

SPECTRUM POLICY FOR THE 21ST CENTURY

Improving International Spectrum Management Policies and Framework



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EXECUTIVE SUMMARY

The world's significant reliance on communications technologies makes radio frequency spectrum an increasingly vital resource to the United States. As technologies advance, efficient and effective use of spectrum becomes imperative to economic growth, public safety and national security interests. Moreover, spectrum-based services, operations and technologies are increasingly international in nature, often relying upon regional and global coordination and harmonization to ensure that technologies are available and cost-effective for as wide an audience as possible.

In light of the importance radio spectrum has to U.S. interests, President George W. Bush launched a Spectrum Policy Initiative, chaired by the Secretary of Commerce, to evaluate U.S. spectrum management policies and procedures and provide recommendations for improvements. "The goal of the Initiative is to promote the development and implementation of a United States spectrum policy for the 21st century that will foster economic growth; ensure our national and homeland security; maintain United States global leadership in communications technology development and services; and satisfy other vital United States needs in areas such as public safety, scientific research, federal transportation infrastructure and law enforcement."¹

In accordance with the *Plan to Implement Recommendations of the President's Spectrum Policy Initiative*, the National Telecommunications and Information Administration (NTIA), in coordination with relevant federal agencies, conducted a comprehensive study of the U.S. international spectrum policy framework.² This study reviewed the following four policy considerations: 1) policies and related approaches regarding barriers to the implementation of new spectrum-dependent technologies and services; 2) U.S. technical, administrative and financial contributions to organizations involved in international spectrum policy; 3) cross-border processes for sharing and coordination to ensure compatibility; and 4) global and regional spectrum harmonization and technical interoperability.

This report is the result of the recommended study effort and examines each of the four identified components of the U.S. international spectrum management framework. In considering each area, an assessment was conducted of how the United States develops positions and interacts with other administrations and regional and international bodies with regard to international spectrum management. Past and ongoing efforts are described and analyzed and conclusions drawn from the outcomes of recent U.S. policy positions. This analysis led to several recommendations for how the U.S. Government might work both to improve national policies and procedures for international spectrum management and also to enhance the underlying

¹ Spectrum Management for the 21st Century – Plan to Implement Recommendations of the President's Spectrum Policy Initiative, United States Department of Commerce, National Telecommunications and Information Administration (2006) (*Implementation Plan*), <http://www.ntia.doc.gov/osmhome/reports/ImplementationPlan2006.htm>.

² See, Memorandum on Improving Spectrum Management for the 21st Century, 40 WEEKLY COMP. PRES. DOC. 2875, 2876, sec. 3(c) (Nov. 30, 2004) (*Executive Memorandum*), available at <http://www.whitehouse.gov/news/releases/2004/11/20041130-8.html>.

framework in which it operates when seeking spectrum for new spectrum-dependent technologies and services.

As many emerging technologies may not be easily categorized by the international framework for the introduction of new spectrum uses, the United States must continuously promote enlightened and flexible regulatory policies throughout the world. In order to consider existing or potential barriers to the implementation of innovative new technologies, the United States continues to work within existing international and regional fora, as well as undertaking bilateral exchanges with foreign administrations. Through the support of agencies and institutions including the Office of the United States Trade Representative (USTR), International Telecommunications Union (ITU) and World Trade Organization (WTO), the United States is able to identify and address barriers or impediments that may be anti-competitive in nature. Moreover, the United States has taken an active role within the ITU in providing valuable input to the Resolution 951 mandated study of the international regulatory framework for spectrum allocations.³

Given the important role international bodies play in the realization of U.S. global spectrum policy objectives, it is essential that organizations such as the ITU are managed in a fiscally sound and responsible manner. An in depth review of the instruments amending the Constitution and the Convention of the ITU by the Executive Branch leading up to the 2006 ITU Plenipotentiary Conference resulted in proposals for changes to the General Secretariat section of the ITU Strategic Plan as well as proposals to eliminate duplication among the three Sectors of the ITU. Given the intimate linkages between ITU Strategic, Financial and Operational plans, it is critical that the United States remain actively involved in ITU administrative planning.

As the United States works to achieve international spectrum policy objectives in deploying new technologies and services, it should not only consider its activities within larger international or regional bodies, but also across its borders with Canada and Mexico. Through the United States-Mexico High Level Consultative Commission on Telecommunications (HLCC) and Radio Technical Liaison Committee (RTLIC) with Canada, the United States has formal processes in place to consider cross-border issues related to spectrum harmonization, interference, interoperability and other telecommunications matters. While there has been success in negotiating agreements with both Mexico and Canada, additional efforts should be taken to ensure that both federal and non-federal spectrum interests are adequately represented and addressed.

In view of the rapid development of radiocommunication innovations and spectrum requirements for both government and commercial systems, as well as the increasingly global nature of network capabilities, NTIA reviewed U.S. approaches towards global and regional spectrum harmonization and technical interoperability. The United States does not have a unified, explicit policy requiring regional or global harmonization but examines issues on an ad hoc basis

³ Through Resolution 951, the 2003 World Radiocommunication Conference (WRC-2003) agreed “that studies be carried out by ITU-R to examine the effectiveness, appropriateness and impact of the Radio Regulations, with respect to the evolution of existing, emerging and future applications, systems and technologies, and to identify options for improvements in the Radio Regulations that address the considering and noting.” 2004 ITU Radio Regulations Volume 3 (Geneva Switzerland, 2004). Results of the study will be considered at WRC-2007.

weighing relevant costs and benefits to stakeholders. An analysis of recent examples of U.S. harmonization decisions coupled with a survey of both U.S. Government and industry spectrum users and of a variety of international administrations provided a thorough view of the impact of the current U.S. approach. The true costs and benefits of harmonization and interoperability can only be judged on a case-by-case basis with adequate and transparent inputs from all stakeholders. While globally or regionally harmonized spectrum and technical interoperability standards can facilitate economies of scale benefiting manufacturers and consumers, establishing a unified policy would unnecessarily constrain U.S. advocacy in international forums and could prevent the flexibility required to fully address national spectrum goals.

This NTIA study examined and described the many collaborative inter-agency, bilateral, regional and multi-lateral processes in which the United States considers spectrum-use related to the international introduction of new technologies and services, as well as trade and regulatory barriers that inhibit access to spectrum. The following represents the results of the study responding to each of the four identified components of the Implementation Plan as well as recommendations for new policies or approaches towards U.S. involvement within these diverse processes that resulted from the study.

I. INTRODUCTION

International traffic on international cable, satellite and other facilities continues to increase due to growth in use of these facilities for broadband services. Revenues per minute for international telephony, the historical mainstay of most international networks, and a chief source of revenue for many countries, however are down dramatically.⁴ Many segments of the telecommunications sector have been merged globally, both in manufacturing and increasingly in service provision. For example, there are only two primary global fixed satellite service operators and many major cell phone operations around the world are under common ownership. The market for telecommunications services has also changed.

In addition to changes in international traffic and its impact on international settlement revenues, another significant trend is the standards-based approach for introducing new services. Increasingly, spectrum-using equipment developments are standards-based and no longer independently developed by individual companies.⁵ At the same time, manufacturers are designing equipment to operate globally – nearly all develop and market equipment for operation in multiple markets around the world. There also has been a disappearance of companies that are clearly identifiable solely as U.S. companies. In the past, promoting the interest of these companies in services or manufacturing often formed the basis for international telecommunications policies of many countries. This is less so today.

Other trends affecting the U.S. role in international telecommunications include:

- Unlicensed or license-exempt devices are increasing (as are the number of applications around the world) and usually operate pursuant to equipment-focused regulations, rather than traditional spectrum management rules and policies. In some countries, though there may be no formal spectrum allocations for these devices, they do operate pursuant to country specific technical and operational rules. There is increased pressure from industry to make more spectrum available for such unlicensed devices.
- Requirements for global harmonization and/or interoperability are increasingly important for telecommunications services supporting U.S. national defense, homeland security, and transportation infrastructure activities.
- Digital technologies and market scale for high growth telecommunications services such as mobile wireless enables countries to use different bands for the same services without significant impact on the costs of equipment or service. Utilizing different frequency

⁴ According to Federal Communication Commission Statistical Reports, since 2000 the number of minutes of international calls to and from the United States for selected carriers has grown from 30 million to 63 million but the revenue per call minute has gone down much more quickly, from \$0.47 to \$0.14 per call minute. See *2004 International Traffic Data*, Strategic Analysis and Negotiations Division, Multilateral Negotiations and Industry Analysis Branch, Federal Communications Commission, International Bureau (March 2006), and Public Notice, *FCC Releases 2004 International Traffic Data*, released March 14, 2006, available at <http://www.fcc.gov/ib/sand/mniab/traffic/files/CREPOR04.pdf>. (last visited September 1, 2006).

⁵ A relevant example is the introduction of equipment around the world by many manufacturers adhering to the IEEE 802.16 standards and the WiMAX Forum compliance profiles. See WiMax Forum Website, <http://www.wimaxforum.org/home/>.

bands in different countries by itself does not constitute an impediment to offering the service or to participation by U.S. technology firms in foreign markets.

As radiocommunication services become increasingly international in nature, U.S. policies and procedures for international spectrum management become critically important to the success of innovative spectrum-dependent U.S. technologies in the global marketplace as well as to U.S. federal and non-federal interests including public safety and national security. How do U.S. policies and the overall international regulatory environment facilitate or constrain access to international spectrum?

In order to address this question, it was recommended through the President's Spectrum Policy Initiative that NTIA evaluate international barriers to the deployment of U.S. technologies and service innovations. This resulted in the following tasks identified in the plan to implement the recommendations related to the President's Initiative.⁶

Project B: Reduce International Barriers to United States Innovations in Technologies and Services

Task B.1 – Improve United States Preparations for World Radiocommunication Conferences

Task B.2 – Improve International Spectrum Management Policies and Regulatory Environment

- a. Barriers to the global implementation of U.S. technologies and services
- b. U.S. technical, administrative and financial contributions to organizations involved in international spectrum policy issues
- c. Cross-border coordination processes with administrations in neighboring countries
- d. Balancing costs and benefits of global spectrum harmonization and system interoperability

To address Task B.1, NTIA issued a report in May 2005 entitled “World Radiocommunication Conferences: Recommendations for Improvement in the United States Preparatory Process.” The recommendations in that earlier report, for the most part, have been successfully implemented in preparing for WRC-2007.

The purpose of this separate study is to assess the four component subtasks under Task B.2, describe activities the United States has taken to fulfill the challenges listed in the Task and offer recommendations, as appropriate, to federal agencies for future action. To obtain more insight into progressive spectrum management policies and tools and to promote U.S. goals within the President's Initiative, this report also considers approaches of other administrations and organizations towards international spectrum management and the impact of such approaches on U.S. interests.

⁶ *Implementation Plan*, *supra* note 1, <http://www.ntia.doc.gov/osmhome/reports/ImplementationPlan2006.htm#projectB>.

II. BACKGROUND

Internationally, the electromagnetic spectrum is allocated by member countries of the International Telecommunication Union (ITU), a specialized United Nations agency, at World Radiocommunication Conferences (WRCs). The allocations are made to various radiocommunication services according to three different geographic regions of the world. Technical aspects of radiofrequency use as well as preparation for WRCs are addressed by ITU member countries through the ITU's Radiocommunication Sector (ITU-R). The ITU-R develops recommendations on coordination between radiocommunication systems and for other technical aspects of radiofrequency operations. The ITU-R evaluates technical aspects, including interference, of revising the allocation tables to support new services. In particular, the ITU-R's role with respect to evaluating whether and under what technical criteria new services can be introduced to operate co-frequency with other allocated services is increasingly important as new demands are made on the radiofrequency spectrum.

Based on agreements reached at WRCs, the ITU revises the International Radio Regulations which include allocations and technical rules for radio services for each region. These conferences take place every three to four years to address needed changes in the Radio Regulations to accommodate new services and technologies. WRCs follow agendas established by the ITU Council, which consists of a small subset of ITU member nations; however agenda items can be added at the actual conferences to address compelling new requirements. In addition, there are regional telecommunications organizations which address specific concerns of the countries within that geographic region, (*e.g.*, Europe, Asia, Africa, and the Western Hemisphere), coordinate use of the radiofrequency spectrum with the region, and provide for a central source of information regarding spectrum use, services and technical developments. These regional groups also provide a venue for addressing upcoming activities throughout the ITU and for preparing regional proposals and common regional positions for WRCs. Within these regional groups there is consideration of harmonization of spectrum allocations and technical regulations, where possible.

Within the United States and its possessions, spectrum is further allocated to federal and non-federal users. NTIA is responsible for managing radio frequency use by federal agencies. The Federal Communications Commission (FCC), an independent agency, is responsible for regulating frequency use by non-federal users, including commercial, private, and state and local government users. Some bands are allocated exclusively for federal use, others are allocated exclusively for non-federal use, and others are allocated for shared use.

Both NTIA and FCC maintain the National Table of Frequency Allocations. NTIA performs its functions with the advice of the Interdepartment Radio Advisory Committee (IRAC), which is comprised of representatives of 19 federal agencies. Coordination between non-federal and federal users of the radio frequency spectrum is accomplished by collaboration between the FCC and the NTIA.

The U.S. Department of State (State Department) oversees all international aspects of spectrum management and works with federal agencies to ensure that the United States speaks with one voice in the international arena. The State Department, along with NTIA and FCC, leads U.S.

preparations for bilateral, regional, and international meetings including ITU and Inter-American Telecommunications Commission (CITEL) meetings, including preparing the U.S. Ambassador for heading the U.S. delegation to WRCs.

A. World Radiocommunication Conference Preparations

The Radio Regulations negotiated and agreed upon at WRCs constitute an international agreement on radiocommunications covering the use of the radio-frequency spectrum by the participating ITU member States. The Final Acts of ITU conferences, including those of WRCs, have been forwarded to the U.S. Senate for advice and consent to ratification by the President. Moreover, the Radio Regulations serve as a framework for development of U.S. national frequency allocations and regulations. Given the serious implications WRC results can have for diverse U.S. commercial and government interests, a lengthy preparation process is undertaken within the United States to accommodate the needs of the government and commercial spectrum users.

To prepare for WRCs and address the wide ranging goals of diverse stakeholders, the United States undertakes the following activities: technical, proposal and position preparation. NTIA works with U.S. federal agencies through the IRAC Radio Conference Subcommittee (RCS), which is composed of interested federal agencies such as the Department of Defense, the Federal Aviation Administration (FAA), the National Aeronautics and Space Administration (NASA) and others. In parallel, the FCC forms a separate WRC Advisory Committee (WAC) comprised of private sector representatives. At times, the FCC issues Notices of Inquiry to solicit public input on issues to be addressed at the WRC. The Department of State, FCC and NTIA then coordinate their respective technical and policy concerns in an effort to develop formal U.S. proposals and positions on WRC issues.

The State Department, through the Office of International Communications and Information Policy (CIP), ensures that the U.S. foreign policy positions are fully considered in radio conference preparations and at radio conferences, and coordinates with NTIA, FCC and other federal agencies. Central to this process is the State Department's International Telecommunications Advisory Committee (ITAC) which provides a forum in which federal and non-federal spectrum users work toward common objectives and to reconcile differences when preparing official submissions for international conferences and regional meetings. To ensure proper policy coordination, the State Department also holds planning meetings with senior leadership of NTIA and the FCC. The State Department is responsible for forming the WRC delegation, coordinating preparatory meetings, and coordinating the appointment by the President of the Head of Delegation.⁷

Importantly, the U.S. WRC preparatory process facilitates meeting the interests of the federal government as well as the interests of manufacturers, service providers and non-federal spectrum users. Given the diverse views that must be considered in determining U.S. positions for

⁷ NTIA Special Report 05-427 - World Radiocommunication Conferences: Recommendations for Improvement in the United States Preparatory Process, U.S. Department of Commerce, National Telecommunications and Information Administration (May 2005), http://www.ntia.doc.gov/reports/wrc/wrc_05232005.pdf.

regional and international conferences, as well as the three to four year span between WRCs,⁸ the process by which proponents of a new technology or service are able to secure an international spectrum allocation through the Radio Regulations is long and labor-intensive. This report will refer frequently to these various institutions and agencies involved in international spectrum management and assess how existing policies and procedures facilitate or constrain the implementation of new and innovative U.S. technologies and services.

III. ASSESSMENT OF TASK B.2 POLICY COMPONENTS

A. Barriers to Global Implementation of United States Technologies and Services

1. Introduction

Technology convergence and globalization of markets are making it increasingly challenging to differentiate between domestic and international telecommunications services and the spectrum allocations and regulations applicable to such services. While the inability to gain access to additional spectrum often is cited as a barrier to introducing new spectrum-dependent technologies and services on a global basis, more often impediments are found within national regulations, policies and procedures for modifying allocations and obtaining service licenses. For example, a country's regulations may not allow a certain new spectrum application, or in some cases, spectrum uses not specifically allowed within the spectrum-management framework are prohibited.

For the purposes of this report, the term "barrier" is used to characterize anything that may impede spectrum access to and use of this scarce resource. Internationally, such barriers may negatively impact trade and market access, which in certain cases may be addressed by treaties and trade agreements. The removal of regulatory impediments and other trade barriers of foreign administrations or international bodies, as well as the promotion of open markets in the radiocommunication sector, are essential for the United States to maintain a level playing field for U.S. manufacturers and operators, as well as Federal agencies who seek to deploy new and innovative spectrum-dependent technologies internationally. This section of the report examines the effectiveness of existing U.S. approaches and institutions in identifying and removing barriers to the worldwide implementation of U.S. innovations in radiocommunication technologies and services.

2. International Spectrum Policy in the United States

Generally, the principal goals of U.S. international spectrum policy are to:

- satisfy the requirements of the U.S. government's global mission;
- identify and remove barriers to the global implementation of U.S. communications technology;
- increase U.S. consumer access to communication technologies;
- avoid harmful interference to incumbent systems; and

⁸ The United States proposed to the 2006 ITU Plenipotentiary Conference that WRCs occur every four to five years in the future.

- ensure that U.S. companies are accorded fair treatment with respect to access to spectrum in particular countries, consistent with applicable trade commitments.

To address these spectrum policy goals, the United States and other nations have established guidelines to determine the legitimacy of spectrum-related government decisions within the context of global trade and competitiveness. The allocation and licensing of spectrum use is a valid exercise of a government's authority, and national governments are able to adapt ITU regulations domestically depending on national interests.⁹ Spectrum managers must deal procedurally with protecting the rights of existing licensees when there is a potential conflict between the new use and existing uses of radio. There is a range of essential and legitimate tasks that regulators/spectrum managers undertake pursuant to national spectrum policies, and rules and regulations that work to protect networks from interference, apportion spectrum, promote competition. However, several steps must be taken to ensure that the underlying policies, rules, and regulations, and the resulting actions do not pose unnecessary barriers; the process for developing and applying them should be open and transparent; decisions based on them should be technology neutral, the least trade restrictive and non-discriminatory with respect to foreign-owned entities; and independence should exist between the licensing authority and licensees.¹⁰

The United States does not have an explicit spectrum harmonization policy, but does examine regional or global harmonization issues, where appropriate and on an ad hoc basis, and weighs relevant costs and benefits to stakeholders.¹¹ The United States does have a formal policy that promotes technology neutral decision-making in its own regulatory decision-making process that guides its advocacy of U.S. technologies and services abroad.¹² On behalf of U.S. industry, the United States encourages foreign governments to be technology neutral in their licensing and spectrum allocation matters in order to support service provider and ultimately consumer choice of technology. For example, the United States supports policies that permit various technologies for commercial mobile wireless services to operate in any available spectrum allocated to the mobile service.

Globally, the United States addresses spectrum related barriers and promotes its spectrum policies in a number of ways, including through:

- participation in the activities of the ITU;
- trade agreements;
- bilateral and multilateral dialogues;
- bilateral and multilateral agreements;
- capacity building initiatives; and
- targeted advocacy in certain cases.

⁹ Annex 1 contains the FCC's Best Spectrum Management Practices that apply to U.S. spectrum management and are recommended for other countries as well.

¹⁰ *ITU Global Symposium for Regulators (GSR): Report of the Chairperson*, International Telecommunications Union, Telecommunication Development Bureau (November 14-15, 2005), <http://www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR05/Documents/chairmansreport.pdf>.

