views and topics related to spectrum areas of interest. Appendix B contains a copy of the agenda. Discussions were intended to specifically focus on the current capabilities and methodologies in spectrum applications and management, and then address the need or potential for change in order to improve the development, use, processing, efficiency, and control of applications requiring the use of the electromagnetic spectrum in the future.

4.1 Keynote Speaker and Remarks

The keynote speaker, Department of Commerce Secretary, Donald L. Evans, provided the opening presentation for the summit. He emphasized the importance of spectrum in support of “security,” which encompassed the three distinct and equally important areas of economic security, homeland security, and national security. Noting that since the 1990s, more than two-thirds of the United States’ economic growth was technology related, Secretary Evans pointed out that the United States wanted and needed to remain a leader in new technology. Closing the door on new technology was not an option, and spectrum was a critical enabler for both sustaining and expanding that technological growth. He also pointed out that 90 percent of the technical and commercial use was in 10 percent of the available spectrum (spectrum under 3 GHz). Of this highly used spectrum area, he stated that 13 percent was designated for exclusive government use, 30 percent for exclusive commercial use, and the rest for shared use between the two. More can and should be done to effectively exploit other areas of the spectrum. While still taking into consideration how other countries’ use the spectrum, the United States must improve the efficiency, planning, and management of its spectrum, while eliminating the unnecessary and unduly complicated processes for licensing technology in the use of spectrum.

Michael K. Powell, Chairman of the FCC, and Nancy J. Victory, Assistant Secretary of Commerce for Communications and Information and NTIA Administrator, provided follow-on remarks to the keynote speaker. They established the tone and expectations for the summit by emphasizing that the improvement of spectrum management would be a multifaceted undertaking, and that it was in the best interest of the public to pursue that goal. To accomplish

change, and in effect, improvement, would take a cooperative and coordinated effort among industry, the NTIA, and the FCC. They expected that greater emphasis would have to be placed on the use of market mechanisms. The politics associated with spectrum allocations, the conduct of auctions, and the potential for unlicensed spectrum use were just a few of the many facets that should play into any management consideration and change. It would also take a greater understanding of new and existing technologies, and their associated efficiencies and operational implications. Both believed in the strong enforcement of standards, but left the question as to where and how to set limits. They said that the results of the follow-on panel sessions would be studied and considered cooperatively by both the FCC and NTIA to effect change in the most expedient manner and best interest of the Government, industry, and the Nation as a whole.

4.2 Panel Discussions

Panel sessions were conducted by fielding specific questions that were germane to the session topic, soliciting panelists' responses, and then opening the discussion up for further audience questioning and participation. The following sections represent an abbreviated capture of the salient information derived from the questions and responses articulated at each session.

4.2.1 Panel Session 1, Views From Spectrum Users

The intent of this panel session was to solicit perspectives from panel and audience participants on spectrum management from a typical user's standpoint. No attempt was made to focus on any particular spectrum usage or user technical discipline or application.

Questions	Responses
<p>With the increased pace in new technology and innovation, how can the allocation process change to support the fielding of technology?</p>	<ul style="list-style-type: none"> • Why should first-, second-, and third-generation cellular technology have to coexist within the spectrum; shouldn't one replace the other based on improvement and service? • TV is the only industry that has given up spectrum; they are doing their part. • The power industry depends on proven technology; that concept may preclude early application of newer technologies until reliability is demonstrated. • Most of the spectrum, in most of the places, most of the time is not being used; cognitive radios could exploit this situation for better use of the spectrum. • The pace of technology exceeds the ability to sufficiently model and test for impact; it takes time to obtain the facts needed to make the appropriate decisions. • Public policy tries to focus on the highest and best use of spectrum, but all too often, the use of the spectrum is unduly influenced by the highest dollar interests.

