



UNITED STATES DEPARTMENT OF COMMERCE
National Telecommunications and
Information Administration
Washington, D.C. 20230

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Mr. John B. Muleta
Chief, Wireless Telecommunications Bureau (WTB)

Mr. Edmond J. Thomas
Chief, Office of Engineering and Technology

Mr. Peter A. Tenhula
Director, Spectrum Policy Task Force
Acting Deputy Chief, Wireless Telecommunications Bureau (WTB)

Federal Communications Commission
445 12th Street S.W.
Washington, DC 20554

Re: Spectrum Policy Task Force Report, ET Docket No. 02-135

Dear Messrs. Muleta, Thomas, and Tenhula:

We commend the Commission staff for developing a comprehensive review of the technical and economic factors of spectrum management to modernize the spectrum policy, allocation and assignment processes. The Spectrum Policy Task Force Report contains a number of innovative and thought-provoking ideas for improving critical spectrum management processes and policies. We are particularly pleased that the Commission has underscored the importance of good spectrum management – a key goal for maintaining and extending our country's technological leadership through the 21st Century.

The Commission's Report not only complements the findings of NTIA's 2002 Spectrum Summit, but represents an important step forward that could make use of the spectrum in the future more efficient and effective, increase the role of the marketplace and competition in spectrum management, reduce micromanagement, and ensure that spectrum is available for innovative technologies in the future while protecting incumbents. The Report has a number of areas that parallel on-going NTIA initiatives and projects based on NTIA's Spectrum Summit and include: (1) interference protection, (2) spectrum efficiency, (3) receiver standards, (4) public safety interoperability technologies, and (5) NTIA-FCC coordination. We will be sharing our progress and findings with you when these activities are completed.

As you are aware, the President recently issued an Executive Memorandum to promote the development and implementation of a U.S. spectrum management structure for the 21st Century that fosters economic growth, ensures our national and homeland security, maintains U.S. global leadership in communications technology development and services, and satisfies other vital U.S. needs in areas such as public safety, scientific research and Federal transportation infrastructure, and law enforcement. Through a series of meetings with Federal government, non-Federal government, and private sector spectrum users, the Secretary of Commerce will develop recommendations for improving the current spectrum management structure and policies. Through this process, the Administration will no doubt examine more closely some of the concepts raised in the Spectrum Policy Task Force Report. The

Administration's spectrum management initiative adds value to the efforts already underway by our two agencies and we look forward to the Commission's participation in this process.

The accompanying comments constitute NTIA's preliminary response to the Spectrum Policy Task Force Report. Our comments have been coordinated with the Interdepartment Radio Advisory Committee (IRAC) and are submitted at this time to accommodate the Commission's timeline for its Task Force inquiry. We look forward to working cooperatively with you toward the important goal of improving our spectrum management policies and processes. If you have any questions regarding our comments, please contact me at (202) 482-1850.

Sincerely,

Fredrick R. Wentland
Associate Administrator
Office of Spectrum Management

Enclosure

NTIA Comments

1. SPECTRUM POLICY

Increase Flexibility. FCC should permit broad, highly flexible use within technical parameters of the allocation and permit traditionally narrow services to lease excess capacity to other services as a means to increase spectrum efficiency. We support increased flexibility in many instances as a means to achieve greater spectrum efficiency. Service flexibility allows spectrum users to better respond to market forces, particularly when the flexibility allows use of ancillary services. In addition, the use of narrowly defined business classes and services can lead to misallocation of spectrum assets and should be avoided. Technical flexibility similarly has many benefits in allowing licensees to make decisions on how best to provide a service without the expense and delay that come with inflexible regulations that detail permitted technical characteristics. Flexibility can have unwanted effects, however, and cannot always be limitless. We plan to explore increasing flexibility (including leasing) in Federal government bands.

Increase Spectrum Access in Rural Areas. Many commenters in the Task Force's proceeding raised concerns about the ability of parties to obtain spectrum in rural areas. To address this problem, the FCC recommends lowering power limits in urban areas and increasing power limits in rural areas. We believe that good spectrum policies can help people in rural areas of the country use and benefit from wireless services on par with those in other areas. Offering a new approach to promoting access to spectrum in rural areas, however, requires careful implementation to avoid problems associated with using equipment designed for one environment in another. This technique of varying the power is already in common use in the commercial cell and PCS phone industries.

Future Allocation Grouping. Grouping future allocations based on mutually compatible technical and operational characteristics is a good idea. This philosophy has worked very well where it has been applied in the current allocation structure, such as grouping: a) radio astronomy with other passive services; b) systems with pulsed modulation; c) fixed service (which points horizontally) with the fixed satellite service (which points more vertically); d) radiolocation and amateur services, which have been generally found to be operationally compatible; and e) other various radionavigation functions together.

