

REPORT
DEPARTMENT OF COMMERCE
SPECTRUM MANAGEMENT ADVISORY COMMITTEE
Working Group 2

Streamlining Federal/Non-Federal Spectrum Sharing

Introduction

In the United States, spectrum management is the dual responsibility of the FCC and the NTIA. Generally, in the United States the majority of radio spectrum below 3 GHz is divided between that which is available for use by the Federal Government entities, subject to NTIA management, and that which is available for use by non-Federal Government entities, subject to FCC management. This division of regulatory responsibility has existed for over seventy years providing important public benefits to both Federal and non-Federal users. However, a consequence of the dual management process is that spectrum is not always used as efficiently or effectively as it could be to meet Federal and non-Federal communication requirements. A more streamlined spectrum sharing process among Federal and non-Federal jurisdictions, supported by both NTIA and the FCC, may increase spectrum efficiency for all users.

To promote greater spectrum efficiency that would support the communication and/or mission requirements of Federal and non-Federal entities, current procedures can be streamlined and new ones adopted to permit greater sharing of spectrum, particularly between and among similar services or uses. These procedures should take into account spectrum capacity and geographic uses. The current rules and procedures within both the FCC and NTIA permit spectrum sharing under certain types of conditions, but are often difficult for potential spectrum users to discern. It is uncertain as to how significant a deterrent effect this lack of well-publicized procedures may be having on the exploitation of opportunities by Federal or non-Federal entities that could serve national interests, public interest and promote greater efficient use of spectrum.

Benefits of Spectrum Sharing

An efficient and effective method of allocating and licensing spectrum is beneficial to all users. Spectrum management has been accomplished, in part, through spectrum “Block” allocations to specific radio communication services; furthermore in the United States access eligibility is sometimes limited to certain types of users and in some cases to certain technologies. Benefits of this spectrum management approach include facilitating interference mitigation between users and providing critical services with virtual guaranteed access to spectrum when needed for emergency and other essential operations. Block allocations however, even for critical services, can lead to unnecessary inefficiency if the licensees are not given flexibility in management of their licensed spectrum. For example, spectrum can lay fallow in certain geographic areas or at particular time periods unless the licensee has the ability to offer either time or geographic limited sharing opportunities. Sharing of those spectrum resources, where practicable, could improve utilization of spectrum, as it would better match

supply and demand. This improved utilization, in turn, serves to advance the national and public interest.

Enhancing spectrum efficiency for all services is becoming more critical as the vast majority of applications are becoming more spectrum intensive. When spectrum availability does not satisfy demand, existing, new and additional services cannot be offered. For example, this can limit public safety, national security, and homeland security capabilities that may require an increasing amount of bandwidth to meet their operational needs. Spectrum unavailability may also delay deployment of advanced technologies (e.g., broadband), inhibit interoperability, and in its simplest form, may prevent the transmission of potentially life-saving radio communications. On the other hand, limited availability of spectrum can sometimes create incentives for investment in more efficient technologies.

In certain cases federal and non-federal sharing can lead to cost savings by reducing deployment and operating costs of radio networks. For example, one party may provide the bulk of the infrastructure (or funding), while the other provides spectrum resources. This avoids unnecessary and expensive duplication of network resources.

Another benefit of spectrum sharing is improved interoperability among similar users, a particularly important benefit domestically for federal and non-federal public safety and homeland security operations, as well as internationally for federal and allied users. In the non-federal environment, there has been a growing trend over the last decade of state and local agencies joining together to deploy “shared” wide area radio systems to promote interoperability, lower costs, and improve spectrum efficiency. These arrangements sometimes involve various licensees “pooling” their spectrum resources. Similar benefits could result from federal/non-federal spectrum sharing.

Sharing Scenarios

In general, spectrum sharing falls into one of the following categories:

- Infrastructure sharing, which typically involves one entity allowing another entity access to its radio system, or vice versa;
- Spectrum sharing, which typically involves one entity allowing another entity to use its assigned frequencies; and
- Hybrid sharing, which involves a combination of infrastructure and spectrum sharing.

The following are some actual and hypothetical situations in which sharing has occurred or could occur with more streamlined procedures.

1. Public Safety access to Federal Government Spectrum

A common scenario is a state or local government entity seeking to develop a trunked public safety radio system in the 30-300 MHz (VHF) band that could be used collaboratively by both federal and state agencies.