¹¹ The U.S. approach towards harmonization will be considered in more detail later in this report.

¹² For example, this policy is reflected in the basic WTO documents and principles for trade agreements that will be presented in more detail later in this report.

3. International Telecommunication Union (ITU)

The ITU works with member states to ensure that worldwide telecommunications systems operate efficiently and systematically. Given the global marketplace's increased reliance on spectrum-dependent technologies, spectrum management and spectrum use are major factors in the coordination of activities undertaken within the ITU. Most specifically, spectrum management activities occur within the ITU's Radiocommunication Sector (ITU-R) whose mission is to ensure rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services. In its function as an international coordinating body, the ITU and its Member States continuously work to address the impact of new technologies and consider how existing regulations can serve to facilitate or impede their introduction.

The ITU continues to provide an effective forum for the global promotion of new technologies. At World Radiocommunication Conference (WRC-2003), for example, the ITU identified significant bandwidth in the 5 GHz range for the mobile service for wireless access systems, including radio local area networks operated in accordance with technical rules to ensure that unacceptable interference would not be caused to other radio services operating pursuant to primary allocations.¹³ Many countries have subsequently adopted this allocation in their rules. However, the ITU appears to have limited ability to effectively address the many issues presented by the use of unlicensed devices that would be consistent with U.S. objectives. Recent ITU study group experience has been that there will be limited ability for ITU to take the lead on such matters and alternative approaches will be needed.¹⁴

In 2003, the WRC-2003 approved Resolution 951 inviting ITU-R to “(1) examine the effectiveness, appropriateness and impact of the Radio Regulations with respect to the evolution of existing, emerging and future applications, systems and technologies and (2) identify options for improvements in the Radio Regulations.”¹⁵ Several considerations contained in this Resolution relate to the introduction of more flexibility into the current international spectrum regulatory framework. Importantly, Resolution 951 reinforces the fact that one of the purposes of the Radio Regulations is to not constrain the use of existing applications and technologies or the development of new ones.

The United States has traditionally led the way on spectrum technology innovation. However, innovative technologies often run afoul of existing domestic and international regulatory and procedural policies. Many new technologies, such as Low Earth orbiting satellites, did not conform to the orderly arrangements established previously for geostationary orbit communications satellites. High Altitude Platforms (HAPs), when proposed, defied service definitions for fixed, mobile, aeronautical and satellite services. Lines between broadcasting, fixed services and mobile services have now become hazy. Fixed satellite uses have been

¹³ ITU Radio Regulations, vol. 3, *Resolution 229* (Geneva, Switzerland 2004).

¹⁴ For example, in 2006 the ITU-R Study Group 1 failed to approve new questions to begin a study of RFID and low power devices operating in certain bands where non-communications devices, such as microwave ovens, also operate.

¹⁵ ITU Radio Regulations, vol. 3, *Resolution 951* (Geneva Switzerland, 2004).

proposed and agreed to for use on moving vessels. Aeronautical mobile satellite use has now been authorized to operate with fixed satellite systems. Ultra Wide Band systems cross all allocation boundaries, even those of bands where emissions are not permitted under the radio regulations. Software defined and cognitive radios are being developed that may operate in any band. In each of these cases, the new uses fell outside the bounds of the existing regulatory or procedural framework of the radio regulations.

For over twenty years, the United States has led the way in the development of unlicensed technology. The United States has been participating in the ongoing work of the ITU-R and providing valuable input to the Resolution 951 study to ensure that recommendations coincide with U.S. objectives and interests. The results of this study will be included in the Report of the Director of the Radiocommunication Bureau to the 2007 World Radiocommunication Conference. Given the importance of the Radio Regulations in guiding the development of international radiocommunication, it is essential for the United States to remain actively engaged with the ITU and contribute whenever possible to discussions of regulatory barriers.

4. Trade Agreements

The United States works to address market access barriers in the telecommunications sector through a range of bilateral and multilateral trade agreements. In the goods sector, market access barriers are characterized as tariff-based (e.g., import duties) as well as nontariff-based (e.g., discrimination in government procurement, discriminatory or overly restrictive standards and technical requirements, import substitution measures such as buy-local policies and content mandates). In the services sector, barriers encompass a range of potentially discriminatory measures (i.e. foreign equity limits), as well as non-discriminatory limits on the number of market participants (e.g., a legal monopoly or duopoly in specific sectors or subsectors). Among such non-tariff barriers are those that have the potential to negatively affect spectrum access and use. Such barriers often are related to a lack of transparency and due process, lack of an independent regulator with a spectrum management function, standards or technology mandates, and inconsistent spectrum management practices. The following is an overview of some of the primary multilateral and bilateral trade agreements through which the United States works through to addresses trade barriers.

a. World Trade Organization (WTO)

Established in 1995, the WTO is the only global international organization that manages the rules of trade between nations. Like its predecessor, the 1948 General Agreement on Tariffs and Trade (GATT), the WTO serves as a forum for ongoing multilateral trade negotiations aimed at liberalizing world trade and facilitating the administration of resulting trade agreements.

The WTO agreements have been negotiated and signed by the greater part of the world's trading nations.¹⁶ These agreements serve as the legal ground-rules for international trade. Agreements were reached and acceded to through consensus of the 151 WTO members. WTO members themselves are responsible for monitoring compliance with these trade agreements and setting

¹⁶ World Trade Organization website, "What is the WTO?", http://www.wto.org/english/thewto_e/whatis_e/whatis_e.htm.

the organization's course. The WTO also has a dispute settlement system designed to ensure compliance with such rules in a non-politicized manner, through interpretation of agreements and commitments.

The WTO General Agreement on Trade in Services (GATS) is the first multilateral, legally enforceable agreement for international trade in services. The GATS was negotiated during the Uruguay Round of Multilateral Trade Negotiations and came into force in January 1995. The agreement covers all service sectors and applies standard principles, such as most-favored nation treatment, and, to the extent a Member has made specific commitments, national treatment and transparency, to all other WTO members. Included in the GATS is the Annex on Telecommunications, which requires, among other things, that each member government to ensure that foreign service suppliers are given reasonable and non-discriminatory access to, and use of, public telecommunications networks and services.

At the close of the Uruguay Round, member nations decided to extend negotiations on trade in basic telecommunications. Beginning in May 1994, these negotiations continued for three years, culminating in the Fourth Protocol of the General Agreement on Trade and Services, commonly known as the WTO Agreement on Basic Telecommunications Services (BTA). The agreement, which addresses entry into telecommunications markets to provide services, was reached February 15, 1997 and went into effect February 5, 1998. Services covered in the BTA included voice telephony, data transmission, telex, telegraph, facsimile, private leased circuit services (i.e. the sale or lease of transmission capacity), fixed and mobile satellite systems and services, cellular telephony, mobile data services, paging and personal communications systems. Value-added services were not formally covered in the BTA, but several participating members included them in their offers, or had previously covered these services through their Uruguay Round commitments.¹⁷

The results of these negotiations included individual commitments of 69 governments (contained in 55 schedules) to open up their telecommunications services markets. These commitments are annexed to the Fourth Protocol of the General Agreement on Trade and Services.¹⁸ These specific country commitments vary, representing a range of liberalizing intent.¹⁹ Additionally and importantly for spectrum matters, the Chairman of the Negotiating Group on Basic Telecommunications issued a scheduling note related to market access limitations on Spectrum Availability.²⁰ That note clarified that spectrum/frequency management is not, *per se*, considered a limitation and may affect the number of suppliers, provided that this is done in

¹⁷ Value-added telecommunication services are telecommunications for which suppliers "add value" to the customer's information by enhancing its form or content or by providing for its storage and retrieval. Value-added services such as e-mail and voice mail have since been included in more recent telecommunications services negotiations.

¹⁸ The Fourth Protocol provided the legal basis for annexation of new basic telecommunications schedules to Uruguay Round services schedules. Fourth Protocol to the General Agreement on Trade in Services, S/L/20 (April 30, 1996), http://www.wto.org/english/tratop_e/serv_e/4prote_e.htm.

¹⁹ In addition to "offers," some countries also made exceptions. A United States exemption for telecommunication services involves one-way satellite transmission of DTH and DBS television services and of digital audio services. In the exemption, the United States seeks to ensure substantially full market access and national treatment in certain markets. Document Title, (April 11, 1997), (GATS/EL/90/Suppl.2.)

²⁰ See, Negotiating Group on Basic Telecommunications, Chairman's Note, Market Access Limitations on Spectrum Availability, S/GBT/W/E (February 3, 1997).

accordance with GATS Article VI (domestic regulation) and other relevant provisions of the GATS.

Most parties to the BTA also committed to a binding set of regulatory principles based on the WTO Reference Paper on Basic Telecommunications.²¹ The Reference Paper addresses six areas relevant to a well-functioning competitive market:

- competitive safeguards;
- interconnection;
- universal service;
- public availability of licensing criteria²²;
- regulatory independence;²³ and
- the efficient allocation of scarce resources, including spectrum.²⁴

While all of these areas could have spectrum-related implications, the last three (public availability of licensing criteria, regulatory independence and the efficient allocation of scarce resources) are arguably the most relevant to removing barriers to access to and use of spectrum. The results of the negotiations on basic telecommunications, while impressive, are only a partial view of the commitments the WTO has achieved in this sector. Prior to the BTA entering into force, sixty-nine WTO member governments already had listed telecommunications in their GATS schedules. Twenty-six of these governments had committed, in some form, within basic telecommunications; fifty had committed, in whole or part, within value-added services. Subsequent to the conclusion of the BTA, several non-participating members added binding telecommunications commitments to their GATS schedules, and all subsequently acceding members (*e.g.*, China, Cambodia, Saudi Arabia, Vietnam) included such commitments as part of their accession packages. The BTA negotiations increased the total number of Member governments' commitments on telecommunications to 86.

It is important to note that commitments made through the WTO must be implemented through national law and policy. The BTA commitments of the United States have been implemented through FCC rules as necessary. For example, as early as 1997, the FCC issued rules (known as DISCO II rules) establishing how foreign (fixed and mobile) satellite systems, whether planned or in service, could gain access to the U.S. market.²⁵

²¹ Negotiating Group on Basic Telecommunications (April 24, 1996), WTO Website, http://www.wto.org/english/tratop_e/serv_e/telecom_e/tel23_e.htm.

²² "Where a license is required, the following will be made publicly available: a) all the licensing criteria and the period of time normally required to reach a decision concerning an application for a license and b) the terms and conditions of individual licenses. The reasons for the denial of a license will be made known to the applicant upon request." WTO Website, BTA Reference Paper, *Negotiating Group on Basic Telecommunications* (April 24, 1996), http://www.wto.org/english/tratop_e/serve_e/telecom_e/tel23_e.htm.

²³ "The regulatory body is separate from, and not accountable to, any supplier of basic telecommunications services. The decisions of and the procedures used by regulators shall be impartial with respect to all market participants." *Id.*

²⁴ "Any procedures for the allocation and use of scarce resources, including frequencies, numbers and rights of way, will be carried out in an objective, timely and non-discriminatory manner. The current state of allocated frequency bands will be made publicly available, but detailed information of frequencies allocated for specific government uses is not required." *Id.*

²⁵ See *e.g.*, *Amendment of Regulatory Policies to Allow Non-U.S. Licensed Space Stations to Provide Domestic and International Satellite Services in the United States*, FCC 97-399, Report and Order, 12 F.C.C.R. 24094 (1997).

Negotiations in the telecommunications sector did not end with the BTA. Written into the GATS is a commitment by WTO Members to progressively liberalize trade in services. Article XIX committed Members to start another round of services negotiations in 2000, which are now underway. Several Members or groups of Members have submitted negotiating proposals in telecommunications services.²⁶

By encouraging the opening of markets worldwide, the WTO and its relevant agreements and ongoing telecommunications sector negotiations work to facilitate policies that allow new entrants to deploy innovative, cost-effective technologies and services, and thereby advance global telecommunications growth.

b. Regional and Bilateral Free Trade Agreements

In addition to WTO trade agreements, the United States negotiates regional and bilateral Free Trade Agreements (FTAs) with its trading partners. Like the WTO agreements, FTAs work to allow companies to enter and compete more easily in the global marketplace but are negotiated with an eye towards specific regional or country-to-country needs. FTAs help level the international playing field by encouraging foreign governments to adopt open and transparent rulemaking procedures along with non-discriminatory laws and regulations. FTAs also are legally binding with dispute settlement provisions written into each agreement.

In most cases, FTAs build and expand upon WTO agreements and commitments including those related to spectrum management. For example, the United States-Australia FTA goes beyond the WTO in terms of language related to the “Allocation and Use of Scarce Telecommunications Resources.” This Agreement includes provisions that retain the right for each party to “allocate frequency bands taking into account present and future needs” and promote market-based approaches in assigning spectrum for terrestrial non-government telecommunications services.²⁷

Moreover, FTA negotiations can be used to encourage and facilitate adoption by trade partners of key regulatory principles negotiated in the BTA, where countries did not have pre-existing WTO commitments. The United States-Central American and Dominican Republic Free Trade Agreement (CAFTA-DR) undertook several months of negotiations specifically related to telecommunications. The final agreement outlined specific principles including interconnection, spectrum allocation, and access to and use of public telecommunications networks and services. Costa Rica was unable to agree to all provisions of the telecommunications chapter and opted for an annex to the Agreement outlining separate commitments for this sector.

²⁶ For more information on the 2000 round of ongoing negotiations, see WTO Website, “The New Negotiations,” http://www.wto.org/english/tratop_e/serv_e/s_negs_e.htm (last visited April 13, 2007).

²⁷ Under the United States-Australia FTA Chapter on Telecommunications, article 12.20, number 4: “When making spectrum allocations for non-government telecommunications services, each Party shall endeavor to rely on an open and transparent public comment process that considers the overall public interest. Each Party shall endeavor to rely generally on market-based approaches in assigning spectrum for terrestrial non-government telecommunications services.” Free Trade Agreement on Telecommunications, U.S.-Australia, art. 12.20, No. 4 (May 18, 2004).

c. Trade Agreement Monitoring and Enforcement

The USTR is required annually to review the operation and effectiveness of U.S. telecommunications trade agreements.²⁸ The purpose of the review is to determine whether any act, policy or practice of a foreign country that has entered into a telecommunications-related agreement with the United States (1) does not comply with the terms of the agreement or (2) otherwise denies to U.S. firms, within the context of the agreement, mutually advantageous market opportunities to telecommunications products and services in that country.

The Section 1377 review is based on public comments submitted by U.S. industry, relevant U.S. Government agencies, trading partners and other interested parties. In recent years, Section 1377 reviews have highlighted spectrum-related issues in a number of countries.

- **2006:** China was cited for “preferences for domestic wireless standards.” In this case, China was planning to issue new licenses for third generation wireless services (3G). USTR noted that China’s process suffered from a lack of transparency and raised concerns that China may issue such licenses in a manner not aligned with licensing and spectrum management commitments it undertook through adoption of the WTO BTA. In addition, press reports indicated that China had taken action to offer broad preferences to the development and testing of Time Division Synchronous Code Division Multiple Access (TD-SCDMA) – a standard developed largely in China. Such preferences, in the form of subsidies and licensing advantages, raise serious questions about China’s commitment to impartial regulatory decisions and technological neutrality with respect to licensing. USTR continues to monitor the process by which China issues 3G licenses to ensure that all standards are given an equal chance to compete in the marketplace.²⁹
- **2005:** Japan was cited for “non-transparent, discriminatory allocation of spectrum,” and the United States urged Japan’s Ministry of Internal Affairs and Communication (MIC) to encourage new entrants, promote competition and ensure that new spectrum assignments are conducted in a transparent and impartial manner, consistent with Japan’s WTO obligations.³⁰
- **2004:** China was cited for a restriction against the use of Code Division Multiple Access (CDMA) technology in the 450 MHz spectrum band. Korea also was cited for its proposed mandate to develop a single standard (WiBro) for “portable” wireless Internet services licensed in the 2.3 GHz range.³¹

Similar to the 1377 Review, the Annual National Trade Estimate Report on Foreign Trade Barriers (NTE) more broadly surveys significant foreign barriers and unfair trade practices to

²⁸ Section 1377 Review - The Omnibus Trade and Competitiveness Act of 1988, Pub. L. No. 100-418 at sec. 1377, 102 Stat. 1107, 1222 (August 23, 1988), *codified at* 19 U.S.C. § 3106.

²⁹ “Results of the 2006 Section 1377 Review of Telecommunications Trade Agreements,” at 10, http://www.ustr.gov/assets/Trade_Sectors/Telecom-E-commerce/Section_1377/asset_upload_file43_9276.pdf.

³⁰ “Results of the 2005 Section 1377 Review of Telecommunications Trade Agreements,” at 10, http://www.ustr.gov/assets/Trade_Sectors/Telecom-E-commerce/Section_1377/asset_upload_file959_7529.pdf.

³¹ “Results of the 2004 Section 1377 Review of Telecommunications Trade Agreements,” at 4, http://www.ustr.gov/assets/Trade_Sectors/Telecom-E-commerce/Section_1377/asset_upload_file802_5269.pdf.

U.S. exports of goods and services across all sectors including telecommunications. The NTE is mandated by statute and requires an annual inventory of the most significant foreign barriers affecting U.S. companies, and U.S. efforts to eliminate and reduce those barriers.³² The report covers sixty-two major trading partners in each region of the world and also includes information on actions taken by these countries to eliminate barriers.³²

The NTE inventory facilitates negotiations to reduce or eliminate identified barriers and provides a valuable tool in enforcing U.S. trade laws. Results-oriented enforcement is a top priority for the United States, and in instances where blatant violations exist and bilateral or multilateral consultations fail, the United States will and has utilized the dispute resolution mechanisms of the WTO and/or FTAs.

5. Multilateral and Bilateral Dialogues

While formal dispute resolution mechanisms have proven effective, the United States has found that building relationships and mutual understanding through organizational or informal bilateral and multi-lateral dialogues can be even more useful in addressing barriers and other issues related to spectrum access and use. In fact, in many cases, such dialogues have helped avoid disputes entirely.

a. Multilateral Dialogues

Examples of regular multilateral dialogues involving telecommunications in which the United States participates include:

- **International Telecommunication Union (ITU):** The ITU does not have a direct role in trade issues; however, in addition to global coordination efforts, the ITU regularly convenes conferences and study groups that explore timely regulatory issues such as spectrum management and promotion of new technologies.
- **Asia-Pacific Economic Cooperation Telecommunications and Information Working Group (APEC TEL):** Membership includes twenty-one member countries including China, Japan and Korea. TEL activities focus on promoting policy and regulatory measures to liberalize trade and investment in the telecom sector.
- **Inter-American Telecommunication Commission (CITEL):** Under the umbrella of the Organization of American States (OAS), CITEL's membership includes 35 Western Hemisphere countries. Its objectives include facilitating and promoting the continuous development of telecommunications in the region. CITEL is structured with three permanent committees including a Permanent Consultative Committee on Telecommunications Standardization (PCCI) and another on Radiocommunication (PCCII).
- **Organization for Economic Co-operation and Development (OECD):** Membership includes 30 countries. OECD produces internationally agreed upon instruments, decisions and recommendations to promote rules in areas where multilateral agreements are necessary for countries to compete successfully in a globalized economy.

³² 2006 National Trade Estimate Report on Foreign Trade Barriers, U.S. Trade Representative (March 2006), http://www.ustr.gov/Document_Library/Reports_Publications/2006/2006_NTE_Report/Section_Index.html.

b. Bilateral Dialogues

The United States also is involved in many regular or permanent and ad-hoc bilateral dialogues. In addition to fostering greater understanding and respect, these bilateral interactions are heavily relied upon to deal with disputes and problems related to barriers such as spectrum access.