Decrease Unwanted Emissions. We agree with the goal of improving out-of-band interference performance of transmitters and receivers. As a matter of principle, transmitters should minimize their unwanted emission levels outside of their necessary bandwidth. However, improving the out-of-band interference performance should be pursued to complement the grouping of compatible systems. NTIA is currently undertaking a series of study efforts to address improving out-of-band interference performance: a) upgrading federal radar emission standards; b) upgrading telemetry emission standards; and c) studying the current state of receiver standards in the U.S. NTIA will actively participate in any parallel efforts by the FCC.

Evaluating Evolving Technology. Often new technologies leap onto the scene without warning and need spectrum that is encumbered with other users. For this reason, spectrum managers – NTIA and the FCC – should engage in periodic evaluation of the allocation parameters (services, rules, technical conditions, sharing, protections, etc.) with respect to evolving technology and uses. For this type of evaluation to be effective, however, industry must be sufficiently forthcoming about new technological applications so as to allow the lead-time necessary for any required spectrum rule revisions. Ideally, spectrum rules should be written to be flexible enough to permit most new applications without having

to resort to time-consuming rulemakings to accommodate every technical phase of evolution of a technology or every new application. Nevertheless, to anticipate inevitable changes, the review of spectrum rules should be on-going.

Periodic Review of Spectrum Rights. Periodic review of spectrum rights can be useful in that consideration can be given to revising rules that were based on old technologies to accommodate new and more efficient technologies. The Commission included the following as the basic spectrum rights parameters for all licensed and unlicensed spectrum uses: (1) designated frequency range and bandwidth; (2) geographic scope of right to operate; (3) maximum RF output, both in-band and out-of-band; and (4) a level of interference protection (*e.g.*, the maximum level of noise/interference that the spectrum user must accept from other RF sources).

The Federal agencies address these spectrum rights parameters through their review of their frequency assignments every five years to ensure the accuracy of assignment characteristics, that the assignments are still required for the purpose stated, and that the assignments comply with the current provisions of the regulations contained in the NTIA Manual. Based on these reviews, it may be possible to broaden or change the rules and rights without impacting incumbent spectrum user operations and providing access by new applications on an overlaying or underlaying or time-shared basis. Flexible spectrum rules and rights would allow dynamic spectrum use to maximize spectrum efficiency. This would also provide an opportunity to alert incumbent spectrum users of new technologies that may be available to make more efficient use of their spectrum assets.

2. INTERFERENCE AVOIDANCE

Interference Management. We agree with the Task Force that the Commission should adopt a more quantitative approach to interference management. Properly developed quantitative interference standards would assist the Commission in accessing the degree of harm from actual interference. As envisioned, this concept would allow “unlicensed” operations within licensed frequency bands based on the detection of spectrum usage by the unlicensed user(s). NTIA understands that the concept of interference temperature as proposed is to quantify and manage the permissible levels of interference at the primary user’s receivers. The determination of the level of interference that a non-primary user (unlicensed) can or will cause is difficult to ascertain. This level of interference is a function of many factors including the transmit power of the non-primary user, the propagation loss between the non-primary and primary users, the antenna pattern and gain of each user, and, possibly, the aggregation of interference resulting from multiple users. Nevertheless, NTIA supports the Commission’s efforts to pursue a more quantitative management approach in this area.

Interference Protection versus Interference Temperature. A significant amount of work has been done both domestically through the Commission’s rulemaking processes and internationally through the International Telecommunication Union – Radio Sector to define interference protections to sustain sharing of various radio services and to meet the accuracy requirements of the systems. We should ensure that as we study the new concept of interference temperature that these protection criteria are taken into consideration. The concept appears to show promise to improve spectrum utilization, especially in newly allocated bands where all users will have the opportunity to make adjustments in their design. However, the concept may be more difficult if there are a significant number of incumbent systems in the band. If the interference temperature is set higher than existing noise levels, this could have a significant impact on incumbents, requiring adjustments to be made. Many incumbent federal systems are designed to meet Congressionally-defined mission requirements and often require very

stringent interference protection criteria. NTIA plans to continue studying this interference temperature concept and any similar concepts with a view toward improving spectrum management.

Understanding Interference Temperature. One of the key technical concepts evolving out of the Commission’s Spectrum Task Force is that of interference temperature. Most processes in spectrum management are fundamentally involved in defining or controlling, in one manner or another, levels of three outputs: RF noise; desired signal; or interference. It is useful to first describe how the levels of noise and desired signal are conventionally defined, and then address interference levels. For purposes of this discussion, radio interference refers to undesired signals in a receiver due to emissions from radio transmitters, both licensed and unlicensed. RF noise refers to undesired signals in a receiver due to RF radiation from all other sources, both natural and man-made.

