

Transition Subcommittee's charter is to examine these issues in an effort to provide the Federal Communications Commission (FCC or Commission) and the Department of Commerce's National Telecommunications and Information Administration (NTIA) guidance on how to meet the public safety community's wireless communications needs.

2.0.2 More specifically, the Transition Subcommittee's primary mission is to establish a strategy that provides for the smooth and orderly transition to newer technologies and new spectrum allocated for use by non-Federal and Federal public safety entities. As public safety equipment becomes more outdated, non-Federal and Federal public safety entities must be in a position to migrate to newer and more efficient technologies, new frequency channelization schemes, and new spectrum allocations in a smooth and timely fashion. The Transition Subcommittee has thus been tasked with developing a plan for the migration to newer, more efficient technologies in both current and future spectrum allocated for use by non-Federal and Federal public safety agencies. To this end, the Transition Subcommittee considers: (i) whether the migration should be voluntary or mandatory; and, (ii) whether different migration timetables should be established for rural as opposed to urban areas.

2.0.3 The Transition Subcommittee has also been tasked to examine spectrum management options that may lead to more efficient use of current and future public safety spectrum allocations by both non-Federal and Federal public safety entities. The Transition Subcommittee examines the current non-Federal and Federal licensing processes to determine whether they can be modified and streamlined to reduce the paperwork burden on both the FCC and NTIA and public safety agencies. Additionally, the Transition Subcommittee examines whether non-Federal and Federal public safety agencies can more effectively and efficiently share spectrum allocations and otherwise improve the coordination between non-Federal and Federal public safety agencies.

2.0.4 The Transition Subcommittee has also been chartered to examine the various commercial wireless radio services that are available in the marketplace and how they may be more effectively used by public safety entities to ease the demand on the need for additional spectrum. The Transition Subcommittee further examines how public safety entities will migrate in a smooth and orderly manner to the recommended interoperability solution.

2.0.5 Migrating to new frequencies and to the use of new, more efficient technologies also raises a number of funding and regulatory issues. The Transition Subcommittee has been tasked with considering regulatory and statutory reform actions that may be required for an orderly and smooth transition to new spectrum allocations and more efficient radio technologies. With regard to the issue of funding, in this era of deficit reduction and balanced budgets, finding funding for migrating to new spectrum allocations and new, more modern radio equipment is difficult at best. Hence, the Transition Subcommittee is chartered with examining alternative approaches to obtain funding to assist in an orderly migration to new spectrum allocations and advanced technologies.

3.0 Background/Report Scope.

3.0.1 The Public Safety Wireless Advisory Committee (PSWAC or Advisory Committee) was established to ensure that the spectrum needs of this Nation's public safety agencies are adequately met through the year 2010. Today, many public safety agencies are facing shortages of spectrum to meet current voice and data communications needs. There is also clear documentation that the spectrum needs of the Nation's public safety agencies will fall far short of that necessary to implement new telecommunications technologies that will provide critical tools for the protection of life and property.

3.0.2 Because of the fear among public safety agencies that there may not be adequate spectrum available to meet their communications requirements, the PSWAC was established to provide the FCC and NTIA with advice on the operational, technical, and spectrum requirements of Federal, state and local public safety agencies through the year 2010. Based on its Charter, the Advisory Committee established five subcommittees to thoroughly examine the operational (i.e., communications) needs of public safety agencies at all levels (Operational Subcommittee), the interoperability requirements of public safety agencies (Interoperability Subcommittee), what current and new technologies are available to meet the communication needs of public safety agencies (Technology Subcommittee), what spectrum is available to meet the existing and future communications needs of public safety agencies (Spectrum Requirements Subcommittee), and how public safety agencies should migrate to new spectrum capacity and new technologies (Transition Subcommittee).

3.0.3 PSWAC's goal is to bring about significant enhancement to the effectiveness and efficiency of public safety communications at both the Federal and non-Federal level. Importantly, in recommending the optimal environment as part of longer-term spectrum planning for public safety agencies, the Advisory Committee's responsibilities also focus on how a smooth and orderly transition to new spectrum and technologies can evolve.

3.0.4 The Transition Subcommittee's primary mission is to establish a strategy that provides for the smooth and orderly transition to any new spectrum allocated for public safety use as the result of PSWAC deliberations. Section 1.0 of this Report provides an Executive Summary of the Transition Subcommittee's findings and recommendations.