Questions	Responses
<p>How do we effectively do future spectrum planning given the absence of knowledge on new or imming technologies?</p>	<ul style="list-style-type: none"> • Look macroscopically at the whole spectrum, including adjacent band compatibility. • The larger question is what will the demand for new technology be because that will drive spectrum requirements. <ul style="list-style-type: none"> – Industry can clearly describe both technology and demand. • Look to make improvements within existing allocations. • Based on society’s higher level of requirements such as security, safety, etc. • Need to level the playing field between users and make a decision on what is going to be government or commercial; the Government must make a decision. • Depend on free market forces. • Need to leverage commercial industry networks and investment. <ul style="list-style-type: none"> – Approach may not satisfy all needs. • Does everyone need “his or her own slice” of spectrum; what is the right balance between private, commercial, and government needs? • Where does the liability rest in sharing arrangements? <ul style="list-style-type: none"> – Need to quantify the risk involved when different constituencies have sharing arrangements; all or nothing partitioning is wasteful. • Planning is dependent on the “prediction” of need, technology, etc. <ul style="list-style-type: none"> – Need to build systems that can dynamically reorder and adjust as situations change. • What is the economic incentive for commercial systems to provide highly reliable systems that are predicated on spectrum?
<p>What can the government do to encourage spectrum efficiencies?</p>	<ul style="list-style-type: none"> • The FCC needs to take a harder stance on improving spectrum efficiencies. • Provide no protection for inefficiencies. • Provide subsidies that can be used to support upgrades. <ul style="list-style-type: none"> – Reapply money acquired from auctions. • Use panel process to select technologies and standards. • Ease policy issues that specify apply to the use and sharing of spectrum. • Overcome legislative hurdles (statutory laws) that dictate processes and uses that are outdated.
<p>How can the United States be more effective in the international arena?</p>	<ul style="list-style-type: none"> • Need a unanimous “U.S.” voice on issues. • Quit being the “rogue” nation that expects to be followed; recognize that we are not a leader in all areas.
<p>It is almost a given that relocation of spectrum use must occur if we are to harmonize use, share, etc.; how do we relocate?</p>	<ul style="list-style-type: none"> • Use auction proceeds to support relocation. • Establish firm clarity on the timing and conditions of relocation.

Questions	Responses
<p>What are your positive and negative views, and expected changes, on spectrum?</p>	<p>Positive</p> <ul style="list-style-type: none"> • FCC and NTIA recognition of problem. • FCC and NTIA cooperation on issue(s). • A dialog for change has started. • There is an openness for change. • Change will not be quick. • The digital rollout in most applications. • FCC and NTIA support on issue(s). <p>Negative</p> <ul style="list-style-type: none"> • U.S. carriers are at a disadvantage on spectrum use. • There are too many layered, bureaucratic spectrum processes. • Spectrum processes are unresponsive. • U.S. timing and bureaucracy in spectrum matters is poor. • There is a reluctance to sunset legacy systems. • The highest and best use of spectrum is driven by money. • Uncertainty in the overall spectrum process. • "Fortress USA" spectrum use mentality. • Inability to efficiently and effectively execute spectrum requirements. • Lack of effective spectrum enforcement. • The trauma of spectrum relocation. <p>Changes</p> <ul style="list-style-type: none"> • The use of more spectrum efficient technology. • Wireless application will grow. • Turn toward a broadband wireless world. • Increase in mobile information exchange and use. • User wireless control. • Government using more commercial spectrum/applications. • Change-out to digital TV sets. • Wireless connections to everything.

4.2.2 Panel Session 2, Views From Economists and Analysts

The objective of this panel session was to solicit inputs on spectrum management specifically from an economic and analyst's viewpoint. In this manner, perspectives on spectrum management could be expanded to include potential market influences and effects.

Questions	Responses
<p>What is the most appropriate framework for managing spectrum allocations?</p>	<ul style="list-style-type: none"> • Do not give spectrum away; the Government should maintain control; need to develop a “bundle of rights” that offers clarity on authority for spectrum use. • Market wants more predictability. • Airwaves are a national resource for the public benefit; need a hybrid model of management that levels the playing field between uses/users. • Allow more unlicensed use. • Treat spectrum more like property. • The Government gives out too many rights for spectrum; cartels form between users. • There is a need for better understanding of the obligations associated with spectrum licenses. • There is an important role for non-exclusive spectrum licenses. • Have to build in market incentives that drive the efficient use of spectrum. • Allow licensees to sell spectrum rights. • Allow new entrants to seize unused airwaves. • Have real property rights for exclusive use spectrum.
<p>Should spectrum auctions be a factor?</p>	<ul style="list-style-type: none"> • The value of spectrum is in the growth it creates. • Money is irrelevant. • Politicians love auctions, and politics drives spectrum management. • Separate spectrum politics and budget politics
<p>What drives a business or user to make efficient use of the spectrum?</p>	<ul style="list-style-type: none"> • Give the user the right to sell out and face the opportunity costs associated with spectrum use. • Licensees should be allowed to do anything with their spectrum as long as there is no interference; flexibility in licenses. • Use of secondary markets. • Charge all users, including government and public safety. • No need to harmonize spectrum. • Minimize overt political influence. • Keep financial community informed.
<p>What are the best and worst things the Government could do with regard to spectrum management in a market economy?</p>	<p>Best</p> <ul style="list-style-type: none"> • Minimize political influence. • Inform financial community of spectrum change projections. • Continue momentum created by this meeting. • Invoke a property rights approach to spectrum management. • Create a balanced policy between those that are using and expanding technical capabilities, and those that are researching and developing new innovative spectrum approaches. <p>Worst</p> <ul style="list-style-type: none"> • Not address the spectrum management problem.