Notwithstanding the higher profile 700 MHz and 800 MHz bands, the majority of state and local public safety agencies continue to operate their mobile radio networks in the VHF band, and to a somewhat lesser extent, in the parts of the 300-3000 MHz (UHF) band, specifically 450-470 MHz and some portions of 470-512 MHz (in 11 major metropolitan areas).

There is a substantial imbedded base of equipment in the VHF bands, and for some users, it retains certain benefits over other bands. Radio equipment for the VHF band is produced by numerous manufacturers and is generally less expensive (making it a favorite for volunteer fire departments and low budget agencies). Additionally, this band has superior propagation characteristics in more remote environments, meaning that it generally requires fewer base stations to reach a large area (making it a favorite for agencies covering large, sparsely populated parts of the United States). The problem with the VHF band is the lack of spectrum to meet demand, even in remote areas, and the lack of channel pairs. Other land mobile bands are assigned in pairs, with one channel used for base-to-mobile, and the other (sufficiently separated in frequency to avoid interference) for mobile-to-base. Channel pairing is necessary for “trunking,” a well-established technology that relies on simple computer-based channel assignments for each separate radio communication. Trunking allows for more efficient use of scarce channels.

NTIA assigns VHF channels within a block of VHF spectrum for use by a variety of Federal agencies, including many with homeland security responsibilities. However, there appear to be portions of the nation where Federal use is relatively light, until an incident occurs, creating opportunities for possible sharing. One of the budgetary limitations for Federal government land mobile radio systems is the need to construct infrastructure (base stations, transmission towers, backhaul, etc.) even in areas with very occasional use requirements. Therefore, a potential benefit to Federal users is that state/local networks can be made available for Federal use “in exchange” for allowing Federal channels to be incorporated into the state/local network. The State of Alaska has developed a significant system that relies on such a sharing strategy.

The UHF band may offer similar opportunities for spectrum sharing between federal and state/local government networks, as there are substantial blocks of Federal and non-Federal land mobile services allocations in the band. However, the federal UHF spectrum blocks are already used among multiple federal agencies for a wide range of applications, including aeronautical mobile satellite and fixed, as well as other mobile services.

2. Federal Government access to Public Safety Spectrum at 700/800 MHz

The FCC has allocated substantial blocks of spectrum in the 800 MHz and 700 MHz bands for public safety. The 800 MHz band is already heavily used for “narrowband” voice/data in most of the nation, while significant use of 700 MHz spectrum will begin after February 17, 2009, when the transition to digital television is complete. Half of the 700 MHz public safety

spectrum is allocated for narrowband voice pursuant to state and local government licenses, and half has been allocated for broadband pursuant to a single national license awarded to the Public Safety Spectrum Trust. While the VHF and UHF bands will continue to play an important role for public safety communications, the 700 MHz and 800 MHz bands are likely to be the focus of many new state/local government system deployments.

In contrast, there are no Federal Government allocations in either the 700 MHz or 800 MHz bands. Aside from the emerging IP-based interoperability solutions, this situation could otherwise limit interoperability between Federal and non-Federal public safety operations. However, allowing Federal use of non-Federal 700/800 MHz systems could further facilitate interoperability. While Federal agencies would not be in position to provide 700/800 MHz spectrum to the shared network, Federal funding assistance could provide incentives for additional sharing in these bands.

3. Federal Agency access to local/regional private sector communication networks

There are hundreds of wireless telecommunication service providers that provide local and/or regional communications capabilities using non-Federal VHF and UHF (including 800 MHz and 900 MHz) spectrum that could accommodate non-critical Federal agency voice and data requirements. Currently, FCC secondary market rules prohibit Federal leasing of the Part 90, private land mobile radio spectrum due to user eligibility requirements, these rules could be modified to include Federal users as eligible or the FCC could grant waivers of these rules. Access costs include wireless device acquisition and recurring monthly use and maintenance fees. Network development capital costs and related infrastructure expenses, i.e., antenna site, software, etc., are borne by the system provider. Current technology capabilities permit the integration within such networks of Federal government frequencies which could be dedicated to the system's Federal users.

4. Shared Federal/Private Systems development

Similar to the systems that were authorized within certain geographic areas, Federal agencies should be permitted to jointly plan the development of communications systems with private sector entities that could offer solutions that allow for the building, operation and maintenance of such communication systems across Federal government and public safety spectrum, on a contractual basis to the federal/state/local governments. System development and maintenance costs could be provided by the wireless system provider.