Recent examples include:

- **U.S.-India ICT Working Group:** This working group was established in 2005 and has met three times, most recently in December 2007 in Washington. The U.S. delegation is led by the Department of State and includes the interagency participation of NTIA, USTR, the International Trade Administration (ITA), FCC, the Federal Trade Commission (FTC), and the National Science Foundation (NSF). The Indian delegation is led by the Ministry of Communication and the Ministry of Information and Broadcasting. By engaging with U.S. agencies such as NTIA and FCC, the Indian delegation is able to consider other perspectives on pending domestic issues, such as freeing up spectrum from government use, which would benefit Indian interests as well as U.S. firms interested in the Indian market. According to India, 80 percent of spectrum held by their government agencies is not used. Following initial meetings, India has expressed interest in learning more from NTIA regarding U.S. spectrum relocation fund legislation as a potential model for moving Indian government users. The Indian government is discussing how to release unused spectrum currently held by its national security agencies to enable the introduction of advanced commercial telecommunications services, which U.S. industry is particularly interested in supporting either through equipment sales or services, or both. NTIA participated in December's meeting of the U.S.-India ICT Working Group and will continue to consult with India on this issue.
- **U.S.-Japan Telecom Working Group:** As part of the larger Regulatory Reform Initiative with Japan, this group meets twice a year to discuss a range of issues related to telecom regulatory reform. The group is led by USTR, and other U.S. Government participants include NTIA, ITA, FCC and the Department of State. Japan's delegation is led by their Ministry of Foreign Affairs (MOFA) and MIC. In 2006, the U.S. Government used this dialogue to discuss problem areas related to Japanese spectrum policy and practices (such as licensing, allocation, testing and fees) and requested more transparent administration; the promotion of greater innovation, competition and efficient spectrum use; and adherence to technology-neutral principles.
- **Quarterly Trade Talks with the Republic of Korea:** USTR meets with Korea on a quarterly basis for trade talks to address any existing market access issues including, but not limited to, telecommunications. In 2004, USTR, along with relevant U.S. Government agency guidance and support, used these talks to address the Korean government's announcement to re-allocate the 2.3 GHz spectrum to a new portable broadband Internet system with only one permitted technology standard. At the United States' insistence, the Korean government provided a written justification for its one-technology preference in January 2004. The U.S. Government and private

sector found serious flaws in Korea's justification, and some called into question Korea's adherence to its bilateral and WTO commitments. In June 2004, the Korean government modified its position and officially announced that all license holders use a technology compatible with the International Institute of Electrical and Electronics Engineers (IEEE) 802.16(e) Rev. D (or any subsequent version) air interface standard, as well as satisfy some minimum performance requirements. Although less trade restrictive than mandating a "home grown" Korean standard – as the Korean government originally planned – this decision nevertheless remains overly trade restrictive.³³ The United States continues to monitor this and related issues and work with Korea to address trade barriers.

- **U.S.-China Joint Commission on Commerce and Trade (JCCT):** The JCCT was established in 1983 as a government-to-government consultative forum to resolve trade concerns and promote bilateral commercial opportunities. The Commission is co-chaired on the United States side by two cabinet officials (the Secretary of Commerce and the U.S. Trade Representative) and on the Chinese side by the Vice Premier responsible for foreign trade. During the April 2004 JCCT meeting, Vice Premier Wu Yi committed to support technology neutrality for 3G standards, and since then, Ministry of Information Industry (MII) officials have provided similar assurances to U.S. officials. However, the Chinese government has openly demonstrated favoritism and provided financial and policy support for Chinese "national" standards. Despite repeated assurances from MII that operators would be allowed to choose which technology or system to deploy, uncertainty remains about how 3G services in China will be licensed and whether licensing requirements may affect the decision of which 3G technologies are adopted by an operator. Through the JCCT and other bilateral opportunities, the United States continues to address this issue with China.

c. Informal Dialogues and Capacity Building

Multilateral and bilateral capacity building initiatives also have proven effective in promoting U.S. spectrum policy, as well as effective in avoiding potential spectrum-related disputes. While some aspect of capacity building is arguably indirectly involved in all of the above noted activities, the United States continues to be involved in a number of targeted annual and ad-hoc training of government personnel and capacity building initiatives including:

- **United States Telecommunications Training Institute (USTTI):** USTTI is a non-profit partnership between senior federal officials and leaders of the U.S. telecommunications, information technology (IT) and broadcast industries. The goal of this collective effort is to share the United States' technological and managerial advances on a global basis by providing a comprehensive array of intensive tuition-free training courses for qualified women and men who regulate and maintain IT and communications infrastructures throughout the developing world. Under the auspices of USTTI, both NTIA and FCC offer

³³ 2005 National Trade Estimate Report on Foreign Trade Barriers, U.S. Trade Representative, at 394-395 (March 2005), http://www.ustr.gov/assets/Document_Library/Reports_Publications/2005/2005_NTE_Report/asset_upload_file383_7446.pdf.

annual spectrum management training for spectrum professionals and regulators from developing countries. These seminars are provided free of charge and cover basic and advanced spectrum management, computer-aided techniques and development of commercial enterprises.

- **FCC International Visitors Program:** The International Visitors Program (IVP) facilitates informal discussions between foreign delegations and FCC personnel who provide legal, technical and economic perspectives on a wide range of communications issues involving spectrum, broadcasting, cablecasting and telecommunications. Such interdisciplinary exchanges are intended to offer insight into each other's regulatory agencies, policies and procedures. These meetings are increasingly important as telecommunications networks become global in scope and many countries seek to modify their regulatory approaches to foster privatization and competition in the telecommunications marketplace. IVP briefings provide useful opportunities for exchanging information and perspectives as the United States and other governments negotiate international agreements to reflect these marketplace and regulatory changes.
- **Ad-hoc Training Initiatives:** The U.S. State Department, often with support of the U.S. Agency for International Development (USAID) Telecommunications Leadership Program (TLP), will frequently support training initiatives for delegates from developing countries of strategic importance to the U.S. telecommunications sector. Such initiatives typically involve training sessions or briefings with NTIA and FCC officials. For example, in 2004, a delegation of U.S. spectrum management experts from both NTIA and FCC traveled to Delhi, India to provide training and consultation on technical and regulatory aspects of spectrum management. In 2005 there was a joint State, NTIA, and FCC delegation sent to Ukraine to meet with its newly formed independent regulatory body.

Given the importance that personal relationships and dialogues hold in managing barriers to the implementation of U.S. technologies and services, it is essential for the United States to maintain or enhance its outreach and capacity building efforts for foreign leaders. By taking advantage of opportunities to meet with foreign delegates through more active involvement in the ITU-Development Sector (ITU-D) or when they visit the United States, for USTTI classes or FCC International Visitors Programs, agencies involved with spectrum management can strengthen personal relationships and remain aware of developments in the international regulatory arena. Moreover, outreach to foreign leaders can help guide countries, especially developing countries, on best practices for international spectrum management and assist in improving spectrum management operations worldwide.

6. Targeted Trade Advocacy

In certain cases, the U.S. government advocates on behalf of U.S. firms involved in foreign government project or procurement competitions. U.S. advocacy assistance promotes U.S. exports, supports U.S. employment and increases global market share for U.S. businesses. In many cases, U.S. government efforts counter foreign government advocacy and political pressure, thus "leveling the playing field" for U.S. companies.

Advocacy conflicts are particularly difficult to recognize with regard to telecommunications and information and communications technology (ICT) policy, where the complexities and interplay

of spectrum, standards and licensing are not always obvious. In the global telecom/ICT environment, regulatory decisions, investment opportunities and contract awards in a host country are rarely isolated events with a single best outcome for U.S. interests. The dynamics of the global telecom/ICT environment mean that U.S. government advocacy officials are increasingly unlikely to know which U.S. interests have a stake in the outcome of a local (foreign) decision.

Decisions concerning the use of spectrum, in particular, often carry an inherent bias towards certain technical solutions. Financial qualifications and other licensing requirements may favor large investors over smaller ones. Mandated equipment standards could benefit a United States-local company joint-venture for telecom services to the detriment of a U.S. equipment exporter that produces to a different standard. These issues and others may all be present at the same time, making it difficult or inappropriate for U.S. government advocacy officials to take a position that accounts for the preferences and intentions of all U.S. players. Furthermore, in such a dynamic global environment where a technology's "citizenship" may be difficult to distinguish, the origin of a technology is only one of many factors in an advocacy decision.

In light of these complexities, full vetting and interagency consultation is required prior to any advocacy decision. A key role of NTIA, FCC and other relevant government agencies is to provide technical expertise and policy guidance to the State and Commerce Departments and USTR when advocating on behalf of federal and non-federal spectrum users and addressing problems experienced by U.S. exporters with respect to spectrum-related products.

7. License-Exempt Devices

One common issue that arises frequently in trade discussions as a reason for apparent barriers is the different treatment within different countries of short-range or low-power devices, such as medical devices, "Bluetooth" and "Wi-Fi" communications devices. Historically, these types of radios are covered by national regulations that govern the devices, which include technical specifications and power limits, but not requirements for service licenses, and hence, have not been the subject of WRC allocation activities or technical recommendations. However, WRC-03 allocated significant bandwidth in the 5 GHz range for mobile services devices with the intention of facilitating "Wi-Fi", which the U.S. accommodated as unlicensed devices in this bandwidth. Most importantly this allocation includes the required technical rules to ensure that unacceptable interference will not be caused to services operating pursuant to primary allocations. However, the ITU appears to have limited ability to effectively address the many issues presented by the international mobility and use of unlicensed devices that would be consistent with U.S. objectives.

Substantial continued growth is expected in the use of license-exempt devices, increasingly for wireless broadband access, including "Wi-Fi" and WiMAX-type devices, which ultimately are likely to provide mobile broadband access. U.S. technology developers and equipment manufacturers are seeking access to the U.S. as well as foreign markets for these types of technologies.

8. Conclusion and Recommendations

Given the increasingly global nature of the telecommunications marketplace, the United States must continuously monitor regulatory and spectrum management policies of administrations throughout the world to identify barriers inhibiting the deployment of innovative new spectrum-dependent technologies and services. In order to address existing or potential barriers, the United States should continue to rely upon international organizations such as the WTO and ITU, trade agreements, multilateral and bilateral dialogues with key foreign administrations, capacity building initiatives and targeted trade advocacy.

Further consideration should be given to developing a coherent approach to addressing the use of unlicensed devices, from the standpoint of spectrum use, technical standards for devices and market access. The United States continues to remain active within the global telecommunications and trade communities, as well as through numerous informal channels and personal relationships. Through expanded U.S. inter-agency collaboration, as well as ongoing activities within global telecommunications and trade forums, the United States will be able to maximize its use of these mechanisms to ensure that regulations and agreements support introduction of U.S. technologies and services, including those utilizing advanced technologies.

Recognizing the increasingly global nature of the telecommunications marketplace, the following recommendations are offered:

- The United States must continue to work actively through multilateral organizations, as well as existing bilateral processes, to monitor relevant policies throughout the world and ensure that barriers do not prevent the international deployment of innovative new spectrum-dependent technologies and services of interest to the United States.
- The United States should remain involved with international organizations such as the ITU and further utilize trade agreements, as well as multilateral and bilateral dialogues, to improve regulatory frameworks, remove regulatory and other trade barriers, advance technologically neutral policies, and promote open markets for U.S. companies who seek to deploy new and innovative spectrum-dependent technologies.
- NTIA should work closely with other Department of Commerce agencies, to keep abreast of the problems experienced by U.S. exporters with respect to spectrum-related products.
- NTIA and FCC, taking into account the needs of federal and non-federal users that require spectrum access to operate radios abroad, should continue to provide technical expertise and policy guidance to the USTR, the State Department, and other U.S. organizations involved with trade and global policy matters. Expanded collaboration among relevant agencies will ensure that international regulations and policies related to spectrum access and use, as well as basic system definitions, and will permit the flexibility demanded by rapid technology developments while protecting the spectrum equities of the United States.
- The United States should strengthen international outreach efforts aimed at improving spectrum management operations of other countries, particularly developing countries.

- By participating more actively in the ITU-Development sector and engaging in more frequent bilateral meetings with key representatives of strategic countries throughout the world, the United States can enhance goodwill and mutual understanding about United States and international technology, spectrum and regulatory issues.
- By taking a leadership role in establishing contact with foreign delegates when they visit the United States, whether at USTTI classes or FCC International Visitors Programs, agencies involved with spectrum management can strengthen personal relationships and remain aware of developments in the international regulatory arena.

B. United States Technical, Administrative and Financial Contributions to Organizations Involved in International Spectrum Policy Issues

Spectrum-based services, operations and technologies are increasingly international in nature. If the goals and objectives related to international telecommunications spectrum management identified in the President's Spectrum Policy Initiative are to be realized, it is critical that the predominant organization involved in international spectrum issues, the ITU, is managed in a fiscally sound and responsible manner. In addressing this task, the United States has fostered more effective use of the management tools available to ITU members, namely the Strategic, Operational and Financial Plans.

The importance of the linkages between the Strategic, Operational and Financial Plans cannot be overstated. The Operational Plans identify ITU activities and provide a framework for achieving priorities and objectives identified in the Strategic Plan. The Financial Plan allocates funds for activities identified in the Operational Plans, and provides a mechanism for tracking expenditures. As internal ITU reform efforts work towards results-based budgeting, the Strategic Plan becomes even more important in guiding ITU activities. Consequently, it was imperative that ITU members develop the Strategic Plan taking into account these critical linkages and their impact on the balanced budget requirement. In addition, objectives identified in the Strategic Plan for the General Secretariat and the three ITU Sectors (*i.e.*, the Radiocommunication Sector, the Telecommunication Standardization Sector, and the Development Sector) should relate to the overall mission of the Union and remain consistent with U.S. priorities. Planned outputs for the General Secretariat and all three Sectors, also identified in the Strategic Plan, should be worded clearly with language supporting measurable performance indicators and results-based budgeting.

The United States focused on linkages between these three plans and contributed towards the proposed revision of the Strategic Plan of the Union, which was updated at the November 2006 ITU Plenipotentiary Conference. U.S. inter-agency preparations on these Plans led to the drafting of numerous contributions that were submitted to the ITU on behalf of the United States. After lengthy debate and discussion among ITU members at the April 2006 ITU Council meeting, the U.S. delegation was successful in revising the General Secretariat section of the Strategic Plan focusing on the budget, conference and meeting support, building and infrastructure issues, and coordination among the ITU sectors. The United States also was successful in advocating its proposals to eliminate duplication of activities among the three

sectors. Priorities and objectives identified for each Sector including the Radiocommunication Sector were consistent with U.S. policy goals.

Moreover, the United States will contribute to the development of ITU-R priorities and recommended efficiency improvements to respond to ITU funding pressures affecting that sector. It was acknowledged that additional work was needed to refine further the process for defining and measuring sector accomplishments to achieve results-based budgeting or objectively implement budget cuts, if necessary.

The United States participated in multilateral discussions leading up to the November 2006 ITU Plenipotentiary Conference. Through active participation in ITU administrative deliberations, the United States was able to advocate administrative policies and procedures essential to the success of new U.S. technologies and the advancement of the interests of U.S. federal and non-federal radiocommunication users.³⁴

Given the important role international bodies, specifically the ITU, play in the implementation of U.S. global spectrum policy objectives, it is essential that organizations such as the ITU are managed in a fiscally sound and responsible manner. The interconnected nature of the ITU's Strategic, Operational and Financial Plans causes any adjustments to administrative or financial procedures to have a direct impact on the overall effectiveness of the ITU in carrying out its objectives, including those related to spectrum management.

The United States, through its various inter-agency processes and regional and ITU working groups, should continue to contribute actively to deliberations on ITU administrative and financial procedures, and to advocate operational efficiency, flexibility and results-based budgeting when possible.

C. Cross-Border Coordination Process with Administrations in Neighboring Countries

1. Introduction

Because radiocommunication services have the potential to produce transmissions that extend beyond national borders, international collaboration is often required to protect services and avoid interference. The framework for protection from interference is afforded through worldwide international treaties, for example, ITU procedures are used to coordinate most satellite applications. However, for terrestrial stations operating at frequencies above 28 megahertz (MHz), interference protection generally must be obtained through bilateral or regional agreements and direct coordination with the neighboring country. The United States has entered into a number of bilateral and regional arrangements with Canada and Mexico for services operating at frequencies above 28 MHz, as well as for selected non-broadcast services operating at frequencies below 28 MHz. For broadcasting operations that may have extensive

³⁴ Due to expected shortfall in the ITU operating budget for the coming years, the Department of State has initiated a detailed review of all ITU activities within the ITU Plenipotentiary preparation process. It is expected that the U.S. will make substantial cost-savings proposals to the Plenipotentiary Conference, ITU Council and ITU Sectors.

geographic reach, the United States has entered into a number of regional agreements and has coordinated multilaterally when appropriate.

The following describes the processes through which the United States negotiates terrestrial radiocommunication issues with Canada and Mexico. In each case, NTIA, FCC and the Department of State work closely together to ensure that conclusions reached are in the public interest and are technically sound and consistent with broader U.S. policy goals. These procedures have been in place for many years and have proven successful in advancing wireless communications on both sides of the borders. These procedures include, but are not limited to: (1) obtaining prior Department of State authority to conduct negotiations (also known as “Circular 175 authority”) with foreign governments for spectrum use in international telecommunications agreements; (2) State Department coordination of U.S. Government negotiating positions among agencies; and (3) ensuring that resulting spectrum agreements are binding under international law.

Current “binding” agreements between the United States and Canada and between the United States and Mexico are listed in the State Department’s Treaties in Force (TIF) document which can be found on-line at <http://www.state.gov/s/l/treaty/treaties>. Texts of most of the agreements listed in TIF may be found on-line at <http://www.fcc.gov/ib/sand/agree>.

2. Canada

Discussions with Canada on frequency coordination and sharing agreements and arrangements are conducted in several bilateral arenas involving various U.S. agencies. The Department of State’s Office of International Communications and Information Policy (CIP) has the overall lead responsibility to ensure that all relevant U.S. government policies are taken into account.

NTIA’s Interdepartment Radio Advisory Committee’s (IRAC) Ad Hoc 181 working group, chaired by the Department of State, considers proposals and positions to modify existing United States/Canada radio frequency coordination/sharing agreements or arrangements and develops new ones. Ad Hoc 181 currently is preparing recommendations on provisions of to amend the 1962 Agreement concerning the Coordination and Use of Radio Frequencies Above 30 Megacycles per Second (“the 1962 Agreement”). The replacement agreement will be limited to non-broadcasting, terrestrial radiocommunication services, and will include frequency bands below and above 30 MHz.

With respect to issues that primarily affect the FCC and its constituents, the United States engages with Canada through regular bi-lateral dialogues on non-broadcasting radiocommunication issues via the Radio Technical Liaison Committee (RTLCL). The RTLCL, co-chaired by FCC and Industry Canada (IC) officials, meets several times a year to discuss issues pertaining to technological and regulatory compatibility of terrestrial non-broadcasting radio services. It provides a forum for direct exchange of information between technical experts and aims to promote early coordination on spectrum allocations and to facilitate negotiation and conclusion of spectrum sharing arrangements necessary for the licensing of non-federal stations along the common border. The FCC participates under the auspices of the State Department’s CIP. NTIA plays an active role during meetings because so many of the issues discussed touch

on Federal agency interests. However, it should be noted that NTIA does not have a mechanism similar to the FCC-led RTLC to conduct direct discussions with its Canadian counterpart at this time.

Discussions regarding broadcasting spectrum are held as needed between FCC broadcast experts and IC rather than as part of the RLTC discussions. Satellite services are coordinated by the two countries under ITU procedures rather than under bilateral agreements. With regard to frequency coordination and sharing agreements, the United States and Canada have concluded AM and FM radio agreements, a TV agreement supplemented by a Letter of Understanding regarding the introduction of digital TV and the use of broadcasting spectrum for other services, and an agreement regarding primarily non-broadcasting, terrestrial radiocommunication services.

Most day-to-day coordination with Canada is conducted under the 1962 Agreement, which, as amended, includes various “Arrangements” dealing with the coordination and sharing of radio spectrum between the United States and Canada for primarily non-broadcasting, terrestrial radiocommunication services. To a limited extent, the 1962 Agreement applies to coordination and sharing with respect to space radiocommunication services. The 1962 Agreement has been amended from time to time for various purposes and such amendments have generally been in the form of new or amended Arrangements. There are now seven Arrangements to the 1962 Agreement with the latest having been concluded in June 2005.

Also, the FCC, and NTIA have informally established various “Interim Arrangements” with IC or its predecessor agencies on certain spectrum issues. These Interim Arrangements are being applied provisionally by the FCC, NTIA, and IC until the amendments to, or a replacement agreement for, the 1962 Agreement have been established between the United States and Canada. Some of the Interim Arrangements are outdated and need to be revised. In such cases, these “Interim Arrangements” may form the starting point for negotiation of new Arrangements under the 1962 Agreement. Those Interim Arrangements that have not already been incorporated into new Arrangements under the 1962 Agreement will be incorporated, as modified, into new Arrangements appended to the replacement Agreement that the United States and Canada are negotiating. Once concluded, this replacement Agreement will bring our cooperation in the area of non-broadcasting, terrestrial radiocommunications up to date, and provide the opportunity to include in a binding agreement the terms of the various Interim Arrangements informally agreed to over the years between the FCC, NTIA, and IC.