3.0.5 Section 2.0 of this Report sets forth a summary of the Transition Subcommittee's Charter. Section 3.0 provides a brief discussion of the background leading to the establishment of the PSWAC and the scope of this Report.

3.0.6 Section 4.0 of this Report provides an overview of the FCC's *Refarming* proceeding and then goes on to discuss issues relating to channel exclusivity and the need for technical standards to govern the migration to the new channelization schemes developed for public safety spectrum below 512 MHz. Section 4.0 also discusses the issues relating to the consolidation of the public safety radio service pools and whether the migration to the newly established narrowband channels should be done on a voluntary or mandatory basis.

3.0.7 Section 5.0 of the Transition Subcommittee's Report discusses issues that relate to the more efficient use of current spectrum allocated to Federal public safety agencies, including plans for Federal users to migrate to narrower channels and more efficient mobile radio technologies.

3.0.8 Section 6.0 discusses the "meat" of this Report -- i.e., how public safety agencies should migrate to new spectrum allocated for the use of non-Federal and Federal public safety agencies. Section 7.0 of this Report discusses spectrum management options that may lead to the more efficient use of spectrum by public safety agencies. Section 7.0 provides an overview of current non-Federal and Federal licensing mechanisms, and then discusses new licensing alternatives that range from the manner in which licenses are issued, to privatizing the licensing process, to granting the States a more active role in administering spectrum allocated for public safety use. Section 7.0 also discusses methods to improve Federal licensing and issues relating to the joint licensing of Federal and non-Federal public safety agencies.

3.0.9 Other spectrum management issues discussed in Section 7.0 of the Transition Subcommittee's Report relate to the issue of multiple coordinators and the need to improve the electronic filing *and* processing of applications, particularly those filed with and processed by the FCC. Finally, section 7.0 discusses methods to improve the coordination between non-Federal and Federal public safety agencies.

3.0.10 Section 8.0 of this Report discusses the commercial mobile radio services that are available to public safety agencies and the potential impact use of such services may have on the need of public safety agencies for additional spectrum. Similarly, Section 9.0 of this Report discusses some of the special issues that surround the use of mobile video by public safety agencies. Section 10.0 of this Report then goes on to discuss how public safety agencies should migrate to the "interoperability" solutions recommended by the Interoperability Subcommittee.

3.0.11 In Section 11.0 of this Report, the Transition Subcommittee provides some insight into what Congress should consider doing to improve the ability of public safety agencies to fulfill their responsibilities to protect the public welfare. This section of the Report also discusses the administrative proceedings that will be required by the NTIA and FCC to allocate additional spectrum for public safety use, and to assist public safety agencies at all levels to achieve an orderly and smooth transition to newer technologies and new spectrum allocated for its use. Section 12.0 of this Report then provides an overall summary of the Transition Subcommittee's findings and recommendations.

4.0 More Efficient Use of New Bandwidth in Existing Public Safety Bands Below 800 MHz Non-Federal.

4.0.1 There are, perhaps, three fundamental radio frequency management challenges confronting the public safety communications sector today. First, there is

insufficient radio spectrum allocated to these services to meet existing as well as future communications needs.

4.0.2 Second, the dispersion of public safety mobile communications land mobile "bands" across the radio frequency spectrum engenders special costs, technology challenges, and hampers operations.

4.0.3 Public safety communications are scattered across at least five main land mobile "bands" in the part of the radio frequency spectrum below 2 gigahertz (GHz). Current public safety radio transceivers cannot function across all public safety bands. This results in multiple units, often owned and operated by the same public safety entity. This diversity of bands increases the cost of public safety communications and impairs interoperability.

4.0.4 Whatever the reason, it is desirable from a public policy standpoint that the performance of the existing, embedded base of public safety communications equipment be substantially improved in areas of current spectrum shortage. Accomplishing this goal would entail significant new capital investment in more modern, more spectrum-efficient equipment.

4.0.5 Both the Federal Communications Commission and the National Telecommunications and Information Administration have undertaken proceedings to increase the efficient use of spectrum currently allocated and used by public safety agencies. The Communications Act of 1934, as amended, specifically directs the FCC to take action to improve the efficiency of spectrum use, to encourage competition, and to promote the introduction of new services and technologies. See 47 U.S.C. Sec. 332(a)(2) and (3); see also 47 U.S.C. Sec 7. Accordingly, the FCC, in 1995, following a lengthy and complex debate over proposals set forth in its so-called "refarming" proceeding, adopted new rules to govern the private land mobile radio bands below 512 MHz. See *Report and Order and Further Notice of Proposed Rule Making*, FCC 95-255 (June 23, 1995).