4.2.3 Panel Session 3, Views From Technologists and Futurists

The objective of this panel session was to solicit inputs on spectrum management specifically from a technology and futuristic viewpoint. In this manner, perspectives on spectrum management could be expanded to include the potential effects of current and emerging technology, as well as expectations for the future.

Questions	Responses
What is the best approach to managing spectrum?	<ul style="list-style-type: none"> • Spectrum should become a real commodity on a real-time basis. • Create secondary markets for spectrum. • A quasi-property rights approach is best for allocations; assignments fall more into the auctioning process. • There is no single “best” model; dependent on different users and uses. • Dynamic sensing and use of spectrum is the future.
What is the vision for the future use of spectrum and technology?	<ul style="list-style-type: none"> • Software-definable operations and equipment; dynamic environmental adaptation and optimization. • Highly mobile and portable applications. • Evolution of the “personal cell”; personal allocation of spectrum. • One managing agency for spectrum. • “XG” systems that sniff out spectrum availability and use it; also adjust to environmental conditions such as frequency, power, modulation, direction, etc.
Once spectrum is allocated, how can we get it back?	<ul style="list-style-type: none"> • Provide money to move incumbents. • Provide comparable spectrum. • Develop receiver standards; will make more spectrum available within existing allocations. • In the future, do not specifically allocate spectrum uses.
What is the Government’s role in anticipating future spectrum needs?	<ul style="list-style-type: none"> • Do not anticipate the future; policy has to be flexible and dynamic. • Make predictions based on current use. • Keep to overarching policy and broad applications.

4.2.4 Panel Session 4, Spectrum Efficiency and New Technologies

The objective of this panel session was to solicit inputs on spectrum management specifically relating to new technologies and their potential for improved efficiencies and capability. In this manner, perspectives on spectrum management could be expanded to include the effects of emerging technology and how it might be used to improve spectrum applications, use, and efficiencies.

Questions	Responses
What should be the obligation of present or future technologists to instill or maintain spectrum efficiency, modernization, etc.?	<ul style="list-style-type: none"> • If you have spectrum, you must be obligated to use it and maximize efficiency. • What is the measure or definition of spectrum efficiency; will be different between users/uses. • Need market incentives that drive efficiency; must consider economic factors such as resources, cost, etc., and the competition. • Efficiency is self-regulating within the market. • A specific definition for efficiency is not possible due to too many influences and variables (i.e., economics, state of technology, critical use, etc.). • Efficiency can be improved by allowing more flexibility for use within the band and then letting the market drive the rest. • Need a guide to when and what to leave to the market forces. • Efficiency will always be a trade-off between modernization and the acquisition of more spectrum. • Need perspective of “use it or lose it” on spectrum; no banking of spectrum. • Need more flexibility in the “access” regimes to spectrum; reduce the

Questions	Responses
<p>What is your reaction to the overall spectrum management process?</p>	<p>“yours/mine” perspective and specificity in type of use.</p> <ul style="list-style-type: none"> • Have to learn too many sets of rules; work through too many bureaucratic levels. • There is not sufficient breadth of experience and expertise to perform accurate analysis. • Efficiencies only occur when they have to. • Constraints are what drive innovation and deployment initiatives. • Spectrum should not be owned or leased, but rented based on specific utilization. • Need a better definition of “harmful” interference; flexibility of operations can provide options within applications.
<p>Given the current command and control between the FCC and NTIA on spectrum policy, what can be done to improve the processes and policies of spectrum management in the short, mid, and long term?</p>	<ul style="list-style-type: none"> • Need to open the bidding process in the short term for spectrum-dependent services. • Need to better share NTIA (Government-specific) knowledge with the FCC. • Need a national spectrum strategy and associated policy that balances the uses and interests between Government and non-government activities, economy, national security, etc. • Need an accurate database of all spectrum uses and licenses. • There are two aspects to improvement, technology and the will to accomplish, • Need to develop a government center that jointly tests spectrum uses between all activities (government and non-government); all can participate,
<p>What can the Government do to better facilitate spectrum management processes?</p>	<ul style="list-style-type: none"> • The Government must make concrete and expeditious decisions; choose • Need more defined parameters on spectrum management and uses to foster predictability.
<p>What is the role of unlicensed spectrum; do we need more or less; has there been any significant harm or good with current use of unlicensed spectrum?</p>	<ul style="list-style-type: none"> • Unlicensed spectrum is needed to look at new technologies. • There has been no real harm from current unlicensed applications
<p>Should there be different policies for the management of spectrum between congested and uncongested spectrum areas (e.g., spectrum >3GHz)?</p>	<ul style="list-style-type: none"> • Yes, limits would force efficiencies in congested areas. • Efficiency is achieved through deprivation and/or requirement. • Should consider treating spectrum differently within urban and rural areas. • Maybe investment and growth in highly intensive spectral areas would be spurred if regulations were lifted.
<p>How should the government do spectrum planning; Are there any models available; 1, 5, 10- year plan?</p>	<ul style="list-style-type: none"> • Should concentrate on structural issues versus procedural. • Planning is questionable, or conversely predictive (i.e., we know what the outcome is— we need more spectrum). • Should concentrate on more flexible policies and processes. • Planning does not mean predicting. • Need more efficient decision-making. • Long-range plans should identify requirements, what is available, and options. • Need to consider the rest of the world. • Need to identify some systematic process for information gathering