RF noise is always present in a receiver and is the fundamental limiting factor in all communications. For most modern communication services, receiver noise primarily results from natural sources, both internal and external to the receiver. However, at frequencies below about 500 MHz, RF noise resulting from human activities (usually called man-made noise) becomes a factor and can even be the dominant source of RF noise. Man-made noise is generated primarily from electrical devices, such as auto ignitions, high voltage power lines, and industrial electrical motors. Levels of man-made noise vary considerably depending on frequency, location, time of day, and other factors. Based on early work at NTIA’s Institute for Telecommunications Sciences (ITS), typical levels of outdoor man-made noise have been characterized in broad geographic categories such as industrial, urban, suburban, and rural areas. Recent limited measurements have generally confirmed earlier work, but suggest that man-made noise levels may actually be lower than earlier predictions, due mostly to quieter ignition systems in modern automobiles.¹ Indoor levels of man-made noise resulting from household and office electronic devices have only recently become of interest in spectrum management and are not as well characterized.

RF noise in a receiver can be defined in at least three ways. First, average noise levels are defined in absolute terms of watts or milliwatts at the input to the receiver, or actually the more convenient logarithmic forms, dBW or dBm.² Second, RF noise can also be defined as a power spectral density in terms of watts per hertz of bandwidth, or in logarithmic terms, dBW/Hz because RF noise is typically broadband in nature. For broadband noise, a third equivalent method often used in defining noise is called noise temperature. Noise temperature is simply related to noise power spectral density by a factor called Boltzman’s constant.³ For example, a noise power spectral density of -200 dBW/Hz is equivalent to a noise temperature of 724 Kelvins. The use of noise temperature is often analytically very convenient since the noise temperatures from multiple sources simply accumulate and the noise temperature from certain sources can be related to the physical temperature of the source.⁴

¹ This is counter to the intuitive and popular view that ambient RF noise levels having been increasing.

² For example, the noise level in a typical cell phone is about 0.000000000000001 watts, or -150 dBW

³ Noise temperature (T) is related to noise power spectral density by: $T = N / k$, where T is noise temperature in Kelvins, N is noise power spectral density in watts/hertz and k is 1.38×10^{-23} joules/Kelvin.

⁴ Desired signals at the input of a receiver can, in theory, be defined in the same three ways as described above for noise. However, from a practical standpoint the term “desired signal temperature” has not been used in spectrum management or elsewhere since it has not been found of value in design or analysis of radio systems. As always, exceptions exist such as in satellite remote sensing where the desired signal is actually the RF noise radiated from the earth’s surface, and RF noise is closely related to the actual surface temperature.

Interference levels at the input of a receiver can also be defined in the same three ways described above for noise. Similar to desired signal, the term “interference temperature” has not been used in spectrum management before, but presumably would have the same meaning as it does for RF noise and would be an equivalent method of describing interference power spectral density at the receiver input. The Commission has coined this term and proposes to adopt its use broadly within the spectrum management processes.

Interference Temperature - FCC Proposals to Use and Apply. According to the Task Force report, the Commission recommends adoption of the interference temperature concept to both quantify and manage interference. The concept thus includes both a technical element and a regulatory element. On the technical side, this measure of interference, as conceived by the FCC, would be of most value when used in conjunction with a new generation of “smart” receivers operating within a cooperative wireless network. The multiple receivers within the network would sense the existing RF environment (*e.g.*, signal, noise, and interference levels, and make real time adjustments to optimize communications while minimizing interference). For example, interference temperature sensory and control mechanisms could be used to maintain both in-band and unwanted emissions within permissible limits using techniques such as adaptive power control (APC) and dynamic frequency selection (DFS). Another element of the concept is that each receiver, or possibly the network, would use measurements to compute the resultant aggregate interference levels from all sources. The Commission proposes to adopt standard methodology for measuring ambient levels of noise and interference temperature (or their equivalent parameters, power spectral density). The Commission further intends to continuously monitor levels of interference temperature and maintain a database of these measurement results, which would be available for all to use.

To implement this concept, the Task Force recommends adopting regulations to establish maximum permissible levels of aggregate interference temperature, in which a receiver would be expected to operate, for each frequency band, radio service, and geographic region. This cap on interference temperature would apply over the full service area. This cap on interference temperature would quantify the level of acceptable interference for any given band, service, or location. Any transmissions that result in interference temperature higher than this cap would be considered harmful interference. While the Task Force report provides no specific examples of a cap, it includes illustrations suggesting that this cap on interference temperature might, for example, be set at the peak of the ambient RF noise levels. The cap on interference temperature would consequently be higher, by a factor of 6 to 10, than the average of the ambient RF noise levels (or technically speaking an I/N ratio of about 8 to 10 dB).

Interference Temperature - Some Preliminary NTIA Observations. NTIA believes that more study is necessary to ascertain what might be the “correct” tool for quantitatively controlling interference between mobile and unlicensed transmitting devices and existing telecommunication facilities. However, the following observations are offered.

1. The interference temperature concept offers a fresh new approach to aid the national spectrum management processes and NTIA looks forward to working with the Commission to further explore its potential benefits and limitations.
2. The concept as described appears oriented to operations of new radio services in bands essentially free of incumbent users, thus appearing to limit application. Imposing requirements on incumbent systems to adopt new temperature sensory and control mechanisms would be

challenging in general and would have to be fully analyzed as to mission and economic impact before being applied to bands in which the Federal government has communications.