4.1.0 Overview of Refarming.

4.1.1 The FCC's new rules governing the spectrum below 512 MHz were designed to provide private land mobile radio users, including public safety users, additional channel capacity and to govern the migration of these users to more efficient technologies in these bands. The FCC sought to attain as its major policy goals (i) technical flexibility, (ii) rules that would enable users to make equipment investment decisions that best satisfy their needs, and finally, (iii) spectrum efficiency. From a public safety viewpoint, the major goal is to secure sufficient usable spectrum to fulfill their vital requirements. Rules, regulations and procedures must be employed to ensure this spectrum is used in an efficient manner.

4.1.2 To implement these policy goals, the FCC established a new channeling plan that permits the use of narrowband technologies. While the FCC's new rules maintained the existing channel spacing in the 30-50 and 72-76 MHz bands, the agency stated that it would list channels every 7.5 kHz in the 150-174 MHz band and every 6.25 kHz in the 421-430, 450-470, and 470-512 MHz UHF bands. The FCC also provided that 12.5 kHz technology

could be licensed in the VHF and UHF bands as an interim measure to the migration to further narrowband technology.

4.1.3 In addition, the FCC established rules that would allow the use of wideband equipment that employs technology at least as spectrally efficient as narrowband equipment.

4.1.4 The FCC's new rules however did not require existing licensees to change out their radio systems by a date certain. Rather, the Federal Communications Commission stated that it would manage the migration to its new narrowband channeling plan through its equipment type acceptance process. The FCC, in this regard, adopted a spectrum efficiency standard of one voice channel per 12.5 kHz of channel bandwidth for equipment type accepted after January 1, 1996, and a spectrum efficiency standard of one voice channel per 6.25 kHz for equipment type accepted after January 1, 2005.

4.1.5 The FCC's new rules governing private radio spectrum allocations below 512 MHz also did not establish specific adjacent channel station separation requirements for the new channelization plan. Rather, the various frequency coordinators were given responsibility for determining separation distances needed in each case based upon the technical characteristics of the proposed and existing station(s).

4.1.6 The Commission's *Further Notice of Proposed Rule Making* in its *refarming* docket proposed to provide public safety agencies, as well as other private radio users that operate in the spectrum below 512 MHz, the option to obtain exclusive use of their channel assignments if they agree to convert to narrowband equipment by a certain date. With respect to the issue of exclusivity, the Commission sought comment on alternative ways to achieve the introduction of exclusivity in the public safety spectrum bands below 512 MHz, including introducing competitive bidding into these bands and the imposition of a user fee system. The Commission also sought additional comment on a modified version of its "Exclusive Use Overlay" proposal that would permit users to develop licensing arrangements with other users that would facilitate the deployment of efficient technologies in four refarmed bands (i.e., 150-174, 421-430, 450-470, and 470-512 MHz). The application of these options to the public safety service will be discussed in the following sections.

4.2.0 Methods To Achieve Exclusivity.

4.2.1 An essential issue presented in the FCC's refarming proceeding is how public safety agencies can use their spectrum below 512 MHz more efficiently, and thus, gain additional capacity to meet their communications needs. Users of public safety spectrum below 512 MHz generally employ single-channel analog FM technology and use their channels in the conventional mode of operation. Offering users the option to convert to narrowband technology and to deploy other efficient technologies such as trunking and digital could lead to spectrum efficiency in these bands. These newer technologies, however, are generally incompatible with the use of other traditional technologies on the same channel in a shared spectrum environment. The needs of public safety for exclusivity and that of commercial users are dissimilar. Public safety requires exclusivity to ensure non-interference to vital communications. Commercial systems are designed to produce revenue, either

through a broad customer base or through effective operation of a business. Exclusive use of a portion of the spectrum can enhance this potential.

4.2.2 As noted, in its *Further Notice of Proposed Rule Making* in PR Docket No. 92-235, the FCC sought comment on mechanisms by which it could promote "more efficient and effective use of the PLMR bands below 800 MHz". The Transmission Subcommittee observes that the FCC believes that spectrum efficiency in these bands can be promoted by converting them from a "shared" to an "exclusive" licensing environment that will allow users to more easily convert their channels to newer technologies. To further encourage the conversion to narrowband channels and newer technologies, the FCC would also permit users in this spectrum to sell any excess capacity that may be created by the deployment of advances in technology.