Questions	Responses
	<p>that can be used to support planning and decisions.</p> <ul style="list-style-type: none"> • Need to incorporate risk analysis. • Need to review the appropriateness of current spectrum management measures or boundaries (i.e., time, geography, modulation, service, etc.).

4.2.5 Panel Session 5, Spectrum Management Issues

The objective of this panel session was to solicit inputs on spectrum management processes in general. It included specifically addressing the regulatory process and spectrum allocation and planning processes.

Questions	Responses
<p>How do we plan for the future spectrum use without identifiable uses?</p>	<ul style="list-style-type: none"> • Split commercial/non-commercial users. • Industry can shift and make change and provide higher value, service, and experimentation. • Difficult, when making decision, to determine which is more important—public safety or commercial. How do you evaluate these competing claims? • Planning for what end? Relocation or change of service rules? • Government developed SPS to look at new requirements • Difficult to plan for new technologies such as software defined radio (SDR) and far-future products being developed. • Focus has been on 3 GHz and below; higher spectrum should be looked at. • What are the broad trends? • What spectrum demands are decreasing? • Look at spectrum being vacated. • Plans are no good unless they are implemented • Public Safety Wireless Advisory Committee Report is good example of planning. • Public safety needs are similar to commercial. • Federal Government users require spectrum nationwide versus needs of state and local governments. • Public safety and Federal Government have unique requirements where no commercial services exist. • Hard to have a commercial/Government plan. • Spectrum lost is lost forever—never get it back. • Plans need to be flexible. • Spectrum-efficient technologies must be considered. • Prefer scientific techniques. • Federal Aviation Administration does future planning and tries to rely on use of spectrum currently occupied. <ul style="list-style-type: none"> – Develop new technologies to more efficiently use spectrum • Three elements in planning <ul style="list-style-type: none"> – Demand—difficult to assess – Supply (spectrum) – Technology/Innovation. • Current allocations need to be flexible to modify as needed and to eliminate unneeded allocations to meet new demands. • Trend is to broadband service.

Questions	Responses
	<ul style="list-style-type: none"> • Group like users. • Get rid of smaller allocations. • Although it takes a long time to move current users, the current system does allow them time to plan. • Provide allocations by geography and number of users, e.g., metropolitan and rural. • Need more dialog between users and vendors. • Commercial service providers providing public safety services should have same accountability. • Rethink what are mission-critical needs that are not going to be met by commercial services • Federal Government and public safety should work together to develop spectrum needs where there is no alternative. • There is a disconnect between spectrum planning and capital planning. • Regulators need flexibility. • To provide public safety services, commercial service providers must place the public safety needs ahead of economics.
How do we implement a national plan?	<ul style="list-style-type: none"> • FCC does collect information from private sector; NTIA gets Government information. Need to work together to harmonize requirements. • Consolidate needs/ideas into a single document then act. • Get rid of lobbyists. • Move together toward market-oriented approach. • Put a public safety filter in front of all plans to ensure their needs are considered. • Needs to be flexible. • People hoard resources. • Rely on engineers to determine effects of reallocation. • Jump beyond brush fires to look at the future; where do we go next? Should we be looking at 4G, 5G, XG? • Receiver standards. • Form a new agency in the White House or a task force with the focus on spectrum planning along with the ITU model.
What are the advantages and disadvantages of the Allocation Table?	<ul style="list-style-type: none"> • Current process is reactive, e.g., the Congress requires transfer of Government spectrum for auctions and licensing of spectrum by auctions; requirements do not meet spectrum demands for new technologies. • Need prospective allocation with flexibility for spectrum use. • Table gives a good idea of how to move forward when new needs are identified. • Difficulty in getting spectrum due to incumbents' reluctance to use more efficient technologies; no review of their use to see if they can become more efficient • World commonality, but process is slow to get changes to Table; the service rules make allocation table complex. • Allocation schemes are driven by budget concerns. • Table is rigid, reactive, slow, but it does group like services. • Table too rigid to recognize and accommodate new requirements. • Allocation must recognize stakeholders. • Table is an open process but needs to be flexible to meet new requirements.