3. While the techniques of ADP and DFS are becoming more common in the marketplace, the concepts embodied in calculating aggregate interference levels in real time and making individual transmitter adjustments to manage this aggregate level appears to be quite original but as of yet untested. The “certainty” of interference free operation proposed by the Commission through use of interference temperature appears quite dependent upon this new untested concept.

4. The interference temperature concept appears very strongly tied to outdoor ambient RF noise levels. However, most existing evidence available at NTIA suggests that such levels are insignificant above about 500 MHz, suggesting limited application in microwave and millimeter wave spectrum.

5. The cap on interference temperature suggested by the Commission appears to be up to 14 to 20 dB higher than the current values of I/N = -6 to -10 dB commonly used as the long-term interference protection criteria in many Commission rulemaking proceedings, NTIA studies, and ITU-R Recommendations. This proposed change would require most systems to be based on interference-limited, rather than the current noise-limited, design. While this approach may offer improved spectrum efficiency for new services in cleared spectrum, mandating this requirement for incumbent radio services may prove very difficult, and may restrict the development of more sensitive receiver technologies.

6. The interference concept is generally illustrated by the Commission in terms of a commercial land mobile communications system. It is less clear at this early stage how the concept could be broadly applied to the other 32 licensed/authorized radio services. Further examination of the concept should reveal the potential benefits and limitations to these other radio services.

7. The Commission states that effective enforcement of these aggregate interference temperature limits is an essential component to this concept. At this early stage of study, nothing has been offered as to how this would be accomplished.

8. The Commission also suggests that these interference temperature concepts might replace conventional unwanted emissions limits on transmitters. However, no evidence was provided to support this claim.

9. The Commission does not suggest a method for choosing appropriate cap levels of interference temperature for the various bands, services, and locations. In this regard, the recent national debate over the application of DFS in the 5 GHz band seems informative. That very lengthy, very technical and complex policy debate involved just one incumbent radio service, one frequency band, relatively few locations, and only a very simple adaptation of the more complex interference temperature concept described by the Commission. Expansion of that debate to address any significant portion of the 33+ radio services, the 500+ allocated bands, nation-wide applications, and the full network concept embodied in the Commission’s proposal should prove challenging.

10. The artificial noise environment established could prevent the development of better receivers, which may lead to the development of higher output transmitters to over come any interference. Moreover, power output levels of the unlicensed transmitters could gradually

increase to accommodate coverage requirements and overcome noise from other users (“the tragedy of the commons”).

Noise Floor and Long Term Monitoring. NTIA agrees with the recommendation to obtain better data regarding ambient radio noise levels in the environment and to adopt standard measuring methods. Both NTIA and the Commission should also review the term “noise floor”, since it is often misunderstood or misused in spectrum management proceedings, and agree on standard radio noise terminology. Actively partnering with the private sector to build a database of radio noise levels in the environment based on monitoring could be beneficial in frequency bands below 500 MHz, where systems could then be designed to better match the environment for which they were intended. Most measurements, however, have shown outdoor levels of ambient radio noise in the environment to be generally insignificant (as compared to basic internal receiver noise) in frequency bands above about 500 MHz; and, with the focus in both the government and non-government sectors on use of higher and higher frequencies, an extensive data base of outdoor radio noise measurements would likely be of limited value. Recent studies have suggested that indoor levels of ambient radio noise may, however, be higher than expected. This suggests further measurements and study of indoor levels are warranted.

Receiver Standards. NTIA supports the Task Force’s focus on receivers which include promotion of receiver performance requirements through industry groups, consideration of incentives for better receiver performance and the promotion of studies to evaluate receiver performance in current environment. The Commission recently issued a broad inquiry into the subject of receiver standards. NTIA plans to be an active participant in this proceeding. As you are aware, NTIA, in cooperation with federal agencies, has been successful in establishing receiver spectrum standards applicable to over 80% of all federal radiocommunications systems. NTIA has also begun a study focused on receiver spectrum standards. The initial phase of the study will be completed in July. We intend to share the results of this study with the Commission.

Interference Information. NTIA strongly agrees with the Task Force’s recommendation on improving communication on interference issues with the public and with the federal agencies, defining interference nationally and internationally, and developing a best practices handbook on interference. The handbook would contain current industry guidelines for coordinating spectrum use, steps that could be taken to resolve interference problems, and a discussion on how best to use FCC databases and related tools. NTIA is summarizing the currently used interference protection criteria for various radio services. We plan to consider adoption of these criteria in the NTIA Manual and will share this compendium with the FCC for use in the agency’s future rulemakings.

3. SPECTRUM MANAGEMENT MODELS

Exclusive Rights Model. For years, NTIA and the government agencies have used the “exclusive rights” model in bands allocated to ITU-defined radio services. Thus, NTIA and its user community develop technical standards applicable to all government uses of the band. Users from any government agency having a need for such a service may seek authorization for operations in the band. In some very widely used mobile communications bands, some of the available frequency channels are allotted to specific federal agencies. These agencies have the first and primary rights to use those channels in any area under NTIA jurisdiction. However, since spectrum requirements vary in different areas, the agencies have the flexibility to negotiate the use of each other’s channels. When advances in technology make more efficient use of the spectrum possible, such as narrowbanding, the agencies have the opportunity to negotiate among themselves for channels during transition to the new channeling

plans. Therefore, NTIA's experience has been that the exclusive rights model with flexibility works well especially where the spectrum requirements are fluid.