5. Experimental Use in Government Spectrum

Under FCC experimental licensing rules, private sector entities and state and local governments are permitted to request FCC authority to access federal spectrum on an experimental basis to test/evaluate new technologies. This type of federal/non-federal sharing has been successful in promoting innovation, spectral efficiency, and is accomplished under FCC experimental licenses or Special Temporary Authorizations (STA). These types of licenses provide an excellent opportunity to efficiently share spectrum for a specified time and scope. In order to further improve on this federal/non-federal sharing approach, the relevant government

regulatory entities, e.g. NTIA and FCC, could both provide further transparency of the application process (see detailed recommendation under 3 below), and align the required data and data formats. Moreover, to the extent the FCC requires applications to be filed with other agencies concurrence, e.g. the FAA, the associated timelines for the validity of the concurrence, and FCC processing schedules should be aligned as well.

What is necessary to streamline sharing opportunities?

1. Transparency

Sharing opportunities are of no value if those opportunities cannot be readily identified by those entities that may benefit. For example, many state and local government radio systems in the VHF and UHF bands need additional channel capacity to expand capabilities, prevent interference, and promote interoperability. Other radio systems might be lightly used and have capacity that could be shared.

Radio system planners need to know how to identify what potential spectrum resources may be available. State/local entities would benefit from having an established, clear process for determining if federal spectrum resources might be available in a given region or for shared purposes with Federal agencies. Similarly, radio system planners would benefit by having information on existing federal radio systems operating in a given area in order to explore whether additional users could be added to the system or resources such as antenna towers, equipment shelters or backhaul communication equipment could be shared.

Given the limited resources, both human and financial, state and local entities would benefit significantly from a process that facilitates both a determination of potentially available spectrum and a clear, simple procedure to determine feasibility of access thus promoting infrastructure cost savings, spectrum efficiency and interoperability.

Both NTIA and FCC should develop informational pages on their respective websites that set forth collectively all of their respective rules and procedures for applying to use spectrum that is jointly allocated for use by federal and non-federal entities; this should include highlighting the experimental licensing rules, which is an important step in testing advanced technologies using both federal and non-federal spectrum. These informational pages should also include specific designated points of contact for public inquiries. As a whole, this will create a meaningful informational starting point for those who wish to pursue the potential for sharing spectrum.

In addition, there may be Federal government frequencies in certain geographic locations where some form of non-federal use could be feasible due to the occasional use or other requirements of the federal users.

As the technical and operational requirements of potential non-federal user entities could vary greatly, one method to explore this concept could be to allow authorized private sector entities to access non-classified information on federal spectrum assignments. For example, by

entering geographic coordinates and desired frequency range the private sector entity would be provided a point of contact for information on whether the frequencies are currently allotted or assigned for use to a specific federal agency. For the specific case of exclusive land mobile radio (LMR) frequencies, the private sector entity could be provided with additional information that would allow it to perform an analysis of whether the federal LMR frequencies and the radio service's associated technical parameters make the frequencies viable candidates for the proposed non-federal use. After evaluating the information provided, the private sector entity would be required to go through the regular FCC application process. By identifying the federal agency and its point of contact, the private sector entity has the possibility for direct and efficient communication to determine if access to the federal LMR spectrum may be viable, and on what terms and conditions. For example, the authorized federal agency may agree to share the LMR frequency in exchange for use of the non-federal users' infrastructure. However, there are significant resource (human and financial) implications for the federal government agencies to timely field and support the databases and the associated requests that may be generated by the non-federal user community.

Spectrum occupancy measurements may also provide increased transparency into certain types of services, such as land mobile radio and others. Measurements may provide insight into the location of transmitters, the type of radio equipment (via the signal bandwidth and amplitude), the system loading (via the measured occupancy), the strength of adjacent transmitters, and other useful information, when a system is transmitting. Measurements may also identify spectrum that is in use, but not included in frequency assignment databases due to unintended emissions, rogue users and errors in the data bases. Measurements could be performed upon request, based on a specific need for a particular frequency band in a certain area or on a periodic nationwide basis on multiple spectrum bands. These measurements could be performed using several nomadic ground-based systems or with an airborne system. The advantage of spectrum measurements compared to assignment databases is that spectrum measurements provide an easy to interpret representation of spectrum use. They also provide information using the actual propagation losses (database approaches rely on propagation models that have limited accuracy) and on worse case assumptions on platform mobility.