Questions	Responses
	<ul style="list-style-type: none"> • Table should allow sale/lease of unneeded licensed spectrum. • Incumbent has everything to lose. • Table provides important predictability. • Property ownership is important because it takes time to move existing systems. • Allocation by service works and provides needed protection. • Need rigid allocation scheme to support global operations such as aviation. • Inflexibility is a big disadvantage.
How do we balance spectral needs for public safety in the future?	<ul style="list-style-type: none"> • More spectrum is needed for critical infrastructure. • Need redundancy. • Spectrum only one element; need money to use new technologies, buy commercial services, develop partnerships. • Allow public safety to sell unused capacity but pull back when needed; e.g., put low priority needs on a trunked system but shut them down during crisis. • Interoperability is a greater issue than more spectrum.
What are the costs of sharing spectrum, e.g., relocation?	<ul style="list-style-type: none"> • Cost is not the only issue; comparable spectrum that meets requirements is greater issue. • Are the new users' operations more important than those being replaced? • Federal Government users concerned about political element coming in if they share spectrum. • Government regulators need to determine how to regulate new technologies, e.g., SDR, ultra wideband (UWB).
What are the strengths and weaknesses of the NTIA/FCC process and how can it be improved?	<ul style="list-style-type: none"> • Federal Government users only have to compete with each other. State and local governments have to compete with all private and public requirements. Hard to show difference in needs. • Concern that spectrum is being looked on as a business, not as a tool for doing business. • Balance is good. • FCC is open and available and subject to acts that promote due process and openness although this creates delays. • Need close cooperation between NTIA and FCC. • FCC and NTIA need to develop new regulations and guidelines together to allow new partnerships. • Make regulations stick. • Rigid, reactive, slow. • Set up independent body to make recommendations for spectrum use; look at underused spectrum allocations; Set up trust fund to pay for relocation. • Have centralized body oversee U.S./international spectrum issues and provide oversight of federal/non-federal use. • The Congress does not provide strong spectrum guidance.
Should there be more Congressional participation?	<ul style="list-style-type: none"> • Need better long-term planning process for the Congress to use in making decisions. • Federal Government users could be more receptive to sharing if they could keep the money from auctions (Let the Congress pass that legislation). • Need to educate Congressmen and staffers—have regular meetings.
Should the way you get	<ul style="list-style-type: none"> • No, you have the right to be protected from interference and the right

Questions	Responses
spectrum dictate your rights and what should they be?	<ul style="list-style-type: none"> to transmit within license parameters. • What rights do unlicensed devices have, e.g., Part 15? They have political power and must be considered. • Auctions impose spectrum efficiency. • What are opportunity costs for not using spectrum productively? Need flexibility to be more productive, use more efficient technology, lease unused spectrum, etc. • Users need incentives to become efficient; what is efficient use? • In the Department of Defense (DoD), efficiency is reliability. • If you get spectrum free, then changing the rules to allow for different uses is not equitable. • Need mandate to narrowband.
When part of the spectrum is not being used, what can be done to use spectrum on an interim basis?	<ul style="list-style-type: none"> • Allow use until the spectrum is needed, e.g., permit terrestrial use of satellite spectrum. • Are international conferences the right place and time to make allocations? There has not always been sufficient planning to determine the best use. • Hard to authorize interim use because of incumbents. • Political will is needed to move incumbents.
What incentives are needed to motivate new entrants to move to higher frequency bands?	<ul style="list-style-type: none"> • Propagation (physics). • Someone to build equipment. • Need to reserve higher spectrum until need is there. • Cost of finding new use for lower bands is expensive (move incumbents, sharing studies, etc.). • DoD has to move to higher bands to meet urgent requirements; problem is getting money to do so. • Market incentives; spectrum is probably cheaper above 3 GHz. • Need assurance that new systems will meet needs.
What is efficiency?	<ul style="list-style-type: none"> • Productivity. • Benchmark against other systems. • Ability to meet users needs.