The State Department has granted authority for negotiating new or amended Arrangements between the United States and Canada as follows:

- 849-851/894-896 MHz - Commercial Air-ground Radiotelephone Services;
- 1427-1432 MHz - Automated Meter Reading and Subscriber Radio Systems;
- 2495-2690 MHz - Broadband Services;
- 4940-4990 MHz - Wireless Communications Services For Public Safety;
- 5850-5925 MHz - Intelligent Transportation Systems;
- 1710-1755/2110-2155, 1850-2000 or 1915-1920/1995-2000, and 2020-2025/2175-2180 MHz - Advanced Wireless Services;

- 806-824/851-869 MHz and 1910-1915/1990-1995 MHz Band reconfiguration related to FCC's 800 MHz Nextel/public safety rebanding proceeding;
- 138-144, 148-149.9, 150.05-150.8, 162-173.2, 173.4-174, 380-399.9, and 406.1-420 MHz - U.S. federal government fixed and mobile services;
- 1850-1915 MHz and 1920-1995 MHz Band – Personal Communications Services (PCS);
- 700 MHz Band – Public Safety Services;
- 700 MHz Band – Commercial Mobile Radio Services; and
- 1670-1675 MHz – Mobile Flexible Use.

There are a number of frequency bands and services whose operations are likely to be addressed in future negotiations including:

- 216-220 MHz Licensing;
- 220-222 MHz Licensing;
- 944-952 / 953-960 MHz Licensing;
- 3650-3700 MHz Licensing;
- 409-410/420-421 MHz Land Mobile Usage;
- 4400-5000 MHz band particularly with respect to radio astronomy; and
- 27 GHz sharing between terrestrial and space services.
- 71-76 GHz, 81-86 GHz and 92-95 GHz

During the review and evaluation of U.S. cross-border activities with Canada, U.S. federal agencies indicated that, while the existing approach has been generally effective, they would benefit from having a group similar to the RTLC that focused on government issues pertaining to the technological and regulatory compatibility of terrestrial non-broadcast radio services. This benefit is due to the type and level of interactions with Canada on matters of mutual interest. NTIA plans to pursue creating a forum in which NTIA and federal agencies would work with Canadian officials on government spectrum matters. This new committee would be led by NTIA but like RTLC would be under the auspices of Department of State and Ad Hoc 181 would continue to be the principal preparatory mechanism.

3. Mexico

U.S. negotiations with Mexico regarding border frequency sharing and coordination agreements are held under the United States-Mexico High Level Consultative Commission on Telecommunications (HLCC). The HLCC, established in 1990, and led by the Department of State and Mexico's Ministry of Communications and Transportation (SCT), covers both federal and non-federal telecommunications issues for both governments. The HLCC is composed of three principals from the United States and two principals from Mexico. The U.S. principals are: the Assistant Secretary for Communications and Information at the Department of Commerce, the Chairman of the FCC, and the U.S. Coordinator for International Communications and Information Policy at the Department of State. The two principals from Mexico are: the Under Secretary of Communications in the SCT and the Chair of the Federal Telecommunications Commission (COFETEL). The HLCC is convened every year or as otherwise needed for: (1)

consultations on important regulatory, standards, administrative and telecommunications policy issues; (2) concluding (signing) new agreements and protocols; and (3) the establishment of cooperative work plans. In August 2007, the HLCC Working Level Group including Task Groups to address the following topics: radiocommunications, satellites, broadcasting, planning communication services, security communications, 800 MHz reconfiguration, maritime communications and the North American Security and Prosperity Partnership Initiative. Additional information on the HLCC can be found at <http://www.state.gov/e/eb/cip/c622.htm> which also includes the HLCC Directory of Bilateral Issues 2007-2009 that lists the current topics being discussed by the United States and Mexico under the HLCC.

The Department of State has granted authority for negotiating new or amended agreements between the United States and Mexico as follows:

- 550-1700 kHz and 54-806 MHz to amend existing broadcasting agreements to resolve interference;
- 54-806 MHz low power television service;
- 88-108 MHz compatibility between FM broadcasting stations and television stations on Channel 6 (82-88 MHz);
- Aeronautical communications services including the bands 108-137, 328.6-335.4, 960-1215, 1545-1560, 1646-1660, 2700-1900, 5000-5250 and 9000-9200 MHz;
- 148-174, 216-220, 380-399.9 and 450-512 MHz fixed and mobile services;
- 698-806 MHz public safety and commercial radiocommunication services;
- 806-824/851-869 and 1910-1915/1990-1995 MHz band reconfiguration related to the FCC's 800 MHz Nextel/public safety rebanding proceeding;
- 806-960 MHz fixed and mobile services;
- 849-851/894-896 MHz for upgrading commercial air-ground radiotelephone services;
- 1990-2110 MHz the mobile service and mobile satellite service; and
- Resolution of harmful interference in frequency bands not subject to an agreement.

The IRAC's Ad Hoc 170 working group, which is chaired by the Department of State, serves as the focal point for interagency formulation and coordination of positions for NTIA administered spectrum that are negotiated at the HLCC. The purposes of Ad Hoc 170 are to: (1) prepare draft positions for negotiating, concluding, and implementing United States-Mexico telecommunications agreements that involve U.S. government spectrum; and (2) recommend changes to the NTIA Manual to support issues treated in the U.S.-Mexico telecommunications relationship. Specific tasks of Ad Hoc 170 are to: (1) formulate positions by reviewing essential factors in negotiations and addressing the impact of positions on member agencies; (2) recommend to the IRAC draft positions on negotiating and concluding and implementing agreements; (3) review difficulties encountered in realizing full implementation of agreements with Mexico, and to formulate positions to achieve full implementation of those agreements; and (4) provide policy oversight for resolving cross-border interference cases that arise in the common border area including activities of the Joint Commission on Resolution of Radio Interference (CMERAR).

4. Conclusion and Recommendations

Through the various cross-border working groups, the United States has undertaken two similar approaches with its neighbors to promote effective spectrum management. The U.S. engagement with both Canada and Mexico requires the continued, active involvement of senior government leadership to remain successful. Considering the rapid pace of technological advances, the need to improve border security and the increased demand for wireless technologies in the border area economies, the cross-border dialogues are very important and their level and frequency are increasing. Moreover, given the potential influence that cross-border agreements potentially can have on larger regional or global spectrum negotiations, the United States is working closely with Canada and Mexico to address the impact of new and emerging technologies on existing spectrum allocations and bilateral regulatory frameworks.

Cross-border coordination through the Radio Technical Liaison Committee (RTLCL), Ad Hoc 181 Group on United States/Canadian Frequency Coordination Agreements, United States-Mexico HLCC, and Ad Hoc 170 Group on United States/Mexico Frequency Sharing Agreements have been largely successful in considering issues related to spectrum harmonization, interference, interoperability, and other telecommunications matters.

The U.S. government should remain engaged with both Canada and Mexico on international spectrum matters as resulting cross-border agreements can help leverage larger regional or international agreements on key issues such as spectrum harmonization.

NTIA and relevant federal agencies should better document and integrate cross-border objectives into its overall domestic spectrum management process. This could be assisted by the establishment of an NTIA-led group to work with Canada with coordination with the State Department. This group would serve a similar purpose for government spectrum matters as the FCC's Radio Technical Liaison Committee does for commercial spectrum matters. IRAC's Ad Hoc 181 committee would continue to be the focal point for federal agency preparatory activities for Canadian spectrum issues.

D. Global and Regional Spectrum Harmonization and Technical Interoperability

1. Introduction

As the global marketplace demands enhanced mobility of communications technologies, harmonized spectrum bands and improved technical interoperability among diverse systems play an increasingly important role in the international communications arena. In the United States, harmonization, and to a lesser extent, interoperability, are deemed useful, but not essential, precursors to the deployment of new technologies and services. The United States does not have a unified, explicit policy requiring regional or global harmonization or technical interoperability, but examines issues on an ad hoc basis weighing relevant costs and benefits to stakeholders. In view of the increasingly rapid development of radiocommunication innovations and spectrum requirements for both government and commercial systems, NTIA reviewed U.S. approaches towards global and regional spectrum harmonization and technical interoperability to ensure that policies do not impede the deployment of U.S. technologies and service innovations.

Harmonization of spectrum on a regional or global basis could enable economies of scale benefiting U.S. interests through lower prices for consumers and increased global sales for industry. Additionally, early designation of harmonized spectrum could minimize some risk to technology innovators who could better quantify potential market size for devices.³⁵ As important users of advanced devices, federal government entities would also stand to benefit from the ability to utilize equipment on a worldwide basis and at lower cost, whether through harmonized spectrum or technical interoperability.

On the other hand, there are instances where the time delay associated with obtaining global or regional spectrum harmonization via the ITU WRC process could negatively impact U.S. technology developers or federal and non-federal users. The time involved in coordinating global allocations through the WRC process can be lengthy, which may result in delayed deployment of a new technology in the U.S. marketplace. Importantly, given the increased convergence of communications technologies, spectrum harmonization may minimize flexibility in licensing next generation technologies in certain bands. Moreover, the financial, public safety or security implications of migrating incumbent users to accommodate a global or regional allocation could be prohibitive relative to benefits of harmonization.

2. Global and Regional Spectrum Harmonization

a. Objectives, Definitions, and Methodology

i. Objectives

This section focuses on spectrum harmonization, and to a lesser extent, technical system interoperability, with the following objectives:

- To assess U.S. policies and procedures regarding regional and global spectrum harmonization and technical interoperability, including some discussion of cross-border harmonization issues;
- To analyze the spectrum harmonization policies and procedures of several foreign administrations for comparison with the United States; and
- To provide recommendations for new approaches that could be examined to improve U.S. harmonization policies and procedures.

ii. Definitions

It is important to define key technical terms and concepts at the outset. For the purposes of this report, the following definitions will be used:

³⁵ European direction in harmonization may be summed up by the following statement: “The development and introduction of new technologies is so costly that large markets must be available to make the investment worthwhile. This means that it must be reasonably easy to have access to spectrum and that similar conditions on spectrum use have to apply throughout the entire internal market.” Viviane Reding, Member of the European Commission responsible for Information Society and Media, *Reaping the Benefits of a More Coherent European Approach to Spectrum Management*, European Spectrum Management Conference, Brussels, March 29, 2006.

Harmonization: Harmonization refers to activities leading to the adoption of common spectrum-use of regulatory approaches among countries. The ITU refers to harmonization as identifying common frequency bands to be used for a specific application, technology or service. Harmonization can occur at a worldwide level (at the ITU), at a Regional level (within CITELE), sub-regional level (within NATO), or even at a bi-lateral level (cross-border collaboration with Canada or Mexico). Spectrum management procedures and regulations can also be harmonized.

Interoperability: The ITU defines interoperability as the ability of two or more systems or applications to exchange information and mutually use the information that has been exchanged based on technical standards. This project addresses government rules within the spectrum management framework that require the use of a particular interoperability standard for devices operating on specified frequencies. Interoperability in this project is considered a subset of spectrum-use harmonization.

Spectrum Management Framework: The spectrum management framework consists of government rules such as allocation tables and procedures for regulating spectrum use including regulatory policies for licensing, procedures for avoiding interference, and the processes for making spectrum management decisions. Governments are the prime actors in the Spectrum Management-Framework.

Spectrum Application Framework: The spectrum application framework consists of rules for the use of spectrum that concern the application of spectrum to identified uses. Spectrum application rules may be imposed by governments or operators. Interoperability rules are an example of a very constraining spectrum application decision. Industry and customers are the prime actors in the spectrum application framework.

iii. Methodology

There were several approaches undertaken to address these objectives. First, the concept of technical interoperability was considered along with relevant U.S. policies. Second, several recent U.S. harmonization decisions were described and analyzed to determine what costs and benefits are considered in the U.S. inter-agency process, how they are weighed, and what impact this approach has had on the rapid deployment of new technologies and services.

The third approach was to interview U.S. officials involved in the international spectrum management process, as well as an array of industry stakeholders. These officials were interviewed to determine the significance of the current U.S. approach towards global and regional harmonization. Although the lack of policy has impacted U.S. interests in the global telecommunications fora, importantly, the current approach is generally considered by most government and industry users to be working well.

Lastly, the study examined the harmonization policies and procedures of several representative countries, as well as their views of the United States' own policies. Interestingly, most countries

also do not have explicit policies to pursue (or not pursue) harmonization. Other countries may view the pursuit of harmonization more favorably, particularly on a regional basis, to ensure the availability of cost-effective new technologies for their citizens; however, they also indicate a desire to maintain flexibility for national interests. While the United States has some measure of influence over the harmonization decisions of foreign administrations, overall, countries have their own formal or informal mechanisms to evaluate costs and benefits when determining their specific approach in each case.

b. Spectrum Use Harmonization

Spectrum-use harmony entails three interrelated decisional frameworks: the spectrum management framework, spectrum applications framework, and geographic scope. Spectrum-use harmony consists of simultaneous choices made in each of three frameworks. Each of the three frameworks consists of a continuum of choices: the spectrum management framework specifies allowable uses of bands of frequencies, narrowly or more flexibly; the spectrum application framework broadly or narrowly describes spectrum uses or applications; and the geographic scope framework indicates coverage area of operation, whether part of a country, a single country or a large number of countries. This section focuses on policy changes within the spectrum management framework that relate to international spectrum-use harmonization – policies related to commonality in spectrum-use among several countries rather than within a single country.

i. Spectrum Management Framework

The spectrum management framework consists of government rules (*e.g.*, allocation tables), license assignment policies (*e.g.*, auctions), rules for eliminating spectrum-related interference, guidelines on technical characteristics of radio stations (*e.g.*, power or bandwidth restrictions), and sometimes extensive rules for what services licensees can offer. Decisionmaking within the spectrum management framework is most often a government function with input from various interested parties. A country's spectrum management framework allows for a continuum of choices in spectrum varying in flexibility and the number of choices. Important U.S. spectrum management framework policies include achieving more extensive and effective use of the radio spectrum, minimizing interference, accommodating national security needs and providing mechanisms to accommodate future requirements for spectrum.

ii. Spectrum Application Framework

The spectrum application framework consists of the characteristics and applications or uses for radio devices. The spectrum application framework is directed primarily by users, such as service operators, who determine how they will use the spectrum resource assigned to them. Direct U.S. government action in the spectrum applications framework is usually associated with safety or scientific use of spectrum or certain applications, such as transportation or broadcasting.³⁶ Additionally, policies that direct government activities within the spectrum

³⁶ Setting requirements and specifications for addressing Radio Frequency Identification (RFID) security concerns for government purchases would be an example of government involvement in the spectrum application framework that might have implications for spectrum usage.

application framework often overlap with the government's spectrum management policies. For example, government policies for the spectrum management framework may seek to make more spectrum available in larger blocks for promoting use of wireless to extend broadband services to that country's entire territory. The related policy in the spectrum applications framework might be research into voice over wireless internet protocol (VOIP) networks and standards development or funding for rural broadband deployment using wireless.

Spectrum decisions often involve elements from both the spectrum management and spectrum application frameworks. In fact, spectrum management decisions are sometimes detailed enough to encompass spectrum application decisions.³⁷ Within the spectrum management and spectrum application interplay there are choices to be made, from both the frequency perspective and from the application perspective: (1) whether a frequency band is designated for a particular type of use (the use could be broadly or narrowly defined) or (2) whether the particular use may only be accommodated in the band(s) so designated. A fully specified spectrum-use arrangement would be for a band to be designated for one and only one well-specified use, and all such uses can occur only in that one band.³⁸ Likewise, often agreements with other countries involve both spectrum management and application aspects.³⁹ For example, when the United States and Europe reached an agreement concerning their respective Global Positioning System (GPS) and Galileo radionavigation satellite systems, the agreement included radio spectrum compatibility aspects, as well as application aspects dealing with interoperability.

iii. Geographic-Scope

Geographic scope is important to governments, industry, markets, and users. In this context geographic scope comprises an individual country's decisions to adopt or not adopt the rules or approaches of other countries. International "harmonizing" occurs when more than one country agrees to a common approach; the more countries in agreement, the more "global" the approach becomes. Regional harmony can also occur. Geographic scope inherently applies to the activities of all international organizations, as well as any bilateral decisions. Common spectrum management framework decisions adopted by many countries achieve spectrum management framework harmony. A common approach to spectrum issues among countries, such as using the same bands for satellites or High Frequency broadcasting, reduces compatibility problems and directs applications to bands that may be available in many countries, thus easing the harmonization of spectrum-applications. Applications, however, are described in general terms. Such harmonization of spectrum management framework decisions is an objective of the ITU.

c. Description of Activities Leading to Harmonization

ITU Radio Regulations, multilateral agreements and bilateral agreements all can establish harmonization or influence countries to adopt harmonized spectrum-use regulations. Short of a

³⁷ For example, India is liberalizing licensing in certain bands to promote outdoor use for rural broadband applications. While addressing a specific application, the decision is a spectrum management one. TRAI Press Release 27/2006 (March 20, 2006).

³⁸ For example, FM broadcasting.

³⁹ For example, when the United States and Europe reached an agreement concerning their respective Global Positioning System (GPS) and Galileo radionavigation satellite systems, the agreement included radio spectrum compatibility aspects, as well as application aspects dealing with interoperability.

treaty or binding agreements, international efforts can facilitate harmonized spectrum-use in a number of ways including research; consensus building; and development of spectrum sharing approaches, model regulatory approaches and frameworks for standardization. The results of such efforts may be varying degrees of geographic scope, specificity in spectrum applications and spectrum management flexibility.

i. Discussion of the Problem

The United States does not have a unified policy regarding the pursuit of regional or global spectrum harmonization. Cases are evaluated individually based on costs and benefits to incumbent users of the proposed spectrum band and manufacturers and potential consumers of the new service, in addition to potential impact on public and national security interests. Many of those interviewed as part of this study were unaware of whether or not there was a formal written policy other than knowing that an ad hoc approach is typically used. In seeking to evaluate and improve upon its international spectrum management policies and procedures, the United States must understand the costs and benefits of harmonization and determine whether a clear policy should be developed. This section will examine the issue of the lack of a policy on harmonization through the evaluation of the following:

- What are the costs and benefits of this lack of a policy?
- Should the United States develop a policy on harmonization?
- In the current ad hoc approach, what are the costs and benefits evaluated in each case?
- Should these costs and benefits be more explicitly and transparently analyzed in the inter-agency process and among affected stakeholders?
- Does the lack of a harmonization policy affect innovation and the rapid deployment of new technologies?
- Can technology flexibility, including multi-mode or multi-band capabilities overcome issues concerning harmonization?

These questions will be considered through analysis of several examples where the United States has addressed the issue of global or regional spectrum harmonization and through analysis of survey results collected from both United States and international spectrum managers and spectrum users.

d. Discussion of Case Studies

The purpose of the following analysis is to evaluate a few examples of past United States approaches to global and regional harmonization issues. The examples highlight instances where the United States and the global community considered the feasibility of global or regional spectrum harmonization for new technologies or services. The cases of IMT-2000, Digital Audio Radio Services (DARS), Public Protection and Disaster Relief (PPDR) services and High Density Fixed Services (HDFS) were considered to be representative of the deliberations that are undertaken by the U.S. government and related stakeholders when determining policy positions in advance of WRCs. These examples demonstrate how a case-by-case analysis of harmonization pros and cons works in practice.

i. Third Generation Wireless – International Mobile Telephony (IMT-2000)

a) *WRC Considerations of IMT-2000*

Substantive discussion of Fixed Public Land Mobile Telecommunications Systems (FPLMTS) spectrum allocations first occurred at the 1992 World Administrative Radiocommunication Conference (WARC-1992).⁴⁰ The IMT-2000 debate considered whether globally harmonized frequencies should be designated to enable international roaming which many countries deemed a viable and perhaps essential goal. After intensive deliberations, WARC-92 ‘identified’ through footnote 746A two separate blocks of spectrum ‘intended for’ IMT-2000 (1885-2025 MHz and 2110-2200 MHz). It should be noted that this was one of the first examples where the ITU used the term ‘identification’ as opposed to “allocation.”⁴¹ This wording preserved flexibility for national administrations to use the identified bands for other purposes and to use other frequency bands for mobile communications, while leading to a degree of harmonization of the bands for IMT-2000, (e.g., advanced wireless communications).