However, spectrum occupancy measurements provide a static snapshot of spectrum use at a particular time/location. For example, they do not capture the existence of passive use systems, and receive only terminals. Also, unlike assignment databases, measurement data provides no information on planned use or intensity of use when in operation. Measurement data may be misunderstood or misused by policy makers if considered without other relevant data.

Many of the intended benefits from the concept of spectrum occupancy measurements could be addressed by existing or new databases being updated on a regular basis to represent currently deployed and planned usage. Furthermore, the government database should reflect current technical parameters, rather than potentially outdated parameters that may have been the basis for an original assignment many years ago. Improvements in database accuracy benefit existing and potential users of all frequency bands.

As with establishing and maintaining databases, a significant level of resources are necessary to conduct effective spectrum occupancy measurements despite the fact that spectrum

measurement equipment costs have decreased over the last few years due to reduced computer costs, digital mass storage devices and low cost handheld spectrum analyzers. Although updating and maintaining databases also requires budgetary resources in each agency, the benefits in terms of accuracy, thus greater efficiency, may be significant. This would be relevant also for commercial licensees, and the FCC should consider requiring updated use and technical information from the FCC licensees. These costs would also be more than offset by the value to the American people of more efficient spectral use.

One additional approach to facilitate state/local entities consideration of federal spectrum would be to designate an NTIA focal point, perhaps the Chair of the IRAC System Planning Subcommittee, for state and local authorized entities to facilitate discussions between and among federal/state/local communities of interest. This would avoid burdening the formal FCC/NTIA licensing processes prematurely or speculatively, and provide more real-time engagement.

2. Application tracking

Current rules require that a private sector entity seeking to use federal spectrum must first file its application with the FCC, which after review submits the application to NTIA. A common frustration is that applicants for federal spectrum are unable to precisely follow the status of its application once it is filed with the FCC. For example, it is not transparent in the experimental licensing process on the FCC website when the FCC transmits applications to NTIA, when NTIA responds to the FCC, and whether that response contains questions to which the applicant must respond to progress the application. Currently, the FCC application process effectively requires applicants to contact individual FCC processors for that information.

On the NTIA side, an IRAC timeline of approximately nine (9) days review period has been established within the Frequency Assignment Subcommittee to respond with concurrence or concerns. Additionally the NTIA website provides some information regarding the status of an application in the IRAC process, however the information is very generic. For example, an application will be identified as “Tabled” but the non-federal applicant has no means to obtain information as to why the request is tabled or to engage directly with the concerned parties. We would recommend that there be a public tracking capability that allows the FCC applicant to readily identify when the FCC sent the application to the NTIA, when the NTIA responded, and whether it had specific questions regarding the merits or technical components of the application. That way an applicant can be proactive in engaging with the FCC to address any Federal government concerns, or know when the application should otherwise be ready for FCC action. Equipment and system testing, planning and funding depends upon timely access to application status. Moreover, this would also eliminate incredible demands on FCC staff to respond to applicant inquiries.

3. Centralized NTIA management

The Federal allotment process does not encourage federal/non-federal sharing as it requires a “match” between the relevant federal agency asserting control over its spectrum and a non-federal entity. However, the NTIA approach does result in significant sharing in various frequency bands among the more than twenty-two federal agencies which operate a wide range

of equipment and systems, for example weather radars, satellites and earth stations, to support their respective missions. Thus, while federal agencies seeking to share spectrum among each other benefit from the centralized management by the NTIA, this centralized management could yield some benefits when qualified non-federal entities seek access to federal spectrum for potential sharing concepts. NTIA would be able to provide support to the individual Federal agencies, which otherwise may not be willing or capable of devoting the necessary staff resources to review the technical, policy and regulatory aspects of a sharing inquiry from non-Federal entities. This effort will require further development from those personnel within NTIA that have a detailed knowledge of the NTIA processes.

4. State coordinators

Sharing between local government public safety entities and the federal government can be complicated by the large number of local agencies in a relevant region. One suggestion from the public safety community is that sharing could be facilitated by existing non-federal regional planning committees working with the FCC and NTIA. Once certain channels are authorized for local government use, the regional planning committee could then facilitate use by specific agencies in the region and serve as a central point of contact. These regional planning committees have served similar roles in allotting channels allocated for public safety use in the 700 MHz and 800 MHz bands.