4.2.6 Panel Session 6, International Issues

The objective of this panel session was to solicit inputs on spectrum management as it pertains to, or influenced by, international issues. It was to include specifically addressing global harmonization, World Radio Conference (WRC) goals, and the development of U.S. positions for international meetings, global competition, foreign market access, and associated spectrum policy.

Due to the parallel and concurrent conduct of panel sessions 4, 5, and 6 on the second day of the summit, as well as the limited availability of staff resources, attendance at this panel session was not possible. Several common international related issues were commented on throughout the other sessions of this summit and are addressed in the report recommendations and conclusion sections of this report. If and/or when minutes are published by the NTIA on this summit, content covered during the course of Panel Session 6 will be addressed as appropriate.

4.3 Summit Conclusion

Throughout the course of the summit, it was emphasized that both the FCC and NTIA were in the “listening mode” now. It was acknowledged by all participants and activities that the

summit was a success in achieving its stated purpose of soliciting and exploring ideas for improvement in the overall spectrum management process. Results of the summit will now be compiled by the NTIA, and the NTIA and FCC will cooperatively explore what ideas are “workable.” Although the promise was made to continue a dialog like that which occurred throughout the summit, no specific dates or products were identified as follow-on actions as a result of this summit.

5. RECOMMENDATIONS

The NTIA and FCC should be applauded for initiating the Spectrum Summit and encouraged by every means possible to continue the dialog and pursuit of improvement in overall national spectrum management, processes, and policy. Continued participation by spectrum users in follow-on activities is imperative. All spectrum users have an important stake in the outcome of this effort, which will directly impact the operational capability within their own current and future spectrum-dependent applications.

First and foremost, a national strategic plan on spectrum use should be developed in cooperation with government and commercial sources. At a minimum, the plan should address the overall national requirements for spectrum, current and expected availability of the resource, and foreseeable options anticipated in the management and use of the resource. Coincident with the plan should also be the development and maintenance of an accurate, real-time national database on current spectrum licenses and use. Database maintenance would need to include a specific methodology and process for gathering and timely reporting of the appropriate data. The strategic plan, together with an accurate database of current spectrum use, could then effectively and actively support risk analysis and mitigation planning on additional spectrum requirements. In addition, it would also allow national management, spectrum users, and market-based activities to position and coordinate their own requirements and planning for future spectrum requirements within a balanced application of the resource in support of overall national interests.

Market based initiatives should be encouraged as an influence and driver in overall national spectrum applications and use. The primary exception to this rule should be spectrum identified for exclusive use in support of national safety, security, and public welfare interests. These areas cannot effectively compete within a market environment, and therefore must be afforded more protection and assurance to maintain required levels of appropriate spectrum access necessary in support of their operational requirements. The authority for allowing “flexible use” applications in secondary market scenarios by all licensed/authorized spectrum users should be encouraged. This approach offers the best potential for improvements in overall spectrum efficiency, coordination, and sharing, while protecting the rights and access of the primary user. Any proceeds derived from spectrum-related market activities should be directly reapplied to appropriate spectrum-related uses, activities and applications.

Finally, real improvement in overall spectrum policy and management will require a reduction in political oversight on the issue(s). Politics is too susceptible to special interests and unresponsive in effectively reacting to dynamically changing conditions. The flexibility required to effectively respond in a timely manner to market conditions, demand, technology, and user requirements necessitates a higher degree of spectrum management responsibility at the user/provider level. Although the Government would always retain ultimate control and authority over all spectrum use, its role should be more in the area of enforcement, oversight, mediation, and tracking. New measures on spectrum applications also need to be employed to assist in real-world spectrum management. Technology and user demand have, in many respects, made traditional measures of time, geography, and service obsolete. Measures for the management of current and future applications should more appropriately focus on the areas of spectrum flexibility, efficiency, use rates, and density of applications.