Command-and-Control Model. NTIA recommends that the Commission continue to dedicate some spectrum on a command-and-control basis for public safety use with the possibility of including flexibility for sharing with the commercial sector. NTIA and the Commission should work with the newly formed Department of Homeland Security (DHS) to review the pool of channels that have been set aside for interoperability at the Federal, state and local levels and determine if all of the foreseen spectrum requirements will be met.

Consideration should be given to allowing the public safety community to share its spectrum with commercial users as long as the public safety services are not compromised. This could result in efficiencies and potential income stream for public safety. However, for such arrangements to be in the public interest, public safety's access to sufficient spectrum when it needs it must be assured. The nature of public safety communications and the duties of first responders in cases of emergencies make spectrum usage unpredictable and immediate access and interoperability a necessity. The recent interference issues within the 800 MHz band, where CMRS providers that are adjacent to or interleaved with public safety systems, have shown that this type of sharing with unlike systems (public safety and commercial service) can be problematic. Further, the technology to enable the public safety entity to take back the spectrum in an emergency remains experimental. While leasing arrangements may be desirable, more study must be done to ensure such flexibility will not disrupt and interfere with critical public safety services.

Enhanced easement rights for public safety entities to access non-public safety spectrum could provide more spectrum for major regional or national emergencies. In major metropolitan areas, such as New York City, Washington, D.C., and Southern California, additional spectrum for such emergencies simply does not exist within bands allocated for public safety use. On the surface, a practical solution is to "borrow" spectrum from non-public safety services on a temporary basis. Priority users, such as first responders, should have adequate spectrum to accommodate the increased need for public safety services in an emergency; however, this could be difficult, especially if the licensees have paid for these rights through auction. Other possible arrangements could include forming partnerships with other critical infrastructure users, such as utilities, where the use of the spectrum may be similar.

Model Relationships. The "command & control" and "exclusive rights" models are related. The differences are the degree of flexibility permitted the individual user after authorization is granted coupled with the degree of flexibility permitted in which uses are eligible for authorization. Thus, specific frequencies may be authorized for use by many different users, such as commercial dispatch operations, taxicab companies, or state and local police, or to only one of them. Moreover, the authorized user may or may not be allowed to offer some of their spectrum to other users. NTIA's experience with allocation of spectrum bands to broad radio services, combined with allotment of various channels to specific users, who may trade them to other eligible users, serves to illustrate the utility of the more flexible "exclusive rights" model. However, in cases where ineligible users seek the use of specific portions of the spectrum, the "command & control" model becomes more applicable.

The "commons" model should work well as long as the users of the systems operating under that model do not interfere with each other or with nearby users authorized using the "exclusive rights" or "command and control" model. As the use of the spectrum under the "commons" model becomes more intense and interference increases, the appropriate model blends into the "exclusive rights" or the

“command and control” models in order to develop rules that will protect other users. These rules may be the result of negotiation among the users with no oversight by regulators.

Application of Models for New Spectrum Allocations. The Task Force recommendation for new spectrum allocations is to apply a basic framework that includes applying one of three spectrum models (exclusive rights, commons, or command-and-control); establishing underlay rights based on interference temperature; and then defining access rights for opportunistic devices, whether based on secondary markets, easements, or a combination of the two.

NTIA agrees that, for new spectrum allocations, application of a basic framework is essential depending on the nature of the spectrum use. NTIA also agrees that the key factors to be considered in the application of the three spectrum models are: (1) spectrum scarcity (the degree to which particular spectrum is subject to competing demands for use so that the demand exceeds the current supply); and (2) transaction costs (the expenditure of time and resources required for a potential spectrum user to obtain the spectrum access rights from one or many parties necessary to its proposed spectrum use) associated with moving spectrum from less efficient to more efficient use.

We agree that it is important to clearly define access rights for all spectrum users. It is vital to do so when considering opportunistic uses through secondary markets, easements, or similar mechanism. One of the major inhibitors to many proposals to improve spectrum efficiency is that the rights of potentially interfering uses are not defined. The basis of avoiding and resolving interference disputes will depend on the extent that the relative rights of users are better defined, especially the rights of new users versus incumbent users when both are co-primary.