Domestic decisions made by the United States on advanced mobile communications caused tension among the many proponents of global harmonization for IMT-2000. Just prior to WARC-92, the United States announced intentions to auction spectrum for Personal Communications Systems (PCS) in overlapping, but different bands (1850-1910 MHz and 1930-1990 MHz) from those being considered by the ITU that reflected European frequency usage.⁴²

At WRC-2000, IMT-2000 proponents sought additional spectrum. The United States advocated multiple band “identifications” that reflected U.S. existing and planned use for advanced mobile services. Because global harmonization of specified bands for additional IMT-2000 frequencies remained a priority for many countries, the WRC identified additional spectrum for IMT-2000 in multiple bands (806-960 MHz, 1710-1885 MHz and 2500-2690 MHz). In many countries, the preferred new band at 2500 MHz was not readily available for IMT-2000 thus language was

⁴⁰ Fixed Public Land Mobile Telecommunications Systems (FPLMTS), subsequently renamed IMT-2000, was a concept under development in Europe through the International Radio Consultative Committee (CCIR). IMT-2000 has been implemented in a number of countries including in the United States as 3G technologies. However, it has not, as originally envisioned, generally replaced second generation mobile systems like GSM. [International Telecommunications Union Website, http://www.itu.int/ITU-R/index.asp?category=archives&link=rcpm&lang=en](http://www.itu.int/ITU-R/index.asp?category=archives&link=rcpm&lang=en) (password protected).

⁴¹ The usage of ‘identifications,’ while providing individual administrations with the flexibility to allocate spectrum based on national interests, continues to cause conflicts as some administrations treat ‘identifications’ as indicating that administrations are obligated to make the band available for IMT. This is less of an issue today after additional bands that are not universally available were identified in 2000 and administrations must choose among several possible uses. International Telecommunications Union Website, <http://www.itu.int/itudoc/itu-r/archives/rsg/1998-00/cpm99-2/056e.html> (password protected).

⁴² At the time of WARC-92 IMT-2000 (FPLMTS) was a vague concept with many firms working to develop alternative standards and capabilities. Unlike IMT-2000, the U.S. PCS was not a standards lead development. The language in the FCC’s PCS rulings was technology-neutral and broad enough to incorporate any version of emerging mobile communications. This approach has continued through allocation of several additional bands and introduction of many new technologies. International Telecommunications Union, Final Acts of the World Radiocommunication Conference (WRC-2000) Istanbul, May 8-June 2, 2000, http://www.itu.int/itudoc/itu-r/archives/rag/rag2001/27_ww9.doc.

accepted enabling administrations to implement any of the bands in any time frame, for any service or technology, and use any portions of the bands deemed appropriate based on national requirements.⁴³ While this language was acceptable to the United States, it did not satisfy other countries' objectives for global harmonization.⁴⁴

b) Assessing Costs and Benefits

The United States' decisions not to work towards globally harmonized frequencies for IMT-2000 flowed directly from the U.S. PCS allocations that were in conflict with those of Europe. The lack of globally harmonized spectrum has affected manufacturers' global marketing efforts and consumers who may benefit less from economies of scale for advanced wireless devices.⁴⁵ In the case of IMT-2000, the following should be considered: what factors were assessed nationally?; what were the overall costs and benefits to the United States?; and did U.S. IMT-2000 decisions impact the timely deployment of advanced mobile technologies in the United States?

c) Costs That Might be Attributable to Systems Operating in Different Bands

As the marketplace for emerging mobile telecommunications services continues to grow in both the developed and developing world, it is difficult to fully quantify losses to consumers and manufacturers. Related costs could include additional research and development required to design a variety of multi-band handsets including features that appeal to a diverse market.

It is difficult, however, to separate the arguments between competing technologies and their preferred bands and lack of harmony in frequency usage. The U.S. market for mobile services continues to be sufficiently large so that manufacturing costs to match equipment to U.S. unique bands are not substantially above worldwide costs. Moreover, the initial reasoning behind efforts towards global harmonization was to achieve worldwide roaming; however, costs to average U.S. users are less noticeable in this area. As a relatively small percentage of U.S. consumers are regular global travelers, lost benefits of global roaming, while certainly a cost to

⁴³ Report of the United States Delegation, U.S. Department of State, World Radiocommunication Council 2000 (May 8 – June 2, 2000).

⁴⁴ Implementation in the 2500 MHz band has not yet occurred and international standards discussions are still underway to define what future IMT-2000 technologies that might be applied to this band. Europe has embarked on a project called Wireless Access Platforms for Electron Communication Services (WAPECS) to define a set of services beyond IMT-2000 and 3G that would be suitable for the 2500 MHz band. Some interests in Europe would like new entities to be licensed in this band and seek services beyond 3G. See EC RSC Comments, Radio Spectrum Policy Group Opinion on Wireless Access Platforms for Electronic Communication Service, RSPG05-102 final (November 23, 2005),

http://europa.eu.int/information_society/policy/radio_spectrum/docs/by_topics/rspg05_102_wapecs.pdf. However, in the United States, advanced mobile services are being installed. Other countries may not ever have the entire band available for IMT-2000 and allocation and sharing issues are on WRC agendas.

⁴⁵ The use of different bands for second generation technologies and their unique follow-on third generation technologies has been more at issue now that use of the new IMT-2000 band at 2 GHz has been the root of many market access disputes between U.S. and other national suppliers in third-party countries. Differences in first generation mobile bands have also played a part in such disputes.

international travelers to countries other than Canada and Mexico, are not significant compared to nationwide domestic service revenue.

A lesser objective was to enhance exports U.S. bands to other countries. In this case regional instead of global harmonization for the purpose of roaming was a more desirable objective for larger markets such as the United States.⁴⁶ Moreover, multi-band handsets, while still costly, have enabled technical interoperability where harmonization is not achieved. To some extent, other countries have adapted by offering technologies and services designed for U.S. bands.

d) Costs to the United States if Global Harmonization Are Supported

Of critical importance is the cost of migrating existing users to new spectrum in order to create room for new technologies.⁴⁷ The United States does not have a formal policy for considering financial and other related costs; however, an ad-hoc cost-benefit analysis is often undertaken. Subsequently, the United States has put in place legislation and policies that allow for reassignment of U.S. government radio systems. Time to accomplish reassignment is also a major factor in the decision-making process. Delaying the consumer benefits of PCS until harmonization could be achieved would not have been acceptable.

In preparation for WRC-2000, the United States undertook an assessment of market potential and technical specifications of IMT-2000 as well as the feasibility and costs of migration should additional frequency bands be made available during the conference.⁴⁸ It was determined nationally that the 1755-1850 MHz band was *not* viable for 3G due to the U.S. Government's extensive and critical operations in these frequencies. It also was determined, however, that the 1710-1755 MHz portion of the U.S. Government's spectrum *was* viable.⁴⁹

e) Benefits of Non-Harmonization

Understanding the context in which the United States decided not to harmonize with WARC-92 identifications is important when considering benefits to the United States. At that time, GSM was the European digital standard for cellular technology, while within the United States multiple standards were competing such as TDMA and CDMA. IMT-2000 (FPLMTS) was a concept being developed by Europe as a replacement for GSM; however, the exact specifications

⁴⁶ In this regard, the United States also benefits from having a large unified market. International roaming would be more of a priority for regions such as Europe where national markets are smaller and harmonization is more of a practical necessity.

⁴⁷ WRC-2000 identified the entire 1710-1885 MHz band for IMT-2000, but the United States only allocated 1710-1755 for this purpose. International Telecommunications Union, Final Acts of the World Radiocommunication Conference (WRC-2000) Istanbul, May 8-June 2, 2000, http://www.itu.int/itudoc/itu-r/archives/rag/rag2001/27_ww9.doc.

⁴⁸ Public Notice, 17 FCC Daily Digest 165, DA 98-103, August 26, 1998.

⁴⁹ However, the band pairing is significantly different than the pairing associated with many IMT-2000 implementations. Auctions for this spectrum concluded on September 18, 2006. Through a statutorily-established Spectrum Relocation Fund, proceeds from the auction of this spectrum are being used to pay the costs associated with migrating U.S. Government users to new spectrum. See Commercial Spectrum Enhancement Act, Pub. L. No. 108-494, 118 Stat. 3991, 3994, sec. 118 (Dec. 23, 2004) *codified at* 47 U.S.C. § 928.

of the technology were still conceptual. Allocating spectrum to a service that was undefined and whose spectrum needs were still vague seemed to U.S. delegates as leading to an inefficient use of spectrum.⁵⁰

f) Conclusion

The IMT-2000 issue holds important lessons regarding the development of a formal policy on global harmonization, particularly when considering spectrum requirements for emerging technologies. As advanced systems, including 3G and now 4G, take hold of the market, it is clear that applications require more bandwidth than may currently be available. In order to promote continued growth in rapidly evolving radiocommunication technologies and services for U.S. consumers and manufacturers, a forward-looking view towards improved spectrum efficiency, spectrum availability and allocations is essential. However, along with long-term planning exists the risk that decisions on emerging, but still unknown, technologies will be taken prematurely and stifle market innovation.⁵¹

E. Satellite Digital Audio Radio Services (DARS)

WARC-92 considered the issue of allocating additional bands, higher in the spectrum than existing FM broadcasts, for digital audio services. At the same time, additional spectrum was sought for Satellite Digital Audio Radio Services (known as Broadcast Satellite Service-Sound or BSS-Sound internationally) referring to the delivery of information or audio programming via satellites directly to consumer radios. Prior to WARC-92 there was no consensus on what bands to allocate for broadcasting. Many other countries, including Canada, supported an allocation in the 1400 MHz band (1452-1492 MHz), primarily for a new digital terrestrial broadcast service but also to include satellite services. However, while the United States had a keen interest in the satellite service allocating the 1400 MHz band presented difficulties. Also the idea implementing a new terrestrial broadcast service in the United States was controversial. The United States identified the 2310-2360 MHz band as suitable for the new broadcasting satellite service. The discussion over whether or not to support a globally harmonized allocation for digital broadcasting for both terrestrial and satellite delivery formed one of the most intense debates leading into WARC-92.

1. Background

The concept of BSS-Sound was envisioned as a useful platform for international broadcasting, in part as a way to alleviate the demand of other types of broadcasting systems such as High Frequency (HF) broadcasting. BSS-Sound technology had been discussed as early as the WARC-79 conference, but formal decisions were deferred continually to future conferences. The WARC ORB-88 conference agreed to add an item to the WARC-92 Agenda to consider

⁵⁰ The 1992 World Administrative Radio Conference: Technology and Policy Implications, Congress of the U.S., Office of Technology Assessment (May 1993), http://govinfo.library.unt.edu/ota/Ota_1/DATA/1993/9345.PDF.

⁵¹ For the 2500 MHz band the United States has taken a somewhat different approach to both new technologies and frequency band incumbents by removing regulations that apply to bands and by allowing any technology, including but not limited to, IMT-2000 technologies. *Amendment of Parts 1, 21, 73, 74 and 101 of the Commission's Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands*, FCC 04-135, Report and Order, 19 FCCR 14165 (2004).

appropriate frequencies and possible allocations for BSS-Sound in the range 500-3000 MHz, including the accommodation of complementary terrestrial sound broadcasting within this allocation.⁵² Domestically, in 1990, Satellite CD Radio, Inc. petitioned the FCC to allocate spectrum for satellite DARS and submitted an application to provide the service.

2. Management of the BSS-Sound Issue Prior to WARC-92

In preparation for WARC-92, there were intense debates within the United States over use of portions of the 1400 MHz band for BSS-Sound. L-band has more desirable technical characteristics for BSS-sound than higher frequency bands.

The former Congressional Office of Technology Assessment (OTA) issued a report following WARC-92, many private sector and federal government interest groups took strong positions on this issue. The majority of the private sector favored an allocation for BSS-Sound between 1430 and 1525 MHz, in common with many other countries. The U.S. aerospace industry, including the Department of Defense and several aerospace contractors, resisted this proposed allocation due to the importance of this band for aircraft and weapons systems testing. Many local terrestrial broadcasters were not in favor of a new broadcasting allocation due to the potential impact BSS-Sound would have on established radio industry stakeholders.

Because of the intense nature of the debate and strong views held on both sides, identifying a potential allocation for BSS-Sound was the only issue that NTIA and FCC could not resolve prior to submitting the package of U.S. WARC proposals in July 1991. Private sector representatives complained that the Department of Defense and relevant contractors had not released enough data on the use of these frequencies to permit a fully informed decision. Executive branch representatives contended that all necessary information had been made available.⁵³ Local broadcasters registered their opposition to the allocation of radio frequencies specifically for BSS-Sound, arguing that many local broadcasters would be impacted negatively by the launch of a national radio service.

Based on internal negotiations among policymakers within the State Department, NTIA, the FCC and other affected agencies, the United States submitted a late proposal to the Conference, proposing 2310-2360 MHz as the appropriate band for BSS-Sound.

3. WARC-92 Results Related to BSS-Sound Allocations

The U.S. proposal advocating frequencies between 2310-2360 MHz for BSS-Sound was met with virtually no support from other countries. WARC-92 allocated 40 MHz of spectrum (1452-1492 MHz) on a co-primary, worldwide basis for BSS-sound and complementary terrestrial systems. The United States took exception by adding a footnote (722B) that allocated the 1452-

⁵² World Administrative Radioconference on the Use of Geostationary Satellite Orbit and Planning of Space Services, Geneva 1988. WARC-92 Agenda Item 2.2.3 the consideration of the allocation of frequency bands to the broadcasting-satellite service and the associated feeder links: a) for the broadcasting-satellite service (sound) in the range 500-3000 MHz, as indicated in Resolution 520 (Orb-88), including the accommodation of complementary terrestrial sound broadcasting uses within this allocation.

⁵³ 1992 World Administrative Radio Conference: Issues for U.S. Spectrum Policy, Office of Technology Assessment (November 1991).

1492 MHz band only to the fixed and mobile services in the United States, thereby prohibiting BSS-Sound or terrestrial DAB in that band. The United States, along with India, added an allocation (RR750B) in the 2310-2360 MHz band for BSS-Sound.⁵⁴

A number of countries in Europe and Asia, including Japan, China and the Russian Federation, allocated the 2535-2655 MHz band for BSS-Sound on a co-primary basis (footnote 757A). In sum, WARC-92 made three allocations for BSS-Sound and its terrestrial component:

- 1452-1492 MHz Worldwide, except the United States
- 2310-2360 MHz Only in the United States and India⁵⁵
- 2535-2655 MHz Various Countries in Europe and Asia

Over the past several years, Sirius and XM launched their networks and are operating competing satellite services, with terrestrial rebroadcast, in the United States. A third U.S. company, Worldspace, is operating services in other parts of the world in the L-band. Rather than operating in a new band, digital terrestrial broadcasts in the United States are being implemented in existing broadcast AM and FM bands.

4. Harmonization Debate Surrounding BSS-Sound Spectrum

The OTA study following WARC-92 recognized that the process for determining a worldwide allocation of spectrum for BSS-Sound was not transparent, and perhaps even flawed.⁵⁶

“The case of BSS-Sound/DAB represents a missed opportunity for the United States. Based on the reported needs and requirements of the Defense Department and its (politically) powerful allies in the aeronautical telemetry industry, and pressure from the Secretary of Defense, the United States was forced to take a position counter to the majority of the world. The problem is not that the Department of Defense won, but rather that the (policy) process for determining needs and evaluating competing needs was largely hidden from view. What should have happened was an objective and thorough review of the existing use of the band compared with the potential benefits to American industry, leadership, and consumers participating in a new worldwide broadcasting system. Questions remain about who did the comparing, what factors they used (and how each was valued) and what inputs were considered from both sides.”⁵⁷

It is difficult to determine fifteen years later whether the appropriate policymaking debate took place. The decision process should have evaluated the issue from technical, economic and public policy perspectives, including the issues stated below.

⁵⁴ At WRC-2000 Mexico added their country name to this allocation.

⁵⁵ The FCC was later required by Congress to limit the amount of spectrum for satellite DARS to 25 MHz. International Telecommunications Union, Final Acts of the WARC for Dealing with Frequency Allocation in Certain Parts of the Spectrum (WARC-92) 1992, Malaga-Torremolinos, *available at* <http://www.itu.int/publications/publications.aspx?lang=en&media=paper&parent=R-ACT-WRC.2-1992>.

⁵⁶ *The 1992 World Administrative Radio Conference: Technology and Policy Implications*, supra note 57, at 40.

⁵⁷ *Id.*

Potential benefits to the United States of supporting the 1452-1492 MHz band:

- Launch of a global satellite radio broadcasting system with worldwide implementation;⁵⁸
- Ability for U.S. satellite DARS providers to offer services in other countries within Region 2, and then expand to other countries;
- Economies of scale for equipment manufacturers of digital receivers
- Greater ability for the U.S. satellite DARS providers to raise money in the financial markets by demonstrating the possibility of an ability to serve additional international markets;
- Increased likelihood of consumers being able to use receivers worldwide
- Easing coordination with neighboring markets;⁵⁹ and
- 1400 MHz continues to be technically superior to higher frequencies for audio satellite and terrestrial broadcasting.

Potential costs of supporting the 1452-1492 MHz worldwide allocation:

- Reallocating or re-accommodating the aeronautical and military test systems – estimated to be in the millions of dollars,
- Resources required to undertake the appropriate technical studies to determine the impact of moving to another band; and
- Impact of a delay for the satellite operators to introduce their services due to the relocation of the aeronautical telemetry users.⁶⁰

There are also benefits of Supporting 2300 MHz that should have been considered:

- Most existing aeronautical and defense systems would continue in the technically more attractive 1400 MHz band;
- Satellite service providers could deploy services immediately since there was limited existing use of the band in Canada and Mexico; and
- The threat to terrestrial broadcasters was lessened because the 2300 MHz band is less attractive for terrestrial broadcast than 1400 MHz.

Likewise the costs of supporting 2300 MHz should be weighed during the decision making process:

⁵⁸ The extent to which the 1400 MHz band would have been available immediately is not certain. In most European countries, for example, the allocation to the satellite service was not planned to be effective until 2007; the implementation of satellite service also was restricted in several other ways as well under Resolution 528. ITU Radio Regulation Regulations, Resolution 528, vol. 3 (Geneva, Switzerland 2004).

⁵⁹ However, compatibility between co-frequency satellite and terrestrial broadcasting is only possible using the same technology. Canada's plans for its T-DAB (terrestrial digital audio broadcast) network probably would have been at odds with United States satellite broadcasting plans. On the other hand, there has been a successful coordination of Canadian terrestrial DAB users with the U.S. telemetry users in the 1452-1492 MHz band.

⁶⁰ The estimated amount of time to reallocate the existing users is unknown, but is presumed to be many years. At that time there was no process by which Federal agencies could be compensated for moving out of a band by the new users of re-allocated spectrum.

- Satellite implementation costs were somewhat higher for 2300 MHz than 1400 MHz and could not take advantage of developmental work done for the 1400 MHz band; and
- Giving up access to 50 MHz for telemetry at 2300 MHz (however, about the same amount of spectrum as in the 1400 MHz).

DARS may be one of the single clearest examples of a commercial deployment of a satellite allocation without substantial harmonization. In the United States, both Sirius and XM Radio use non-harmonized spectrum to serve more than 10 million subscribers and are growing quickly. Outside the United States, using “harmonized” spectrum, Worldspace has far fewer subscribers and no real competition. Had the FCC waited for U.S. aeronautical telemetry users to relocate in order to use the "harmonized" spectrum, there would have been significant delay and cost increases in setting up DARS. Furthermore, the U.S. concept of “in-band on-channel” overlay of terrestrial broadcasting has proven feasible and made new licensing unnecessary. U.S. satellite operators did not face any competing satellites in the same bands leading to uncertainty and delay. Under a harmonized band a large number of competing domestic and international satellite systems, at least on paper, would be expected. In this case, DARS compatibility with terrestrial uses of the 2300 MHz band internationally was relatively easy to achieve.⁶¹

5. Conclusion

- **Regulatory Certainty and Swiftness:** The importance of this for a developer of a new technology can not be overstated. While early satellite DARS proponents may have desired globally harmonized spectrum, they ultimately benefited from the certainty provided by WARC-92 spectrum provisions. After the Conference, the FCC was able to relatively quickly auction the spectrum and award licenses. Delaying the spectrum allocation decision or waiting for other users to vacate an alternate spectrum band would have negatively impacted business plans.
- **WARC Deadlines:** The WARC served as a useful forcing function for decisions on DARS spectrum because it required U.S. policymakers to act even if pertinent data was incomplete or not publicly available. The downside, of course, to such deadlines is that policymakers must make decisions without comprehensive data or analyses.