APPENDIX A—LIST OF PARTICIPANTS AND PANELS

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Participant Title/Organization	Participant Name	Session Position
Welcome, Introduction, and Keynote Speaker		
DOC, Secretary of Commerce	Donald L. Evans	Keynote Speaker
NTIA, Deputy Assistant Secretary for Communications and Information	Michael D. Gallagher	Master Of Ceremonies
FCC, Chairman	Michael K. Powell	Speaker
NTIA, Assistant Secretary for Communications and Information	Nancy J. Victory	Speaker
Panel 1-1, Views From Spectrum Users		
FCC, Chairman	Michael K. Powell	Moderator
NTIA, Assistant Secretary for Communications and Information	Nancy J. Victory	Moderator
ARINC, Inc President & COO	John M. Belcher	Panelist
Lin TV, Chairman & President & CEO	Gary R. Chapman	Panelist
DOJ, Dir, Telecom Services Staff, Justice Management Division & CEO	Michael D. Duffy	Panelist
UTC, President	William R. Moroney	Panelist
APCO, President	Glen S. Nash	Panelist
Motorola, Senior Vice President & CTO	Dennis A. Roberson	Panelist
VoiceStream & Western Wireless, Chairman & CEO	John W. Stanton	Panelist
DoD, Assistant Secretary of Defense for Command, Control, Communications and Intelligence (C3I)/DoD CIO	John P. Stenbit	Panelist
PanAmSat, President and CEO	Joseph R. Wright, Jr	Panelist
Panel 1-2, Views From Economists/Analysts		
FCC Commissioner	Kevin J. Martin	Moderator
NTIA, Assistant Secretary for Communications and Information	Nancy J. Victory	Moderator
The Precursor Group, Vice President & Global Strategist	Rudy L. Baca	Panelist
New America Foundation, Director, Public Assets Program	Michael Calabrese	Panelist
UK Radiocom Agency, Director of Spectrum Services	Hazel Canter	Panelist
Progress and Freedom Foundation, President & Co-Founder	Dr. Jeffery A. Eisenach	Panelist
Manhattan Institute for Policy Research, Senior Fellow	Thomas W. Hazlett	Panelist
Jackson Telecom Consulting, Consultant	Dr. Charles L. Jackson	Panelist
Legg Mason Equity Research, Managing Director & Analyst	Blair Levin	Panelist

Participant Title/Organization	Participant Name	Session Position
Panel 1-3, Views From Technologists/Futurists		
FCC Commissioner	Kathleen Q. Abernathy	Moderator
NTIA, Assistant Secretary for Communications and Information	Nancy J. Victory	Moderator
CEO, Vanu, Inc.	Dr. Vanu G. Bose	Panelist
Arraycomm, Inc., Chairman, CEO & Co-Founder	Martin Cooper	Panelist
AOL Anywhere, Senior Vice President for Business & Product Development	Alex D. Felker	Panelist
University of Colorado, Director, Interdisciplinary Telecom Program	Dale N. Hatfield	Panelist
Toffler Associates, Lead Author of Report, "Creating the Future of Spectrum Allocation"	Steven Kenney	Panelist
Teledesic, Chairman & Co-CEO	Craig O. McGraw	Panelist
DARPA, Director of Advanced Technology Office	Dr. Tom Meyer	Panelist
Panel 2-4, Spectrum Efficiency & New Technology Issues		
NTIA, Deputy Assistant Secretary for Communications and Information	Michael D. Gallagher	Moderator
NTIA, Chief, Office of Engineering & Technology	Edmond J. Thomas	Moderator
Qualcomm, Inc., Vice President of Government Affairs	William A. Bold	Panelist
Verizon Wireless, Director of Spectrum Policy	Donald C. Brittingham	Panelist
DoD/DISA, Director, Office of Spectrum Analysis and Management (OSAM)	Rebecca Cowen-Hirsch	Panelist
Sprint PCS, Assistant Vice President, Network Operations & Technology, Broadband Wireless Group	Sheldon Fisher	Panelist
Nextel Communications, Inc., Senior Vice President and Chief Regulatory Officer	Robert S. Foosaner	Panelist
Leap Wireless, Vice President & Chief Technology Officer	Mark Kelly	Panelist
Wireless Communications Association International, President & CEO	Andrew T. Kreig	Panelist
Nortel Networks, Senior Manager, Spectrum Regulations	Michael Lynch	Panelist
Xtreme Spectrum, CEO & Co-Founder	Dr. Martin Rofheart	Panelist
Time Domain Corporation	Greg Simon	Panelist
FCC, Chief, Wireless Telecommunications Bureau	Thomas J. Sugrue	Panelist
Satellite Broadcasting and Communications Association, President	Andrew Wright	Panelist