Spectrum Transition Planning. The Task Force stated that flexibility in spectrum regulation is critical to improving access to spectrum. Flexibility means granting both licensed users and unlicensed device operators the maximum possible autonomy to determine the highest valued use of their spectrum, subject only to those rules that are necessary to afford reasonable opportunities for access by other spectrum users and to prevent or limit interference among multiple spectrum uses. In determining whether and how to transition legacy command-and-control bands to the flexible rights models (exclusive rights or commons), the Task Force recommended that the Commission focus first on initiating transition in those bands where additional flexibility will provide the greatest benefits at the least cost. Further, the Task Force recommended that, for encumbered spectrum, bands be identified that are suitable for initiating transition to expanded flexible rights licensing models within the next five years and that a transition plan be developed for each band. This would include: identifying 100 megahertz of spectrum for this transition phase; looking for band “defragmentation” opportunities (consolidating narrowband spectrum “slices” and encouraging migration of compatible technologies into common band groupings); specifying the interference temperature that would be appropriate to most new allocations and associated assignments and underlay operations; and addressing underlay/easement rights in transition bands on a going-forward basis (avoiding retroactive easements).

Identifying Spectrum for Transition. NTIA agrees that identifying spectrum for transition is a positive step. In lieu of setting a discrete amount of spectrum for this activity, possible frequency bands, and combinations of bands, could be identified as transition candidates, and then the band with the highest public interest value could be chosen for the transition experiment. Shared Federal Government/non-Federal Government bands should perhaps be avoided for initial transition efforts, since sharing procedures often require excessive time to resolve.

Defragmentation. With respect to band “defragmentation”, frequency bands historically were segmented into allocation blocks for exactly this purpose; that is, to group compatible services into common frequency spaces. While in the early days of spectrum management the term “mobile” usually meant a vehicle with an antenna on the roof, it now is the umbrella allocation term for a wide variety of wireless services, not all of which are compatible. We concur with the sentiment that frequency bands have become fragmented beyond the original intent of the block allocation system, and an effort to reassemble the small fragments into more usable segments is warranted.

Underlay Usage. NTIA agrees with the basic tenets of underlay usage, but cautions that too much change at once, (e.g., transition to different usage model plus the addition of underlay usage or easement) might cause instability among the license holders. Certainly, retroactive easements would be a cause of concern among the user population. Also, the choice of bands is critical since shared bands would present problems not associated purely with the transition.

Secondary Markets in Facilitating Transition. The Task Force recommended that mechanisms be developed to improve efficiency of secondary markets in facilitating transition by: (1) moving forward with the secondary markets proceeding; (2) facilitating use of leasing, band managers, and similar mechanisms to promote transition, particularly in multi-use bands; (3) addressing spectrum access issues in rural areas; (4) recommending that Congress amend Section 309(j) of the Communications Act of 1934 to include an express grant of authority to the FCC to conduct two-sided auctions and simultaneous exchanges; (5) recommending that Congress amend the Communications Act to authorize the use of auction funds to pay relocation expenses to incumbents; and (6) recommending that Congress eliminate the 2007 expiration date on the Commission's statutory auction authority and grant the Commission permanent auction authority.

NTIA congratulates the Commission on its recent order authorizing the expanded use of secondary markets. As the Commission is aware, the Administration supports the increased flexibility and incentives for efficiency that secondary market authority provides licensees and urged the agency to take such action.⁵ Within that order the Commission also sought comments on a number of additional issues and actions that could be taken to expand secondary market authority. We urge the Commission to proceed expeditiously in addressing these issues to extend the benefits of secondary markets.

It may be difficult to facilitate the use of leasing and band managers to help encourage secondary markets in shared government and non-government bands because of the potential lack of information that can be shared with non-government entities, given the classified nature of the government use of spectrum.

NTIA believes that access to spectrum in rural areas is more a market-driven problem than a technical problem, and agrees that transaction costs for rural spectrum access should be reduced. Although flexible rules that allow for increased power in rural areas may be practicable in certain situations, it is not a general solution. For example, PCS cell sizes might be larger in rural areas, requiring more power, but these cell sizes, for a given tower height, are ultimately limited by the transmitter power of the mobile unit. Federal government users have a rural/urban problem in terms of frequency assignment congestion, but NTIA does not plan to revise spectrum rules relative to this

⁵ Letter from NTIA Assistant Secretary, Nancy J. Victory, to FCC Chairman, Michael K. Powell, In the Matter of Promoting Efficient Use of Spectrum Through Elimination of Barriers to Development of Secondary Markets, WT Docket No. 00-230, *Notice of Proposed Rulemaking* (March 7, 2002).

geographical distinction. However, as noted in the Task Force report, realistic metrics distinguishing urban from rural areas are lacking and might need to be studied.

NTIA also agrees that a two-sided auction has potential as a novel way to make spectrum available for new uses. While we cannot take a position at this time on the necessity for legislation, NTIA supports the Commission's work to develop such auctions.

NTIA supports the use of auction funds to pay the relocation expenses by incumbents. The Administration has supported legislation to establish a spectrum relocation fund to streamline the current process for reimbursing federal agencies that must relocate from spectrum to be auctioned to commercial users, and this proposal is consistent with that effort. We hope the Commission will continue to support efforts to pass this vital legislation.