Even though the United States allocated a separate set of frequencies for satellite DARS, U.S. consumers have benefited from both a new service and the continued protection of the aeronautical telemetry and military applications. They may have benefited more by having harmonized allocations, perhaps, as they would have benefited from lower priced user equipment due to economies of scale achieved by manufacturers. Satellite providers may have benefited from harmonized spectrum. They certainly would have benefited from access to larger markets and the ability to expand services into multiple countries. Harmonized spectrum also could have offered U.S. firms an opportunity to become the dominant global players in this nascent market.

⁶¹ The 2300 MHz band is again at issue in the upcoming WRC-07 where competitors for use of the band include IMT-2000. U.S. DARS is reflected in the International Table of Frequency Allocations however; RR5.393, and is unlikely to change.

In the end, it appears that the U.S. public as well as industry ultimately benefited from the decision not to harmonize on a global basis. Benefits were garnered not only through saved financial or security costs from a migration of aeronautical industry users (as stated, true costs of this reallocation were not clearly provided), but more importantly, through more rapid deployment of services given that the uncertainty and delay of a possible migration were eliminated.

F. Public Protection and Disaster Relief (PPDR)

1. Background

Public protection and disaster relief (PPDR) professionals have become increasingly reliant on advanced radiocommunication technologies to carry out their daily responsibilities. As pressures on PPDR services grow and change on a global level, it has become evident that existing spectrum allocations may not be sufficient to meet current and future needs, particularly for higher bandwidth services. Although PPDR allocations typically are the purview of national administrations, WRC-2000's Resolution 645 invited the ITU-R "to study, as a matter of urgency, identification of frequency bands that could be used on a global/regional basis by administrations intending to implement future solutions for public protection agencies and organizations, including those dealing with emergency situations and disaster relief."⁶²

Recognizing the many difficulties expressed by Administrations during initial WRC-2000 PPDR discussions, preparation for WRC-2003, Administrations agreed upon the following terminology for studies on public protection and disaster relief in order to adequately reflect those concerns.⁶³

Public protection radiocommunication: Radiocommunication used by responsible agencies and organizations dealing with maintenance of law and order, protection of life and property, and emergency situations.

Disaster relief radiocommunication: Radiocommunication used by agencies and organizations dealing with a serious disruption of the functioning of society, posing a significant, widespread threat to human life, health, property or the environment, whether caused by accident, nature or human activity, and whether developing suddenly or as a result of complex, long-term processes.⁶⁴

Additionally, it is important to point out that PPDR radiocommunication systems can be categorized under "narrow-band," "wideband" and "broadband" and that there is a wide range of diversity in spectrum needs and operational requirements under each category.

⁶² Resolution 645, *Global Harmonization of Spectrum for Public Protection and Disaster Relief* (WRC-2000), <http://www.itu.int/ITU-R/study-groups/seminars/rwp8a-protection/docs/res645.pdf> (password protected).

⁶³ During WRC-2000 deliberations on this issue, concerns were expressed by a number of Administrations regarding use of the term "safety." The term "safety" causes problems when dealing with existing radio services, and WRC-2000 chose to use the word "protection." *Id.*

⁶⁴ United States and Canadian proposed terminology for use in studies on public protection and disaster relief consideration of WRC-2003 agenda item 1.3.

2. PPDR Considerations at WRC-2003

ITU-R Working Party 8A was tasked with investigating the proposed recommendation and considering the PPDR issue. CITEL administrations agreed to an Inter-American Proposal (IAP/5/47) for WRC-2003 “encouraging” global and regional harmonization for this purpose, including the submission of several bands for consideration by other Regions. Importantly, some of these spectrum bands had already been harmonized regionally which facilitated the approval of the proposal within the Americas.

Ultimately, WRC-2003 did not officially allocate specific spectrum bands for PPDR, but issued Resolution 646 with more flexible language:

“for the purposes of achieving regionally harmonized frequency bands/ranges for advanced public protection and disaster relief solutions, administrations are encouraged to consider the following identified frequency bands/ranges or parts thereof when undertaking their national planning:

- Region 1: 380-470 MHz as the frequency range within which the band 380-385/390-395 MHz is a preferred core harmonized band for permanent public protection activities within certain countries of Region 1 which have given their agreement;
- Region 2: 746-806 MHz, 806-869 MHz, 4940-4990 MHz;⁶⁵ and
- Region 3: 406.1-430 MHz, 440-470 MHz, 806-824/851-869 MHz, 4940-4990 MHz and 5850-5925 MHz.”

There are a wide range of bands in use throughout the world for the purpose of PPDR applications, with only some cross-over between regions.⁶⁶ While other countries entered into the WRC-2003 process with the hope of working towards a global allocation, the United States maintained its opposition to harmonized spectrum, at least on a global basis.

3. United States Position on PPDR

While there would have been some benefits from economies of scale and facilitated interoperability between public safety and disaster relief professionals, the United States was opposed to the idea of global harmonization for the purpose of PPDR. The United States believed that before identifying spectrum for this purpose, two considerations must be made. First, technology requirements of PPDR professionals must be clearly defined. Second, it must be determined if harmonized spectrum would offer the most effective solution or if it could even cause disruption to existing systems. If determined that PPDR operations demand equipment that operates across borders, then technology requirements should be studied in terms of advanced technology solutions versus spectrum identification. Additionally, it was the United States’ view that most nations have already established requirements for voice systems

⁶⁵ Venezuela added a footnote to the resolution stipulating that it had identified 380-400 MHz for PPDR.

⁶⁶ Both Regions 2 and 3 designated 4940-4990 MHz for PPDR. In Region 1, NATO occupies this band, and relocation was not deemed feasible. This was one of the instances in which existing regional or national conflicts prevented a global allocation.

eliminating a need for harmonized spectrum just for PPDR communications. The United States believes that spectrum should only be identified when benefits to users are clearly demonstrated.

The United States highlighted a wide array of advanced technologies currently in use (or planned for use) by both public protection and disaster relief professionals that facilitate cross-band communications, spectrum-sharing and enhanced interoperability between systems. While Public Protection and/or Disaster Relief activities remain distinct, and their spectrum requirements are different, solutions for both may be found in similar technologies, which would allow for interoperability as required.⁶⁷ As technologies advance, success of PPDR missions may rely less upon the availability of internationally harmonized spectrum and more upon interoperability capabilities of devices themselves.

Given the distinction between PPDR activities, the United States also proposed to differentiate between the two groups of professionals for the purpose of the ITU studies. Public safety professionals tend to operate solely within national borders. National harmonization and interoperability is essential to ensure that public safety professionals can communicate on a daily basis, as well as during emergencies. As it is unlikely that public safety professionals would be required to serve in other nations, globally harmonized spectrum seems unnecessary. Any need for spectrum coordination could be done on a regional or bilateral cross-border level, and in fact, has been done with Canada and Mexico.

Disaster relief professionals, on the other hand, often operate across borders, however, their needs are sporadic and event-driven. Once again, the United States deemed it impractical to identify or allocate a band of spectrum on a global level that would adequately address the specific needs of individual nations in what may be a wide variety of emergency situations. Flexibility should be maintained for administrations to take national interests into account.

4. Benefits of Harmonizing Globally for PPDR

As seen in previous examples, a key benefit of global or regional harmonization is potential economies of scale brought to PPDR professionals who would benefit from less expensive equipment. Moreover, the promise of global markets could offer incentives to manufacturers to invest in additional research and development for more innovative products and services for this sector.

Furthermore, for disaster relief organizations that may be required to deploy services on short notice at any given location throughout the world, harmonized spectrum would greatly facilitate usage of equipment in multiple locations and preclude the need for more costly multi-band devices.

5. Benefits of the United States PPDR Harmonization Approach

In its decision to oppose global spectrum harmonization for PPDR, the United States sought to preserve flexibility for national interests with respect to public protection and disaster relief

⁶⁷ Future Technology Solutions for Public Protection and/or Disaster Relief (April 2002), <http://www.itu.int/md/R00-WP8A-C-0191/en> (password-protected).

professionals. Harmonization potentially has a negative result if the international community supports a band that the United States cannot implement. For example, at WRC-03 many countries supported identification of 380-400 MHz, a band committed to defense operations in the United States. Bands used by U.S. defense forces are often attractive to many parts of the world for new technologies, since they may not be occupied by commercial services. While in the case of IMT-2000 there may have been more arguments supporting a globally harmonized band, the nature of PPDR communications requirements makes national, or perhaps regional, approaches more practical. In fact, the United States did work to reach cross-border and regional agreements on this issue.

Moreover, the United States continues to support broad allocations with language that does not restrict usage of spectrum bands to specific technologies or applications. By leaving spectrum identifications open and non-restrictive, the United States maintains the flexibility to allocate spectrum for commercial, government, or public safety needs without taking into account global consensus.

6. Conclusion

While public safety and disaster relief operations require a certain level of equipment interoperability and spectrum harmonization, a policy of globally harmonized spectrum was not pursued. Despite potential benefits for economies of scale, ultimately, PPDR communities – in both the United States and in countries throughout the world – allocated spectrum based on individualized operational needs. Regional harmonization is necessary to facilitate cross-border operations or regional equipment distribution, and in that regard, the United States has harmonized regionally for some PPDR spectrum allocations. Potential relocation costs, aside from the costs of achieving global allocation through the lengthy ITU process, are too great for the relatively minimal and short-term benefits of enhanced interoperability brought during single disaster events.

G. High Density Fixed Services (HDFS)

High Density Fixed Services (HDFS) is another example demonstrating the difficulty in measuring the needs of existing services against the need to identify spectrum for new and emerging services. While the HDFS debate was not as polarizing as the debates surrounding DARS and IMT-2000, it highlights an instance where many countries sought to harmonize spectrum on a global basis purely to facilitate lower cost equipment.

HDFS refers to wireless point-to-point and point-to-multipoint technologies ranging from Fixed Wireless Access (FWA) to high-speed broadband wireless systems such as Local Multipoint Distribution Service (LMDS). HDFS is expected to play a growing role in a wide range of applications, from broadband access for business customers to low-cost facilities for monitoring remote sites.

WRC-97 allocated several bands for HDFS (31.8 - 33.4 GHz, 51.4 - 52.6 GHz, 55.78 - 59 GHz and 64 - 66 GHz⁶⁸), and the Conference adopted several resolutions inviting future conferences

⁶⁸ *Radio Regulation provision 5.547 (footnote to the allocation table).*

and study groups to examine the ability of HDFS to share with existing services, particularly with Fixed Satellite Services (FSS).

Since these networks essentially are local networks where global roaming would not be an objective as with mobile services, the key motivation for seeking harmonization was to enable manufacturers to achieve economies of scale in designing and producing equipment, allowing HDFS manufacturers to shorten design cycles, thereby lowering costs for end-users.

The HDFS harmonization debates during WRC-97 and WRC-2000 considered the need to protect existing services. To this end, in preparation for WRC-2000, several studies were conducted within the ITU-R Study Group structure to examine these issues. The United States had several objectives going into the WRC-2000 conference regarding the protection of existing U.S. services, including radionavigation, space research service, fixed satellite service and passive space borne sensors. The United States met its objectives at WRC-2000 through the adoption of power limits and the modification of a footnote highlighting potential interference HDFS systems might encounter from military radars.

The allocations made to HDFS during WRC-2000 covered a range of higher frequency bands.⁶⁹ In addition to allocations, the conference also agreed on regulatory provisions applicable to the deployment of HDFS as well as power limits to protect HDFS from other space services allocated to the same bands or to adjacent bands. Based on the cooperation demonstrated to protect existing equipment and users and the desire to identify global allocations for HDFS, the allocation of spectrum for this growing type of network was considered a success. However, HDFS has not developed to the extent anticipated using the frequency ranges allocated at WRC-2000 and the commercial focus has shifted to broadband access through mobile networks using much lower frequency bands.

H. Conclusion and Recommendations

This analysis was intended to address how the United States balances costs and benefits of global harmonization and whether the current ad hoc approach is successful. In each of the examples above, the United States conducted a lengthy evaluation of costs and benefits to stakeholders when considering proposals for global or regional spectrum harmonization. Potential benefits to manufacturers or consumers when economies of scale are achieved are a clear argument for always pursuing spectrum harmonization. However, these examples exposed other potential costs that may limit benefits from economies of scale.

There often are entrenched users in proposed bands. The United States must weigh not only the financial costs of migrating existing users to new spectrum, but also the technical feasibility of operations on alternate bands, particularly in the case of national security or public safety needs. The process of debate and evaluation of costs and benefits seldom results in a clear, objective comparison. In most of these cases, deliberations over harmonization unfolded over many years, often more than a decade. If the United States chooses to follow a unilateral policy of always harmonizing, it could delay the provision of new technologies and services for U.S. consumers.

⁶⁹ The bands allocated ranged from 30 to 90 GHz, see RR 5.547 and WRC Resolution 75.

Moreover, some globally harmonized allocations may be restrictive and limit the ability of the United States to manage its national spectrum in a flexible manner.

Pushed by global manufacturers and operators, there is a trend toward harmonization but with frequency flexibility, an example being broadband wireless access systems where a common technology base is used, such as 802.16e (WiMAX) but with various frequency band options. In this case individual countries and service operators can select bands that make sense for their market while still realizing most of the economies of scale from worldwide implementation. In the end, allocation flexibility gives the United States the greatest choice in its domestic proceedings.

As there are recognized benefits from achieving harmonization including global economies of scale, the United States should approach harmonization proposals with an eye towards achieving it wherever feasible. However, given the uncertain and frequently changing communications marketplace, overall the current ad hoc approach towards global or regional spectrum harmonization functions well and provides needed flexibility for diverse U.S. interests.

In order to better anticipate future international spectrum needs, assess costs and benefits of harmonization proposals and advocate U.S. positions in regional and multi-lateral organizations, the following recommendations are offered:

1. Assess harmonization proposals through a transparent and thorough cost-benefit analysis:

- The United States should develop a framework for considering harmonization costs/benefits both short and long term, for use by stakeholders, policymakers and others when analyzing significant proposals to modify its use of spectrum to harmonize with other countries. The considerations should include, among other financial and public policy topics, a technical review to understand harmonization requirements of a new technology, a public interest policy analysis, an assessment of how regulatory delays might impede the introduction of a new service and a study of financial and possible national security and public safety impact of migrating existing users to new spectrum.
- The United States should conduct its cost-benefit analysis in a transparent forum in order to better inform stakeholders about the decision making process and factors under consideration.

E. Technical Interoperability

In its review, NTIA considered both the technical components of interoperability standards as well as the effect of existing U.S. policies towards interoperability on the international integration of technical systems. The United States supports spectrum flexibility for both federal and other sector users and recognizes that this policy encourages innovation in spectrum use. With respect to specific U.S. policies regarding interoperability standards for devices operating on specified frequencies, it is important to note that the United States upholds a policy of technology neutrality. The United States does not advocate specific technology standards nor

dictate that manufacturers must create interoperable devices but prefers to let markets operate freely. The discussion of interoperability will consider international implications for U.S. services given this market-based approach to standards development.

1. Spectrum-Dependent Interoperability

Regulations, when linked to spectrum use, such as spectrum licenses, that require an interoperability standard to be employed by the spectrum-user results in spectrum-dependent interoperability. To achieve harmonized spectrum-dependent interoperability, the use of a dedicated common radiofrequency by multiple countries is needed, or the use of a predefined set of frequencies, some of which can be used within each of the individual countries. Thus, where a set of frequencies is standardized, countries can use different frequencies for the same application and still interoperate, so long as the mandated interoperability standard addresses all used frequencies. In this case, all interoperable equipment must be able to use any of the allowed frequencies. While suitable frequencies must be available to allow interoperable use, interoperability can be, and typically is, achieved outside spectrum management framework decisions.

Acting in the spectrum applications framework, governments may encourage interoperability in many ways: participating in standards efforts; initiating the standardization process for certain applications; promoting standards generally; encouraging industry consensus on a particular standard in purchasing decisions; and setting rules for adopting standards. Other than mandating the use of a particular interoperability standard, governments also can facilitate interoperability by assigning only one license for a type of use.

2. Standards

Interoperability is often the objective of standards-making. Interoperability standards can include spectrum requirements; however, the main objective is to develop standards that allow different devices from different manufacturers to operate with each other and/or use the same network. Adherence to an interoperability standard can facilitate “roaming” of devices among various countries and networks. Interoperability standards typically define the “radio” or “air interface” between devices, usually the air interface of the user device and its servicing network.

Standards are an increasingly important factor in international spectrum management discussions. Three aspects are of particular interest in the international spectrum management context: conformance testing leading to interoperability; Intellectual Property Rights (IPR); and linkage of standards to spectrum management framework policies internationally.

Standard entity controls are particularly important in cases where one entity controls the transmitter and another, the receiver. Ideally, standards allow users to perform minimal functions to operate a system with acceptable levels of interference and appropriate interoperability. For example, broadcasting standards permit consumers to purchase radio or television devices from a wide variety of manufacturers and be assured they will be able to receive all the stations available in any part of the United States, and in many cases, internationally. Importantly, these

same standards also ensure that television or radio users will be able to use their receivers not only at present, but in the future.

In order for international interoperability standards to be recognized, adoption by the International Standards Organization (ISO) is needed. ISO is a Geneva-based organization where countries are represented by national standards bodies including the American National Standards Institute which represents the United States. Most of ISO's work entails establishing procedures and codes of conduct for setting standards rather than developing standards themselves.

3. Conformance Testing

There are three levels of conformity testing relevant to spectrum-dependent interoperability. First is testing for conformance with spectrum rules. Spectrum licensing authorities typically require manufacturers either to certify or obtain certification from independent certification labs that equipment meets the minimum technical rules established for equipment to be operated within a country's territory. Such technical rules include emission levels, safety features and increasingly automated frequency sharing technologies. These technical rules generally are developed by national authorities and may not specify international equipment certification procedures. However, actual testing for "regulatory conformity" is often done by certification testing laboratories or Technical Certification Bodies (TCBs). In some cases, countries recognize other governments' certification activities. An agreement between two governments providing for such recognition is called a Mutual Recognition Agreement (MRA).

A second level of conformity testing determines if equipment conforms to a standard. Typically such testing is done by individual companies, trade associations or user groups rather than by governments. Many open standards, such as those of the IEEE, may contain conformity tests as part of the standard. On the other hand, most ITU standards do not address or require conformity tests, and there are no assurances that one device will interoperate with another absent testing outside of the ITU. The ITU standardization group ITU-T is examining this issue.⁷⁰

The third level is device interoperability testing. Interoperability testing is important in addressing devices operating based on open standards. It is a separate, generally proprietary process, undertaken by private sector interest groups such as the WiMAX forum whose purpose is to ensure WiMAX-labeled products interoperate on a global basis. These organizations and their testing are essential for successful product deployment and ensuring that user equipment from one manufacturer works with the base station of another. Governments typically do not provide this function.

4. Intellectual Property Rights (IPR)

Standards-making organizations have well-defined IPR policies that typically require participating companies to make necessary IPR available to any other participating companies on a fair and reasonable basis. This often involves cross-licensing of IPR necessary for devices compliant with the standard to operate without infringing on any IPR. As the expense of

⁷⁰ ITU-T Study Group 17, ITU News, Jan-Feb 2006.

acquiring the necessary IPR can be burdensome over the long term even if arrangements are “fair and reasonable,” standards-makers often look to minimize compliance with IPR.