Participant Title/Organization	Participant Name	Session Position
Panel 2-5, Spectrum Management Issues		
FCC, Chairman of FCC Spectrum Policy Task Force	Dr. Paul Kolodzy	Moderator
DOC/NTIA, Acting Associate Administrator	Fredrick R. Wentland	Moderator
AT&T Wireless Services, Inc., Vice President of External Affairs and Law	Doug Brandon	Panelist
Cellular Telecom and Internet Association, Vice President for Regulatory Policy	Diane J. Cornell	Panelist
Treasury, Assistant Director of Wireless Programs	James Downes	Panelist
Consultant & Prior Department Associate Administrator	William D. Gamble	Panelist
City of Portland, Director, Communications & Networking Service Division	Nancy Jesuale	Panelist
Association of American Railroads	Thomas J. Keller, Esq	Panelist
UTC, Vice President and General Counsel	Jill Lyon	Panelist
Association of Public TV Stations, Vice President, Policy and Legal Affairs	Marilyn Mohrman-Gillis	Panelist
Treasury, Co-Chairman of Public Safety and Wireless Network	Julio Murphy	Panelist
FCC, Chief, Office of Plans and Policy	Robert M. Pepper	Panelist
DoD/OAS (C3I) Deputy Assistant Secretary of Defense for Spectrum, Space Sensors & Command Control and Communications	Steven Price	Panelist
Motorola, Inc., Director T/C Regulation	Steve Sharkey	Panelist
DOT, FAA, Director of Spectrum Policy and Management	George Sakai	Panelist
Panel 2-6, International Spectrum Issues		
FCC, Chief, International Bureau	Donald Abelson	Moderator
State, Deputy Assistant Secretary	David Gross	Moderator
NTIA, Deputy Associate Administrator, Office of Spectrum Management	Karl Nebbia	Moderator
Boeing, Director, Americas Region, International Regulatory Affairs	Audrey L. Allison	Panelist
State, Senior Deputy U.S. Coordinator	Richard Beard	Panelist
UK Radiocom Agency, Director of Spectrum Services	Hazel Canter	Panelist
Cingular Wireless, Vice President Government Regulation	Amb Brian F. Fontes	Panelist
USTTI, Chairman	Amb Michael R. Gardner	Panelist
Inmarsat, Ltd., Director, International & Regulatory Affairs	Donald Kennedy	Panelist
Ericsson Inc., Director, Telecommunications Policy & Regulations	Tom Lindstrom	Panelist
Former World Radio Conference Ambassador	Amb Gail Schoettler	Panelist
Lockheed Martin Corp., Senior Director, Trade and Regulatory Affairs	Jennifer A. Warren	Panelist
NASA, Chief, Spectrum Management Office, Glen Research Center	Wayne A. Whyte, Jr.	Panelist
DoD/OAS/C3I, Director, Spectrum Management	Dr. Badri Younes	Panelist

APPENDIX B—SUMMIT AGENDA

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DAY ONE: (9:00 a.m.–5:30 p.m. in Department of Commerce Auditorium):

Introductions by Master of Ceremonies (Deputy Assistant Secretary Michael D. Gallagher, Deputy Assistant Secretary, National Telecommunications and Information Administration [NTIA]) (Starting at 9:15)

Keynote Speaker—Department of Commerce Secretary Donald L. Evans

Remarks by Nancy J. Victory, Assistant Secretary for Communications & Information & NTIA Administrator, & Michael K. Powell, Chairman, Federal Communications Commission (FCC)

Panel Session 1 (10:00 a.m. to 12:00 p.m.)—Views from Spectrum Users moderated by Assistant Secretary Victory & Chairman Powell of the FCC

Panel Session 2 (1:15 p.m. to 3:15p.m.)—Views from Economists/Analysts moderated by Assistant Secretary Victory & Kevin J. Martin, Commissioner, FCC

Panel Session 3 (3:30 p.m. to 5:30 p.m.)—Views from Technologists/Futurists moderated by Assistant Secretary Victory & Kathleen Q. Abernathy, Commissioner, FCC

DAY TWO: The second day will consist of three parallel, concurrent, breakout panel sessions. There will be a morning session from 9:00–11:30 a.m. and an afternoon session from 1:00–3:30 p.m. with discussions on spectrum topical areas shown in the enclosed.

Panel Session 4 (Room: Hemisphere A): Spectrum Efficiency and New Technologies Issues moderated by Deputy Assistant Secretary Gallagher; and Edmond J. Thomas, Bureau Chief, Office of Engineering and Technology, FCC

Panel Session 5 (Room: Hemisphere B): Spectrum Management Issues (includes the regulatory process and spectrum allocation and planning) moderated by Fred Wentland, Acting Associate Administrator, Office of Spectrum Management; and, Paul Kolodzy, Director, Spectrum Management Task Force, FCC

Panel Session 6 (Room: Meridian D & E): International Issues (includes global harmonization, WRC goals, development of U.S. positions for international meetings, global competition, foreign market access, and associated spectrum policy) moderated by Karl Nebbia, Deputy Associate Administrator, Office of Spectrum Management; David Gross, Deputy Assistant Secretary, Department of State; and Donald Abelson, Bureau Chief, International Bureau, FCC)