Moreover, the Administration supports legislative efforts to extend indefinitely the FCC's auction authority. Competitive bidding has proven to be a rational and fair method of assigning licenses in efforts to resolve mutually exclusive applications. NTIA believes the Commission should continue to have this authority. The President's Fiscal Year 2004 budget proposes this authority and legislation to accomplish this has been submitted to Congress.

Secondary Markets in Licensed Bands. The Task Force recommended that, in licensed spectrum bands, secondary markets policies should be pursued that encourage licensees to provide access for "opportunistic" uses above the interference temperature threshold through leasing of spectrum usage rights. In addition, at a later time, after evaluating the effectiveness of the secondary markets approach, the Task Force recommended that the Commission assess whether there is a need to create government-granted "easements" for some types of access, but consider the potential impact of this approach on planning and investment by licensed users.

NTIA supports the development of leasing through secondary markets of licensed spectrum. The Commission has proposed to develop the concept of "interference temperature" as a threshold for permitting additional users to operate in many instances. Where an additional use exceeds that threshold, leasing would provide a mechanism for potential new licensed users to reach an agreement with an incumbent licensed user over conditions in which the new user might operate. The result would be increased use of the spectrum. The notion of an "easement" has merit. At such time as the secondary markets approach is more fully developed, the Commission should inquire as to the types of spectrum uses that would qualify for an easement, while fully taking into account the needs of licensed users.

Competitive Bidding – Satellite Services. In order to provide more flexibility in allocating and licensing spectrum used for satellite services, the Task Force recommended that the Commission consider a statutory proposal for Congress that would assess and re-examine Section 647 of the Orbit Act to consider permitting, but not requiring, the Commission to utilize competitive bidding to resolve mutually exclusive applications for global and international satellite services.

The Commission should have the flexibility to consider all possible options when determining how to resolve mutually exclusive applications. In determining the best way to resolve these applications, the FCC should consider international concerns, including international obligations, current and future growth in satellite services, new technologies, recent rulemakings such as mobile satellite services ancillary terrestrial component, and the impact that competitive bidding may have on global systems.

4. PROMOTING ACCESS TO SPECTRUM

Spectrum for Unlicensed Devices. The Task Force recommended that methods for additional spectrum access for unlicensed devices be considered that include: (1) access to new bands controlled by a new type of band manager or frequency coordinator; (2) the determination of cognitive radio techniques to find “white space” in existing bands or use protocols to get out of the way of primary users; (3) underlay unlicensed devices that would operate below acceptable interference levels (operate on a non-interference basis with licensees) beneath primary users; and (4) underlay unlicensed devices that would operate at higher powers if negotiated with the licensee – negotiations can either take place directly or through a private band manager.

With respect to the first recommendation, NTIA supports further exploration of the band manager concept. However, we note that it may be difficult for band managers/frequency coordinators to perform the coordination among users unless the unlicensed users can be identified along with their location. We are not sure how this will work without this type of information.

With respect to the second recommendation, NTIA agrees that new technology will change the way radio systems operate. However, since these techniques are in their infancy, it is not clear what systems will prevail in the long-term. It has been suggested that some frequency bands be designated for these systems for experimentation and to provide a spectrum space to allow the shake-out of products and services. Yet, finding spectrum would be problematic. In the short-term, the use of existing bands becomes the default spectrum for such use. The evolution of “smart” radios will require an evaluation of standards and protocols on the part of the spectrum regulators, leading to a compatible set of software-defined radios used by both federal and non-federal entities.

With respect to the third recommendation, the Commission’s proposals for “underlaying” unlicensed radio services in bands already used by licensed users is quite promising if a proper balance between the “rights” of the licensed and unlicensed users in each band is made. The Commission must consider the nature of the communications supported by the unlicensed devices since there are major differences between the need for reliable communications by mobile common carrier offerings as compared to baby monitors, garage door openers, and radio-controlled toys. Thus, it would be difficult for a high priority licensed service, such as public safety land mobile services, to operate in the same portion of the spectrum as unlicensed wide area radio networks. However, assuming that the proper balance can be struck, NTIA agrees that the use of unlicensed devices in bands also used by licensed devices is very promising.

With respect to the fourth recommendation, NTIA believes that the use of higher output powers of unlicensed devices through coordination with the incumbents warrants further exploration. However, the operation of such devices would need to be limited so that they could not be used in areas in which agreements had not been reached. This would reduce a great deal of the appeal of unlicensed devices, since they would in effect become licensed for a limited area.

Spectrum (Millimeterwave Bands) Above 50 GHz It is suggested that all future rulemakings for terrestrial use above 50 GHz include *de novo* review on the merits of licensing. A large amount of the spectrum above 50 GHz is shared between NTIA and the Commission and therefore requires coordination to prevent interference. NTIA agrees that transaction costs should be as low as possible without compromising the protection of radio systems and services provided. In shared bands, federal users need to know where commercial/private systems are operating in order to prevent interference.

Automated licensing and database systems should be developed and used to allow both rapid access to the spectrum for all users, and to keep transaction costs low. NTIA agrees that a fresh review of licensing procedures is appropriate for bands above 50 GHz.