5. Application Process

Aligning the FCC and NTIA application process would expedite licensing of federal users in non-federal spectrum and non-federal users in federal spectrum. For example typically the FCC and NTIA require different technical data in their applications and the formats for submission are also different, alignment of these two aspects would result in much needed streamlining between the two licensing agencies. Also the possibility of filing with NTIA and FCC simultaneously would result in time savings for the applicant and quite possibly for NTIA and FCC, since both may have relevant data and both agencies may require further information from an applicant. In order to address the application process a joint task group could be established to align the processes to extent practicable.

6. Process documentation

If spectrum sharing is going to increase, it may make sense for NTIA and the FCC to document their efforts to share spectrum. Such documentation would provide roadmaps for subsequent sharing efforts, while also providing benchmarks to determine whether sharing is working and what future steps may be needed to further streamline the process. This Report could include lessons learned and best practices to be taken into account in future spectrum sharing efforts. Consideration should be given to having NTIA and the FCC issue a joint bi-annual report detailing progress towards greater spectrum sharing among Federal and non-Federal entities, which could be published coincidentally during the statutory FCC/NTIA bi-annual meetings.

7. Post-Sharing Enforcement

Post-sharing enforcement considerations should be addressed as part of any framework developed to facilitate federal and non-federal spectrum sharing. This is essential to clarify both Federal and private sector user rights with respect to potential interference mitigation concerns that could arise. Post-hoc enforcement of interference should be established as part of streamlined sharing arrangements to provide mutual certainty between users as to how such concerns would be addressed, particularly when complainants may seek relief from different regulatory bodies (e.g., FCC versus NTIA). Long-term sharing arrangements could also inadvertently create presumptions of incumbency in certain circumstances, meaning that clear post-sharing enforcement mechanisms are needed to prevent politically asserted “squatters’ rights” from prevailing over actual regulatory rights associated with spectrum use. In the case of the garage-door interference example, Federal agencies, as primary users, were deploying narrowband LMR systems to comply with an NTIA mandate on spectrum efficiency. Unlicensed users (e.g., garage door opener manufacturers) had been operating as secondary users in these bands without interference risks prior to the narrowband LMR deployments, but the new systems created confusion for consumers not aware of the interference limitations of their systems under Part 15. The FCC staff facilitated discussions among key stakeholders in this instance by raising awareness about the terms of use of Part 15 systems and addressing concerns on both sides. However, a post-hoc enforcement regime allows such issues to be addressed expediently and with well-established expectations by all users about the rights and responsibilities of their access to a particular band.

8. Federal/State and Local government MOU templates

A common area of concern with sharing arrangements, is the required Memorandum of Understanding that sets forth the terms and conditions of the spectrum sharing. To the extent possible, there should be a template that Federal and non-Federal users can use in creating MOUs for their situation. While language to preserve the legal right of the Federal Government to reclaim any spectrum being shared may be necessary, there should be efforts to explain that situation in non-legal terms, perhaps in documents outside of the MOU. Those considering sharing of Federal Spectrum need to understand that Federal reclamation, while possible, is unlikely.

SUMMARY OF RECOMMENDATIONS

1. NTIA should establish a clear process for non-federal entities to determine if federal spectrum resources might be available in a given region or for shared purposes with federal agencies.
2. Both NTIA and FCC should develop informational pages on their respective websites that set forth collectively all of their respective rules and procedures for applying to use spectrum that is jointly allocated for use by federal and non-federal entities.

3. NTIA should establish a focal point, perhaps the Chair of the IRAC System Planning Subcommittee, for state and local authorized entities to facilitate discussions between and among federal/state/local communities of interest.
4. The FCC should establish a public tracking capability for applications seeking access to federal spectrum that allows the FCC applicant to readily identify when the FCC sent the application to the NTIA, when the NTIA responded, and whether it had specific questions regarding the merits or technical components of the application.
5. The FCC and NTIA should attempt to align their application processes to expedite licensing of Federal users in non-federal spectrum and non-federal users in federal spectrum.
6. The FCC and NTIA should document and report on their efforts to facilitate spectrum sharing among federal and non-federal users.
7. The FCC and NTIA need to establish post-sharing enforcement policies and procedures.
8. NTIA should establish a template for a spectrum-sharing Memorandum of Understanding that provides a realistic set of rights and obligations.