4.2.3 The requirement for spectrum efficient technology is clearly an incentive for exclusivity/protected service areas. However, the requirement to protect existing public safety users from harmful interference must also be recognized. Certainly, there is a valid reason for requiring new equipment on any newly allocated spectrum. There is also a need for an incentive to expedite the move to the new channels created by refarming. Finally, the need to encourage spectrum efficient equipment in the present spectrum not affected by refarming (30-50 MHz, 70-72 MHz, 800 MHz). The Transition Committee supports all reasonable requirements to move as rapidly as possible toward the use of more spectrum efficient technology in area where spectrum shortage is critical.

4.2.4 The Transition Subcommittee generally supports the concept of introducing channel exclusivity in these bands, but has reservations about allowing public safety to sell so-called "excess capacity". Public safety agencies are licensed for the channels they need to carry out their public safety responsibilities and do not normally operate with excess capacity. The Transition Subcommittee recognizes, however, that once a system is converted to narrowband channels and/or newer technologies are implemented, some public safety and public service agencies may have some extra capacity. These agencies should be encouraged to share and combine their systems with other similar entities on a not for profit or cost recovery basis.

4.2.5 In all, the FCC proposed three options for transitioning to exclusivity. These are use of improved technology, auctions, and spectrum fees. As discussed below, the Transition Subcommittee does not agree that these are the only options which should be considered for transitioning to exclusivity. Furthermore, of the three options proposed by the FCC for transitioning to exclusivity on the bands below 800 MHz, the Transition Subcommittee believes that an appropriate licensing mechanism, as opposed to a regulatory scheme based on auctions or spectrum fees, is the preferable solution.

4.2.6 Clearly, the use of auctions is not an appropriate manner in which to transition to exclusivity for public safety for a variety of reasons. Commercial incentives for exclusivity clearly do not apply to public safety spectrum. Public safety entities rely on public funding to support their communications needs, and would not be able to compete fairly in an

auction market. Public safety does not have a commercial subscriber base which can be used to support bids for spectrum. The need for spectrum is based entirely on the geographic area served by the specific public safety entity, its demographics. Agencies with the greatest needs for spectrum may have the least ability to generate funds.

4.2.7 The use of spectrum fees is similarly unsuited for public safety agencies. As recognized by the FCC, at the present time it does not have the authority to impose spectrum fees under its current statutory authority. Spectrum user fees are not appropriate in services for the public safety radio services where the primary purpose is to protect safety of life, health, and property. User fees would be inappropriate and impose a financial burden on the public that need not be levied. Forcing state and local governments to pay for the use of a public resource also poses serious constitutional questions. Depending upon how such fees are structured, they could be tantamount to a tax on the use of the spectrum and, therefore, violate the constitutional principal that the federal government may not tax the states and vice versa.

4.2.8 An option that allows private radio users, including public safety agencies, to gain exclusive control would however contribute substantially to improving spectrum efficiency in the bands below 512 MHz. Existing licensees, in this regard, should be provided an appropriate licensing mechanism to gain exclusivity within their specific service area.

4.2.9 The term "exclusivity" does not imply that the sharing of channels among public safety users will be eliminated. Exclusivity in the case of public safety means that an agency must be protected from harmful interference. The public safety frequency coordinators have always gone to great efforts to make recommendations to minimize the possibility of interference. Public safety agencies are confined to jurisdictional and political boundaries which often results in independent operation of private systems for the various public safety departments within each entity.

4.2.10 There are several alternatives that have been proposed by which existing licensees that operate in the bands below 512 MHz can convert their shared licensed systems to exclusive licensed systems. The FCC's *Initial Notice of Proposed Rule Making* in its *Refarming* proceeding, for example, proposed giving new applicants and existing public safety licensees the right to gain exclusivity through a plan it called Exclusive Use Overlay. The Land Mobile Communications Council (LMCC) has also proposed a method to gain exclusivity that permits licensees to file for a Protected Service Area, which is similar to a proposal submitted by the Association of Public-Safety Communications Officials - International (APCO) based on the political jurisdiction of a public safety agency. The Utility Telecommunications Council (UTC) submitted a plan that would allow licensees an opportunity to obtain exclusivity through an option it terms "shared exclusivity" Alternatively, a form of *de facto exclusivity* can be awarded through the existing frequency coordination process. Through existing frequency coordination procedures, the police, fire, and emergency medical services already essentially operate with a form of exclusivity - i.e. in the frequency coordination process, public safety users are provided the largest degree of channel exclusivity possible to prevent harmful interference and to ensure channel availability in times of emergency. Unlike the other concepts discussed above where the user would

obtain an exclusive license to use the assigned frequency against all other applicants, the term *de facto exclusivity* does not mean that the concept of sharing channels below 512 MHz is eliminated.