Technical Rules. The Task Force recommended that technical rules be calibrated to areas where spectrum is in the greatest demand and the most congested, which are typically urban areas. In less congested areas, the Task Force suggested that rules not prevent licensees from operating at higher power on a non-interference basis, but licensees operating in such areas should not have expanded interference protection rights or reduced obligations to avoid interference. In addition, in unlicensed bands, technical rules should allow for higher-power operation in less congested areas.

The use of radio devices that could alter the transmit power depending on the presence of other users is about the only way one could implement this type of guidance. Regarding unlicensed bands, if bands were set aside for exclusive use of unlicensed devices, then operation at higher output powers in less congested areas may be appropriate. However, the operation of such devices would need to be designed so that they could not be used in more crowded areas. This would reduce a great deal of the appeal of unlicensed devices, since they would, in effect, become licensed for a limited area. However, the use of radio devices that could alter the transmit power depending upon the presence of other users could eliminate this problem.

Experimental Licensing. The Task Force recommended that an interface with IRAC members would be helpful to search for workable compromises for experimental applications and suggest that NTIA or the Department of Commerce appoint an advocate/ombudsman for the private sector. This recommendation resulted from concerns expressed regarding the excessive length of processing time required in some cases for experimental applications. The Task Force Report relates these delays to the need to coordinate with NTIA via the IRAC for frequency applications in federal exclusive or shared bands.

There are three components in the frequency application process for Commission assignments requiring coordination with the NTIA:

1. After the applicant files, the Commission's Office of Engineering and Technology (OET) reviews the application and determines any need for additional information and whether coordination with NTIA is required. This period can take up to 30 days to complete.
2. After OET sends the application to NTIA, the information then goes to the IRAC's Frequency Assignment Subcommittee (FAS). If the application contains all the correct information, the coordination process takes 14 business days. If the application does not contain the correct or sufficient information for coordination, the application is returned to OET to obtain the information. Substantial periods of time may elapse while OET obtains needed information or addresses necessary issues.
3. NTIA provides approval, with conditions if necessary, to the Commission. The Commission then notifies the applicant by issuing a license.

The Task Force recommends that an ombudsman for the private sector be appointed to help monitor the status of pending applications for licensing because limited information is available regarding where an application stands. NTIA does not believe an ombudsman is necessary. To provide current status information, NTIA recommends that the following approaches be considered. First, the Commission's universal licensing system (ULS) could be updated on a more frequent basis to more

accurately reflect the status of a pending licensing application. Currently, when an application is pending, the ULS system frequently indicates that the application is pending before the IRAC, which may or may not be the case. NTIA would suggest that the status of such application be updated weekly and, that if the application is returned to OET for further information, the ULS system should reflect that fact. Second, NTIA is considering placing the status of these types of applications on the NTIA website. However, before that can happen, NTIA and OET must engage in further dialog to coordinate their actions. NTIA believes that if both of these proposals are undertaken, applicants should have current information regarding their applications.

The Task Force also recommended that NTIA and Commission identify some (frequency, location, time) combinations in the transfer bands for experiments that have low risk of interference to Federal systems, "pre-clear" them and announce availability for experiments in a "broad area announcement" like public notice. This recommendation appears as a result of the discussion regarding the need to have more information about Federal use of certain bands for experimental applications, particularly government bands identified for transfer. The *Federal Long-Range Spectrum Plan*, available on the NTIA website, delineates current usage, and future Federal operational and spectrum requirements in bands above 30 megahertz. Many of the frequency bands identified for transfer from the Federal Government to the private sector are documented in NTIA reports, including the identification of the locations, agencies, frequency bands, usage, and radio services. It is not always clear at the time of transfer what private sector radio service(s) are planned and when they will become available. The availability of specific frequencies, locations and times is dependent on the new experimental operation. To provide generic pre-clearance would require broad worst-case considerations that, while likely to speed accommodation, are likely to decrease the availability of spectrum. To pre-clear applications using more realistic considerations means conducting extensive interference analyses tailored to individual requirements and coordinating at the local levels for every possible experimental use such as aeronautical, fixed, mobile, satellite, and broadcasting for the private sector throughout the United States with existing Federal operations. This requires either direct private sector interaction with the IRAC or private sector coordinator access to all federal assignments, including classified assignments. Furthermore, there is still a risk that, when the assignment goes through the Commission and FAS processes, a problem may be found and the request may be denied.

We believe that the Spectrum Policy Task Force Report represents a huge step forward in creative and innovative thinking about spectrum management and how to ensure our policies and processes accommodate the spectrum needs of the future. In the Report, the Commission staff has identified a number of areas for significant changes that could lead to using the spectrum more effectively and efficiently, bringing new wireless technologies into the marketplace in a more timely fashion, and enabling the market to play a much larger role in accessing and using spectrum. We hope our comments are useful to the Commission as it continues its spectrum management review. We look forward to working cooperatively with the Commission in exploring these promising areas for change.