5. Discussion of Policy Issues

The establishment of technical interoperability standards is an essential component of international cooperation in the radiocommunication sector for safety-related communications. The ITU also addresses standards that enable systems from different manufacturers to operate for users in multiple markets. While standards can be extremely important, it also is recognized that when standards are set too early or too restrictively, technical innovation may be impeded. Further, it is not always clear, even in cases where standards are necessary, that government, rather than industry, is best equipped to choose. While the U.S. views that industry typically is best situated to determine when and if to develop interoperability standards, government still has an important role in setting policy goals and evaluating potential impact on public safety and national security.⁷¹ In such cases, it may be necessary for the government to mandate interoperability standards or promulgate standards specifically to improve spectrum efficiency.⁷²

What criteria should be considered to anticipate market failures and determine when government intervention is appropriate in establishing interoperability requirements and standards, as well as device and equipment standards in general? The FCC’s general guidelines for government-mandated interoperability standards provide useful criteria for evaluating when government should consider mandating standards versus relying on the private sector.⁷³ An important consideration is that in most circumstances, the Administration’s role is not to select or influence the selection of the standard itself, but to manage the transition from old to new interoperability and equipment standards. For example, regulatory authorities often might require “backward compatibility” and set timetables to phase-in a new standard, to allow for amortization of existing investment, as well as a transition period for manufacturers, service providers and users to balance the costs and benefits of implementing the new standards.⁷⁴

An example of direct government-to-government interaction with respect to interoperability is the negotiations between the United States and the European Union regarding the interoperability of Global Positioning System (GPS) and European Galileo.⁷⁵ The agreement covers spectrum use carried out within the context of the international frequency allocations, interoperability of

⁷¹ U.S. Spectrum Management Policy: Agenda for the Future, 1991, <http://www.ntia.doc.gov/osmhome/91specagen/1991.html>.

⁷² Such is the case in the 700 MHz public safety band, where the FCC mandated TIA-102 (APCO Project 25) for interoperability purposes. *See* 47 C.F.R. § 90.548 (2005)

⁷³ *Id.*

⁷⁴ Such has been the case with the U.S. government-mandated transition from analog to digital television broadcasting standards. The FCC has adopted an industry developed standard for digital television in its rules. *See* 47 C.F.R. part 73.682(d).

⁷⁵ Agreement on the Promotion, Provision, and Use of Galileo and GPS Satellite-Based Navigation Systems and Related Applications, United States and European Community (2004), <http://pnt.gov/public/docs/2004-US-EC-agreement.pdf>. *See also*, United States and European Commission Joint Statement on Galileo and GPS Signal Optimization, Brussels (March 24, 2006), <http://pnt.gov/public/docs/2006-L1C-statement.pdf> (announcement of the interoperability). It should be noted that the interoperability will be for new GPS signals, not the existing GPS civilian signal.

future implementations of both systems, mutual non-discriminatory market access, and national security issues. Because of the widespread use of global positioning data for many commercial and government applications, there are clear advantages to users and end-user equipment manufacturers of having interoperability between the two systems. However, the advantages to operators are less clear since each operator seeks to distinguish its system from the other by offering different services. The agreement on GPS and Galileo identifies interoperability at the user level as its main objective.⁷⁶

On an international level, considerations of interoperability cannot be taken outside of some discussion of spectrum use, management, and harmonization.⁷⁷ For example, while spectrum may be harmonized globally through the WRC process, spectrum use and the development of policies governing the use of spectrum-dependent technologies and services are determined on a national level. Negotiations at the international level over interoperability often involve political and other issues that may not lead to appropriate solutions. However, recent technological advances often can enable manufacturers to achieve interoperability where harmonization does not exist. As technologies such as software-defined radios or multi-band mobile phones continue to evolve, interoperability between systems will be facilitated despite a lack of global or regional spectrum harmonization. By working to preserve flexibility within international and domestic spectrum allocations, the United States enables spectrum-efficient technologies to evolve and encourages industry development of interoperability standards even where harmonized spectrum is not feasible.

While the United States prefers to permit national or global interoperability standards to evolve through market forces, this approach is not always followed in other nations or regions. For example, European nations that are members of the European Telecommunications Standards Institute (ETSI) prefer to encourage or mandate the development of standards and not leave actions up to the marketplace. While the United States typically views standards mandates as stifling technological growth and development, the European view is that a market-based approach results in a wide array of technologies and devices that are not able to interoperate, thus limiting their wide scale marketability and often their overall utility.

Recent U.S. government policies and decisions have addressed interoperability internationally primarily for safety services. Examples include radionavigation receivers for ships and aircraft where interoperability is required for safe passage of these vessels in other countries. There are specialized international conventions and agencies established to ensure such interoperability. The ITU itself does not typically develop interoperability standards for radio systems; one exception is maritime safety communications standards. In some cases, such as IMT-2000, the ITU references interoperability standards maintained by outside standards bodies.

With regard to safety services, the U.S. government, including NTIA, is involved in Project MESA (Mobility for Emergency and Safety Applications), a joint ETSI/TIA (Telecommunications Industry Association) venture developing a set of recommendations for international broadband public safety standards. The public safety community recognizes the

⁷⁶ It is important to note that interoperability in this case technically means two separate systems which are compatible and will use two separate receivers packaged together in a dual-mode device.

⁷⁷ A more substantive discussion of harmonization will be undertaken later in this report.

need for standards which facilitate interoperability, and despite its reluctance to mandate technology standards in favor of a market-based approach, the United States has begun working to encourage interoperability in the interest of national security and public protection.⁷⁸

6. Conclusion and Recommendations

Because of each government's national sovereignty rights to adopt and implement different standards and policies, global and regional harmonization of spectrum for new spectrum-dependent technology solutions will not guarantee interoperability with either future or legacy equipment. Generally, the United States takes the approach that where there is an established, expanding market for a technology, extensive government involvement in setting interoperability standards usually is unnecessary and contrary to the U.S. preference for market-based approaches and technology neutrality. For services such as aviation safety where interoperability is necessary at the international level, the ITU and other international organizations are appropriate avenues for reaching international agreement on interoperability standards.

Although U.S. regulatory agencies have authority to set interoperability standards for spectrum devices, they have generally preferred that industry, with appropriate Federal agency input, establish these standards.⁷⁹ As discussed above, it is not necessary to have spectrum harmonization to achieve interoperability. In addition, when a service provider – whether private sector or government – faces increased demand, flexible spectrum policies facilitate more efficient use of spectrum as users can evolve to new technologies and/or standards on certain frequencies without requiring new allocations or licenses. The United States should maintain its flexible and market-based approach to technical interoperability.

⁷⁸ While the United States has been working on some levels (cross-border and regional) to achieve interoperability for public safety devices, it has resisted efforts to harmonize spectrum internationally for this purpose. The Public Protection and Disaster Relief (PPDR) spectrum harmonization issue will be considered in a later section.

⁷⁹ U.S. Spectrum Management Policy: Agenda for the Future, 199. For example, NTIA's standards for narrowband (12.5 kHz) land mobile radio are based upon current industry standards, i.e., TIA-102 for digital and TIA-603B for analog systems. *See* Manual of Regulations and Procedures for Federal Radio Frequency Management, NTIA, U.S. Department of Commerce, ch. 5, sec. 5.3.5.2 (revised May 2006).

IV. DISCUSSION OF SURVEY

A. Survey Design and Administration

1. United States Survey

The U.S. survey was developed to capture the views of key personnel within NTIA, the FCC, Department of State, and other U.S. government agencies, as well as industry users familiar with the process governing international assignment of spectrum and harmonization. Within the U.S. Government, the study sought perspectives of agencies that manage or regulate the spectrum for government or commercial use (NTIA and FCC), as well as those that require spectrum to fulfill their operational responsibilities (*e.g.*, Department of Defense (DoD), the U.S. Air Force, National Aeronautics and Space Administration (NASA), and Department of Justice). NTIA approved a list of respondents representing nine U.S. government agencies and eight companies.

The survey was designed primarily to review perceptions and practical implications of U.S. national policies and procedures regional and global spectrum harmonization and system interoperability. The survey solicited respondents' views on these topics:

- Existing Policies on Harmonization and Interoperability
- Pros and Cons of Adopting Policies Promoting Harmonization and Interoperability
- Impact of International Activities on U.S. Efforts to Harmonize
- Harmonization through Regional Outreach (focusing on CITELE)

2. International Survey

The international survey addressed the views of foreign administrations on harmonization and interoperability as well as their approaches to coordination of their positions and outreach to other countries. Surveys were administered to seven foreign administrations representing each ITU Region (Region 1: United Kingdom, France, Jordan; Region 2: Brazil; Region 3: Australia, India, Korea) and intended to provide insight into their policies and procedures for promotion of spectrum based services. NTIA considered and approved a list of foreign respondents contributing to the survey.

3. Format

Proposed questionnaires for both U.S. and foreign representatives were circulated among a U.S. Task Group for feedback and then approved by NTIA. Interviews with all U.S. respondents were held in person to elicit more comprehensive responses from subjects. Notes were taken at each meeting and analyzed to draw out commonalities and themes among responses, to highlight issues, and to identify recommendations. The format and questions of the foreign administration survey were similar to those used for the U.S. interviews to offer a basis for comparison to U.S. practices, although the international survey was not administered in person. Responses varied widely in their comprehensiveness, and summaries are reflected in the results section. Many

respondents provided their views based on the understanding that comments would not be attributed.

In the section that follows, major issues covered in both surveys are discussed in aggregate.

B. Analysis of United States Survey Results

1. Existing U.S. Harmonization and Interoperability Policies

Despite their roles in the Interdepartment Radio Advisory Committee (IRAC) or long experience on the industry side, most respondents could not identify a U.S. policy explicitly requiring spectrum harmonization or system interoperability. If such a policy existed, they were unaware of its availability to the public. U.S. participation in ITU-R processes, other treaty organizations, and international fora (International Civil Aviation Organization (ICAO), International Maritime Organization (IMO)) indicated for some that the United States is, by default, working towards the harmonization of spectrum and towards interoperability. Similarly, the United States adheres to specific agreements that encourage cross-border harmonization of spectrum with Canada and Mexico.⁸⁰

The view was near universal that the process within the United States of gaining support for harmonized spectrum is somewhat ad hoc, depending on the particular circumstances and the technology involved, and even on the personalities and budgets of the proponents. Rather than establishing policy through advance planning and consultation on an issue, U.S. policies are often determined through development of position papers for regional and international conferences. The satellite DARS provides a good example of an issue debated and decided during the WARC preparatory process.⁸¹

To help facilitate more advanced planning on spectrum needs of rapidly emerging technologies, the United States should take steps to enhance awareness of industry developments. Moreover, through more effective involvement in the ITU-Radiocommunication study group process, NTIA and other U.S. agencies can better anticipate new spectrum demands and understand global technology developments.

2. Pros and Cons of Adopting Policies Promoting Harmonization and Interoperability

On the question of whether the United States should adhere to a specific policy of seeking harmonization and encouraging interoperability, differing views emerged. While there was little argument that certain technologies and systems require harmonization (such as space and satellite services, and many aviation and maritime safety services), the majority of participants stated that the United States should remain flexible and treat harmonization on a case-by-case basis to determine the extent to which its promotion is valuable.

⁸⁰ The Department of State provides a complete listing of the Treaties in Force which provide a description of the various telecommunications agreements with Canada and Mexico on its website at <http://www.state.gov/s/l/treaties/c15824.htm>.

⁸¹ See *infra* at pages 40 through 44 (comprehensive discussion of the DARS harmonization issue).

From a policy standpoint, some government officials felt that adopting a policy requiring the United States to harmonize spectrum for new technologies would lessen the flexibility allowed to U.S. delegations in negotiating positions and seeking optimal national solutions. Moreover, such a policy might hinder innovation. Ensuring flexibility was seen as the best way to accommodate unforeseen technology advancements without requiring new allocations and was a driving force behind the U.S. policy decision to forgo harmonization for PPDR services.⁸² Some participants mentioned that harmonization, from a practical point of view, would be desirable, but is difficult to achieve because of the large number of installed users in many bands leading to a negative cost/benefit. On the other hand interoperability requirements may demand a degree of harmonization in services such as public safety.

Manufacturers of large systems or military systems suggested that interoperability was more critical to their ability to operate with certainty worldwide. Having harmonized bands certainly assisted in their ability to operate networks; however, it was not a necessity if equipment is designed to operate in differing bands. It was noted from the Department of Defense perspective that harmonized bands would enable more efficient deployment and usage of equipment around the world, which would be an important advantage. The harmonization of commercial services is often easiest in bands occupied by the Department of Defense since that spectrum is available in most countries. This creates a significant disadvantage for defense interests when the international community focuses on commercial harmonization. Department of Defense investment in cognitive radio technology development reflects the need of the defense community to deal with the international interest in commercial harmonization of frequency bands.

The terrestrial wireless community was vocal concerning the need for harmonization and interoperability, as both help yield the economies of scale that are critical to their business models. However, this view of harmonization and interoperability has evolved over the past few years. In fact, certain terrestrial manufacturers that were not supportive of harmonization just a few years ago now make it one of their highest priorities.

In the early stages of cellular development, while standards were considered important, it was felt that multiple standards in different regions of the world would not be detrimental to product rollout or growth of cellular service. The U.S. market was considered sufficiently large to justify investment of products that conformed to their own standards. Over the past ten years, the terrestrial wireless industry has matured considerably, and handsets are no longer considered to be a luxury item. As handsets become less expensive for consumers thereby lowering profit margins, manufacturers require the assurance of larger markets to justify development plans. Moreover, certain markets such as the United States have matured for terrestrial wireless services. The rate of growth for terrestrial wireless services in developed markets has slowed significantly relative to the rate in developing countries. As a result of all of these factors – the maturing of the industry, the commoditization of the terminals, the need for the manufacturers to access larger markets to justify investment – manufacturers are now placing a greater emphasis on the need for spectrum harmonization and technical interoperability.

⁸² See section 3, *infra* at pages 45 through 47 (comprehensive discussion of the PPDR harmonization issue).

Generally, the views expressed support the notion that a more quantitative process for considering the costs and benefits of possible harmonization of spectrum within the typical case-by-case consideration. It was suggested that, in the United States, the possible harmonization of spectrum continued to be examined on a case-by-case basis with an eye towards achieving it wherever possible. It was also suggested that a framework be developed that would provide context for considering the public interest impact, relocation costs and technical requirements in a way that would be relevant to the policy determination process.

3. Procedures of Existing United States and International Bodies That Consider Harmonization

Many users work effectively through various communities of interest (*e.g.* Federal Aviation Administration (FAA) through the ICAO, NASA through the Space Frequency Coordination Group, Department of Defense through NATO). These communities provide opportunities to harmonize and coordinate outside of the traditional regional bodies (*e.g.* European Council of Post and Telecommunications Administrations (CEPT), CITEL, or APT). Generally, these communities have similar interests, and members are able to quickly arrive at consensus and lobby their respective administrations to support their common positions. This vehicle has been effective and enabled those space services and sciences that typically require harmonized and interoperable systems to effectively coordinate prior to meetings and often in advance of their individual country preparations. Respondents considered the United States to be very effective in disseminating its views through these organizations; however, the United States is often late in developing its own views.

The private sector equivalent of such communities exists but are more informal, such as industry coalitions, associations and multinational corporations. The Telecommunications Industry Association (TIA), as an example, has established solid working relationships with standards bodies in other countries and regions. They meet annually with their members and international counterparts to exchange information, consider new technologies and identify policy priorities. In fact, it would be fair to say that a proponent for a position without the support of an international body would be at a disadvantage.

While the United States has been effective in the international spectrum arena, it could be more effective by engaging in additional outreach through regional or trade-based networks. Additional avenues for outreach include demarches, the U.S. Agency for International Development's Telecommunications Leadership Program (USAID-TLP), attendance at other regional meetings and engagement of leaders in bilateral meetings. Working within industry groups offers a means for interested parties to unify views when participating in the United States process with respect to harmonization considerations or otherwise.

4. Harmonization through Regional Outreach (CITEL)

Most interviewees were positive about the United States' involvement with CITEL. Nearly all noted that over the past ten years, CITEL has become a more effective institution, making active engagement within this regional body a necessity. Additionally, U.S. participation in CITEL has been enhanced through more bilingual speakers and more exchange and interaction when

developing positions. Some commented that the United States is more respected among CITEL members due to this increased outreach.

CITEL has been active in harmonizing band plans and equipment standards. As noted in a previous section, CITEL was active in promoting regional harmonization for PPDR. Nearly all respondents felt it was critical to work through CITEL, particularly for WRC preparations. Many in both industry and government expressed a desire for additional resources to participate more actively in CITEL.

Some believe that the regional approach has mixed results for the United States, and that generally only the larger CITEL countries have significant impact in CITEL or WRC negotiations. Others believe that investing in and cultivating relationships with smaller CITEL member countries can also prove beneficial, such as the 12 Caribbean Telecommunication Union (CTU) members since the smaller CITEL countries are taking on a more active role.

Given that decisions for WRCs and other international spectrum policy issues are often developed at the regional level, the United States should enhance its involvement in other regional bodies such as the APT and CTU, in addition to continuing its increased CITEL involvement. Increased regional engagement will serve to advance United States' goals in multilateral processes.

5. Conclusion and Recommendations

Overall, members of government and industry involved with international spectrum allocation and harmonization issues agree that the United States' present ad-hoc approach towards harmonization offers the most flexibility in a rapidly changing global marketplace. While the United States has many avenues through which these interested agencies and companies can advocate their views on international spectrum issues, more advance consideration of industry developments and future spectrum requirements would facilitate the United States' ability to consolidate its national views early in the multi-national process.

Overall, the positive effects of regional bodies in helping advance United States interests stood out among respondents. Given the increased effectiveness of regional and trade-based groups in advocating U.S. positions on spectrum issues such as harmonization, it is recommended that the United States enhance its participation in groups such as CITEL. As discussed in the following section.

Advocating U.S. positions on international spectrum allocations, including harmonization, in regional and multilateral fora:

- Given the specific importance of CITEL in developing regional views to be advanced in the multi-lateral process, the United States should increase its financial and in-kind support of CITEL.
- In many cases harmonization decisions are driven by regional-level negotiations, making the APT, the CTU and existing multi-lateral committees – in addition to CITEL – essential to

achieving U.S. goals in the broader multi-national arena. The U.S. should better integrate its spectrum policy and planning goals in its participation in CITELE and these other organizations.

- The United States should continue involvement in other regional organizations that serve as allies for the United States as it develops positions related to global and regional harmonization efforts.

C. Analysis of International Survey Results

1. Australia

The Australian Communications and Media Authority (ACMA) is responsible for the regulation of broadcasting, radiocommunications, telecommunications and online content. ACMA's responsibilities include: (1) promoting self-regulation and competition in the telecommunications industry, while protecting consumers and other users; (2) fostering an environment in which electronic media respects community standards and responds to audience and user needs; (3) managing access to the radiofrequency spectrum, including the broadcasting services bands; and (4) representing Australia's communications and broadcasting interests internationally.

The process of reviewing and coordinating positions that impact harmonization is driven by the consensus of both government and industry stakeholders. Industry participants in fora facilitated by the ACMA have open channels to the regulator and can influence government positions to the point of blocking a position if consensus cannot be reached.

Given its reliance on the production of technologies by larger economies and that the increasing globalization of industry requires international interoperability, Australia places a high value on harmonization and interoperability with other countries. The government works to remain technology-neutral and let the market choose "winners."

Australia would prefer to see common radio spectrum allocations across all ITU regions to the maximum extent possible. Any harmonization initiatives are likely to receive support. One reason is that harmonization and interoperability can lead to a wider selection of products available at lower costs to an island nation such as Australia. Australia contends that when manufacturers are able to design products to a global standard, greater product selection for the consumer markets generally results. Australia, with a comparatively small population – and therefore a more limited consumer base and investment center – recognizes the importance of having access to the sophisticated consumer goods demanded and produced in other developed economies with similar GDPs.

2. Brazil

The Committee of Spectrum and Orbit, managed by a Commissioner of Anatel, the Brazilian telecommunications regulatory commission, oversees spectrum matters including long-term spectrum planning and coordinating harmonization, balancing both government (civil and military uses) and private sector needs.

Brazil's Telecommunications Law of 1997 and Spectrum Use Regulation both generally support international harmonization. Policymakers within Brazil, including the Committee of Spectrum and Orbit, take both economic and technological concerns into consideration when determining Brazil's approach towards harmonization. Brazil is unlikely to support harmonization if there is a lack of technical basis for its promotion.

Brazil's approach to harmonization is dependent upon observed economic and technological benefits. As Brazil looks regionally not just to CITELE but to MERCOSUR (Common Market of the South), its perspective on economic benefit is strongly rooted in the views of its South American neighbors, many of whom are influenced by the European Conference of Postal and Telecommunications Administrations (CEPT) in part due to historical ties.⁸³ As a major emerging market with a large consumer base, Brazil has more flexibility with respect to adoption of technology and standards and works to its own national advantage when evaluating harmonization options more so than smaller countries in its region.

3. France

France has an open process wherein public and private interests are considered when a user presents its case to the Agence Nationale des Frequencies (ANFR). Industry is obligated to coordinate its proposals not only through ANFR, but also through the Autorité de Régulation des Communications Electroniques et des Postes (ARCEP), the public administrative body for commercial applications. The manner in which these commissions are managed and the degree to which industry and government users attend or drive the same mechanisms to develop positions is somewhat unclear.

Generally, countries in Europe support harmonization because differences between countries in their spectrum allocations can create many issues.⁸⁴ France supports harmonization, regionally within CEPT and globally through the ITU, while taking into account its own national use and interest. Similarly, France favors interoperability when it provides demonstrable benefit to

⁸³ The European Conference of Postal and Telecommunications Administrations, CEPT, was established in 1959 by 19 countries and expanded to 26 during its first ten years. The original members were the monopoly-holding postal and telecommunications administrations. CEPT cooperated on commercial, operational, regulatory and technical standardisation issues. *See*, CEPT Website, <http://www.cept.org> (last visited Jan. 2008).

⁸⁴ Basic spectrum policies for European Union countries are contained in the framework for radio spectrum in the European Community. *See*, Decision No. 676/2002/EC of the European Parliament and of the Council on Regulatory Framework for Radio Spectrum Policy in the European Community (Radio Spectrum Decision, March 7, 2002), http://europa.eu.int/information_society/policy/radio_spectrum/docs/policy_outline/decision_6762002/en.pdf. However, more recently the EU has discussed somewhat different objectives in its spectrum policy such as greater flexibility in use, technology neutrality and market-based approaches which in some instances may conflict with harmonization objectives. *See* remarks of Viviane Reding "Reaping the Full Benefit of a More Coherent Approach to European Spectrum Policy", March 29, 2006, http://ec.europa.eu/comm/commission_barroso/reding/docs/speeches/esmc_20060329.pdf Rewards See debate over the over policies for future use of the 2500 MHz band. *See also*, Invitation for Comments http://europa.eu.int/information_society/policy/radio_spectrum/docs/current/ong_consult/imt_2000_com/invitation.pdf.

consumers. As a CEPT member, France's interests lie first with the activities of its European colleagues; therefore, U.S. influence is less compelling than that of its neighbors.

Procedurally, the French representative believed that harmonization for future uses should be pursued through improved advance coordination. Failure to coordinate can result in later re-farming of spectrum, a costly and lengthy process. Additionally, technologies such as Software-Defined Radios may help to overcome some of the difficulty resulting from lack of harmonization, when the use of that technology has fewer drawbacks than re-farming a band in some regions of the world.

More so than other countries in this study, France underscored the importance of a harmonized approach, citing the need to avoid the difficulty of later re-allocations of spectrum if unforeseen use should require it. By contrast, other respondent countries more typically cited results of informal economic and technological cost-benefit analyses as a greater weight in determining whether to embrace harmonization. Similarly, France advocates closer coordination among regional standards organizations for interoperability considerations.

4. India

International spectrum management matters in India are coordinated through the Department of Telecommunications of the Ministry of Communications and Information Technology. The Department of Telecommunications is responsible for policy, licensing and coordination matters relating to telephones, wireless, data, facsimile and telematic services (mobile telecommunications and Internet), and other like forms of communications; international cooperation in matters connected with telecommunications including matters relating to all international bodies dealing with telecommunications such as the ITU, its Radio Regulation Board (RRB), and Radiocommunication Sector (ITU-R); and promotion of standardization, research and development in telecommunications.

The preference in India for harmonization and interoperability is largely dependent on the service being offered and whether spectrum use in India differs from that specified in the Radio Regulations.

In advance of meetings such as WRCs, the national preparatory process incorporates all spectrum users in the development of Indian positions. The government considers its own use in a separate and more closed process.

India's responses indicate a greater degree of government control over spectrum use than in the United States, particularly resulting from a focus on security issues (one of the Department of Space's concerns and part of the reason for protection of its satellite industry). Thus, while government user interests tend to take priority over industry use, this tendency is believed to be changing somewhat to become more responsive to industry needs.

5. Jordan

Jordan's spectrum harmonization policies are broadly supported through its Telecommunications Law and Telecommunications Regulatory Commission (TRC) regulations. Official documents are publicly available on TRC's website.

Government policy supports the assignment of spectrum based on international standards. Generally, Jordan's policy supports international harmonization and interoperability. This is evidenced in part by periodic regional (Arab Spectrum Management Group) and bilateral meetings to harmonize use among neighboring countries and to resolve any spectrum issues.

The main issue in the landscape of Jordanian spectrum management is spectrum allocated to the Jordanian military and the negotiations required should industry users request access. Lack of transparency in this process appears to hamper open coordination of domestic spectrum use. This situation suggests that Jordan's positions for international meetings are driven more by government interests, however, this point was not explicitly made by respondents.

6. Korea

The Ministry of Information and Communication (MIC) has the sole authority to make decisions regarding use of radio frequencies, but may consult with other government agencies. However, consultations and meetings, both interagency and with the public, are scheduled by MIC on an as-needed basis, and outcomes are largely influenced by the MIC. There does not appear to be established procedures for making decisions regarding radio frequency use as with the U.S. IRAC or ITAC processes.

Korea appears to have stronger policies to support international harmonization than other respondents in the international study. The MIC bases domestic licensing considerations in part on the likelihood of an applicant's potential both to bring the technology into use domestically and achieve international harmonization. Similarly, the Korean government standards body is viewed as coordinating effectively with its counterparts globally. This approach may explain in part Korea's leading role in developing technologies that have experienced rapid uptake in international markets.

7. United Kingdom

The United Kingdom Office of Communications (Ofcom) is the regulator for the UK communications industries, with responsibilities across television, radio, telecommunications and wireless communications services. Ofcom's spectrum-related duties include ensuring the optimal use of the electromagnetic spectrum and ensuring that a wide range of electronic communications services – including high speed data services – is available throughout the UK. Policies concerning spectrum are reflected in both the Communications Act of 2002 and European Union Directives governing the issue.

The United Kingdom does not explicitly support a policy of harmonization across the board, but lets the market determine what technologies require harmonization. Ofcom participates in

European regulatory fora that are likely, however, to take a harmonized approach to spectrum allocations, satellite services, and services where there is a particular need for harmonization or interoperability (such as Bluetooth technologies or the various Institute of Electrical and Electronics Engineers (IEEE) standards).

Where improvements may be needed in the harmonization process, intergovernmental dialogues should be embarked upon before regional and international positions are set. As a matter of policy, harmonization should be made more generic in those bands where required. This would allow the market to drive harmonization, leaving the government to facilitate rather than plan.

Ofcom relies upon existing multilateral mechanisms for conveying its position, first to make its position part of the European Common Position (ECP) and then to work within the CEPT to propagate the position among other regional spectrum organizations such as the Arab League and the Asia-Pacific Telecommunity (APT). However, it is incumbent on the user to develop *international* support for the position.

The UK's approach to harmonization – letting the market drive the process rather than an explicit planning process that always seeks harmonization as an objective – largely conforms to EU and CEPT approaches. While the UK generally adopts these positions and is viewed in other realms as acting in accord with the United States, its spectrum policy is not explicitly captive to either.

8. Conclusions

The above results demonstrate that while other administrations are generally disposed towards policies of harmonization, countries typically allow the market and technology requirements to determine its support or advocacy of a harmonization proposal. Many countries have processes to evaluate these needs and prepare for international conferences that involve multiple government agencies in a closed review process, with commissions or public consultations to hear and coordinate industry views. Overall international practices towards harmonization and interoperability are in line with those of the United States, keeping in mind that the size of the U.S. market offers more flexibility than smaller countries with respect to service and product availability. Smaller countries tend to coordinate more actively within regional bodies to ensure economies of scale and adequate service availability for citizens.

V. RECOMMENDATIONS

In accordance with the *Plan to Implement Recommendations of the President's Spectrum Policy Initiative*, the objective of this project was to assess U.S. international spectrum management policies and procedures and review the overall international regulatory environment with respect to spectrum access. The United States currently has in place many collaborative inter-agency, bilateral, regional, and multilateral processes in which to consider spectrum use related to the international introduction of new spectrum-dependent technologies and services, as well as trade and regulatory issues that may inhibit access to spectrum. An analysis of the various components of this report has led to the following recommendations for new policies or approaches towards U.S. involvement within these diverse processes.

A. Barriers to the Global Implementation of New Spectrum-Dependent United States Technologies and Services

Technology convergence and globalization of markets are challenging the international spectrum management framework. Given this environment, spectrum management policies and regulations established by foreign administrations have the potential to act as barriers to the global implementation of U.S. technologies and services. The United States must continue to work actively through multilateral organizations, as well as through bilateral processes, to monitor relevant policies throughout the world and ensure that such barriers do not prevent the international deployment of innovative new spectrum-dependent technologies and services of interest to the United States.

Recognizing the increasingly global nature of the telecommunications marketplace, the following recommendations are offered:

- The United States must continue to work actively through multilateral organizations, as well as through existing bilateral processes, to monitor relevant policies throughout the world and ensure that spectrum management policies and regulations established by foreign administrations do not prevent the international deployment of innovative new spectrum-dependent technologies and services of interest to the United States.
- The United States should remain involved with international organizations such as the ITU and further utilize trade agreements, as well as multilateral and bilateral dialogues, to improve regulatory frameworks, remove regulatory and other trade barriers, and promote open markets for U.S. companies that seek to deploy new and innovative spectrum-dependent technologies.
- NTIA should work closely with other Department of Commerce agencies, to keep abreast of the problems experienced by U.S. exporters with respect to spectrum-related products.
- In light of the importance to a variety of U.S. interests, NTIA should, with appropriate consultation, develop approaches to reducing international spectrum-related barriers promoting greater harmonization of bands and regulations concerning low-power (unlicensed) devices.
- NTIA and FCC, taking into account the needs of federal and non-federal users that require spectrum access to operate radios abroad, should continue to provide technical expertise and policy guidance to the Office of the U.S. Trade Representative (USTR), the State Department, and other U.S. organizations involved with trade and global policy matters. Expanded collaboration among relevant agencies will ensure that international regulations and policies related to spectrum access and use, as well as basic system definitions, permit the flexibility demanded by rapid technology developments while protecting the spectrum equities of the United States.

- The United States should strengthen international outreach efforts aimed at improving spectrum management operations of other countries, particularly developing countries.
- By participating more actively in the ITU-Development sector and engaging in more frequent bilateral meetings with key representatives of strategic countries throughout the world, the United States can enhance goodwill and mutual understanding about United States and international technology, spectrum and regulatory issues.
- By taking a leadership role in establishing contact with foreign delegates when they visit the United States, whether at USTTI classes or FCC International Visitors Programs, agencies involved with spectrum management can strengthen personal relationships and remain aware of developments in the international regulatory arena.

B. United States Technical, Administrative and Financial Contributions to International Spectrum Policy Organizations

Given the important role international bodies, specifically the ITU, play in the implementation of U.S. global spectrum policy objectives, it is essential that organizations such as the ITU are managed in a fiscally sound and responsible manner. The interconnected nature of the ITU's Strategic, Operational and Financial Plans causes any adjustments to administrative or financial procedures to have a direct impact on the overall effectiveness of the ITU in carrying out its objectives, including those related to spectrum management.

- The United States, through its various inter-agency processes and regional and ITU working groups, should continue to contribute actively to deliberations on ITU administrative and financial procedures and to advocate operational efficiency, flexibility and results-based budgeting when possible.

C. Cross-Border Coordination Processes

Cross-border coordination through the Radio Technical Liaison Committee (RTLCL), Ad Hoc 181 Group on United States/Canadian Frequency Coordination Agreements, United States-Mexico HLCC, and Ad Hoc 170 Group on United States/Mexico Frequency Coordination Agreements have been largely successful in considering issues related to spectrum harmonization, interference, interoperability and other telecommunications matters.

- The U.S. government should remain engaged with both Canada and Mexico on international spectrum matters since the resulting cross-border agreements can help leverage larger regional or international agreements on key issues such as spectrum harmonization and provide support to the border economies as well as make needed improvements in communications for first responders.
- NTIA and relevant federal agencies should better document and integrate cross-border objectives into its overall domestic spectrum management process. This could be assisted by the establishment of an NTIA-led group to work with Canada with coordination with the Department of State. This group would serve a similar purpose for government spectrum

matters as the FCC's Radio Technical Liaison Committee does for commercial spectrum matters. IRAC's Ad Hoc 181 committee would continue to be the focal point for Federal agency preparatory activities for Canadian spectrum issues.

D. Global and Regional Spectrum Harmonization and Technical Interoperability

Since there are recognized benefits from achieving harmonization including global economies of scale, the United States should approach harmonization proposals with an eye towards achieving harmonization wherever feasible. However, given the uncertain and frequently changing communications marketplace, overall the current ad hoc approach towards global or regional spectrum harmonization generally functions well and provides needed flexibility for diverse U.S. interests.

In order to better anticipate future international spectrum needs, assess costs and benefits of harmonization proposals and advocate U.S. positions in regional and multi-lateral organizations, the following recommendations are offered:

Assess harmonization proposals through a transparent and thorough cost-benefit analysis.

- The United States should develop a framework for considering harmonization costs/benefits for use by stakeholders, policymakers and others when analyzing significant proposals to modify its use of spectrum to harmonize with other countries. The considerations should include, among other financial and public policy topics, a technical review to understand harmonization requirements of a new technology, public interest policy analysis, assessment of how regulatory delays might impede the introduction of a new service and study of financial and possible national security and public safety impact of migrating existing users to the new spectrum.
- The United States should conduct its cost-benefit analysis in a transparent forum in order to better inform stakeholders about the decision-making process and factors under consideration.

Advocate U.S. positions on international spectrum allocations, including harmonization, in regional and multilateral fora.

- Given the specific importance of CITELE in developing regional views to be advanced in the multilateral process, the United States should increase its financial and in-kind support of CITELE.
- In many cases harmonization decisions are driven by regional-level negotiations, making the APT, the CTU and existing multilateral committees – in addition to CITELE – essential to achieving U.S. goals in the broader multinational arena. The U.S. should better integrate its spectrum policy and planning goals in its participation in CITELE and these other organizations.

- The United States should continue involvement in other regional organizations that serve as allies for the United States as it develops positions related to global and regional harmonization efforts.

VI. CONCLUSION

In view of the rapid development of radiocommunication innovations and spectrum requirements for both government and commercial systems, as well as the increasingly global nature of network capabilities, NTIA reviewed U.S. international spectrum policies and the international regulatory environment. Overall, current U.S. policies and procedures for international spectrum management are functioning well. While challenges posed by new and emerging spectrum-dependent technologies require continuous reviews of the international regulatory environment, systems and procedures are in place to ensure that United States is able to advance its interests in cross-border, regional and international spectrum management deliberations. Going forward, the United States should continue to facilitate dialogue between government and industry, and among international bodies, to ensure that spectrum policies and procedures continue to address advanced communications systems.

ANNEX 1

Best Practices for National Spectrum Management (FCC 2005)⁸⁵

***Introduction:** This Annex addresses “Best Practices” for national spectrum management activities. International practices are not included. However, some of the Best Practices contained below are intended to interface with, or transition to international practices, e.g., those relating either to collaboration with colleagues in other countries, or to coordination, such as that which would occur at a bilateral or multilateral consultation preceding a World Radiocommunication Conference, or at an international satellite coordination meeting. These practices are further intended to harmonize global spectrum management policies, to the extent practicable, by harmonizing practices among national administrations.*

Practices:

1. Establishing and maintaining a national spectrum management organization, either independent or part of the telecommunication regulatory authority responsible for managing the radio spectrum in the public interest
2. Promoting transparent, fair, economically efficient, and effective spectrum management policies, i.e., regulating the efficient and adequate use of the spectrum, taking into due account the need to avoid harmful interference and the possibility of imposing technical restrictions in order to safeguard the public interest
3. Making public, wherever practicable, national frequency allocation plans and frequency assignment data to encourage openness, and to facilitate development of new radio systems, i.e., carrying out public consultations on proposed changes to national frequency allocation plans and on spectrum management decisions likely to affect service providers, to allow interested parties to participate in the decision-making process
4. Maintaining a stable decision-making process that permits consideration of the public interest in managing the radio frequency spectrum, i.e., providing legal certainty by having fair and transparent processes for granting licenses for the use of spectrum, using competitive mechanisms, when necessary
5. Providing in the national process, in special cases where adequately justified, for exceptions or waivers to spectrum management decisions
6. Having a process for reconsideration of spectrum management decisions
7. Minimizing unnecessary regulations
8. Encouraging radiocommunication policies that lead to flexible spectrum use, to the extent practicable, so as to allow for the evolution of services¹ and technologies using clearly-defined methods, i.e., (a) eliminating regulatory barriers and allocating frequencies in a manner to facilitate entry into the market of new competitors, (b) encouraging efficiency in the use of spectrum by reducing or removing unnecessary restrictions on spectrum use, thereby encouraging competition and bringing benefits to consumers, and (c) promoting innovation and the introduction of new radio applications and technologies
9. Assuring open and fair competition in the marketplaces for equipment and services, and removing any barriers that arise to open and fair competition

⁸⁵ These guidelines are published at <http://www.fcc.gov/ib/sand/irb/bestpractices.html> (last visited April 17, 2007).

10. Harmonizing, as far as practicable, effective domestic and international spectrum policies, including of radio-frequency use and, for space services, for any associated orbital position in the geostationary-satellite orbit or of any associated characteristics of satellites in other orbits
11. Working in collaboration with regional and other international colleagues to develop coordinated regulatory practices, i.e., working in collaboration with regulatory authorities of other regions and countries to avoid harmful interference
12. Removing any regulatory barriers to free circulation and global roaming of mobile terminals and similar radiocommunication equipment
13. Using internationally recommended data formats and data elements for exchange of data and coordination purposes, e.g., as in the Radio Regulations Appendix 4, and in the ITU Radiocommunication Data Dictionary (Recommendation ITU-R SM.1413)
14. Using “milestone” management steps and phases to monitor and control lengthy radiocommunication system implementation
15. Adopting decisions that are technologically neutral and which allow for evolution to new radio applications
16. Facilitating timely introduction of appropriate new applications and technology while protecting existing services from harmful interference including, when appropriate, the provision of a mechanism to allow compensation for systems that must redevelop for new spectrum needs
17. Considering effective policies to mitigate harm to users of existing services when reallocating spectrum
18. Where spectrum is scarce, promoting spectrum sharing using available techniques (frequency, temporal, spatial, modulation coding, processing, etc.), including using interference mitigation techniques and economic incentives, to the extent practicable
19. Using enforcement mechanisms, as appropriate, i.e., applying sanctions for non-compliance with obligations and for inefficient use of radio frequency spectrum under relevant appeal processes
20. Utilizing regional and international standards whenever possible, and where appropriate, reflecting them in national standards
21. Relying to the extent possible on industry standards including those that are included in ITU Recommendations of in lieu of national regulations

ANNEX 2

CITEL PCC II Topics During 2006

1. Low power devices regulatory aspects, RFID in particular:
 - Definition
 - Commonalities in current administrative regulations of CITEL countries
 - Economies of scale
 - Recommendations on specific applications
 - Common technical limits
 - Frequency considerations – low interference causing capabilities
 - BPL interference to amateur radio
2. Low power local area networks on aircraft leading to a recommendation for CITEL countries
3. New recommendation on harmonized frequency channel plan for public protection and disaster relief operations in the range 746-806 MHz
4. New recommendation on harmonized frequency channel plan for broadband public protection and disaster relief operations in the 4940-4990 MHz band
5. Wireless broadband:
 - Regulations and bands for wireless broadband networks of CITEL countries
 - IEEE 802.16 characteristics
 - Sharing with FSS in the 3.4-4.2 GHz band
6. Digital Broadcasting:
 - ATIS standard
 - Digital techniques for the medium frequency band (AM band) under the regional MF agreement
 - FM band techniques (U.S. standard)