4.2.11 The Transition Subcommittee notes that the concept of exclusive licensing has a specific legal meaning as used in the FCC's Rules. Consequently, without formal recognition in the FCC's Rules that existing public safety shared spectrum users have the right to use their channels on an exclusive basis, the legal ability to protect the channels against all other users may be difficult to achieve. Thus, even though many public safety agencies may operate with a form of *de facto exclusivity*, this cloud of potential interference may be a factor that could prevent public safety agencies from implementing advanced technologies that are dependent upon channel exclusivity.

4.2.12 The Transition Subcommittee therefore concludes that an appropriate licensing mechanism that would permit public safety agencies to convert their shared system licenses to exclusive system licenses could encourage users to convert to narrowband channels and advances in technology. The Transition Subcommittee believes that the concept of permitting public safety agencies to file for a "Protected Service Area" (PSA) more closely describes public safety requirements than those proposed by the FCC and UTC. To this end, while public safety agencies should be permitted to continue to file under the existing concept of sharing spectrum in the bands below 512 MHz, those users that want to convert to exclusive licenses should also be permitted to do so if they can meet the following criteria:

- (i) That the area of coverage authorized by the license to the maximum extent possible coincide with the users' area of operation (PSA);
- (ii) That channel loading and utilization be used to determine the appropriate number of channels; and
- (iii) That, to achieve maximum spectrum efficiency, exclusivity can be based on sharing with other users provided that signals are kept below levels that would cause harmful interference.

4.2.13 The requirement for new spectrum efficient technology is clearly an incentive for exclusivity protected service areas. However, the requirement to protect existing public safety users from harmful interference clearly more important. Certainly, there is a valid reason for requiring new equipment on any newly allocated spectrum. There is also a need for an incentive to expedite the move to the new channels created by refarming. There is also the need to encourage spectrum efficient equipment in the present spectrum not affected by refarming. The Transition Subcommittee supports all reasonable requirements to move forward the use of more spectrum efficient technology in areas where spectrum shortage is critical.

4.2.14 The need for exclusivity is an element if the spectrum below 512 MHz is to be used more efficiently. The value of radio spectrum has seen explosive growth as the FCC has auctioned spectrum to commercial industry users. Inadequate spectrum availability

jeopardizes public safety's ability to safeguard the nation's well-being. Additional reliance on more spectrum efficient technologies is thus required if public safety agencies are to fulfill their responsibility to serve the public welfare.

4.2.15 The Transition Subcommittee believes that the concept of exclusivity/protective service area, is a critical element for public safety. Further, that increased spectrum efficiency is an absolute necessity. These requirements must be tempered with the reality of the difficulty that public safety entities have in obtaining adequate funding. This applies to day to day operations as well as funding for major system changes. The bottom line is recognition of the vital role played by public safety and the need for radio systems which can be operated without fear of harmful interference from other users. The effective role played by public safety frequency coordinators in this regard can be strengthened by a process which affords further protection through rules and regulations.

4.2.16 Accordingly, to achieve gains in spectrum efficiency in the bands below 512 MHz, the Transition Subcommittee believes that a form of exclusive licensing would facilitate public safety agencies to invest in more efficient technologies. Access to additional spectrum for public safety, as shown later in this Report, is critical. Likewise, administrative solutions that allow public safety entities to use their current spectrum allocations more efficiently will also maximize public safety's ability to protect lives and property.

RECOMMENDATION: The Transition Subcommittee recommends that all public safety licensees authorized to use channels in the shared bands below 512 MHz be given an opportunity to file for a protected service area which corresponds to their area of operation. Appropriate rules must be developed which would address requirements for the number of channels based on (1) number of units, (2) population served, (3) system design and (4) type of service.

For any new channels created by refarming, there should be a further requirement for spectrum efficient equipment. Channels in any newly allocated spectrum would require that all of the above apply, including the use of spectrum efficient equipment. The Transition Subcommittee also recommends that such public safety applicants *not* be required to upgrade their systems to narrower channels and new technologies at the time they file for exclusivity or PSA. Rather, as discussed below, applicants need not upgrade their systems until they seek additional channels that may be made available in the future. Frequency Coordinators should be given the authority to determine if the listed criteria was in accordance with the rules and to recommend system parameters which would limit radio coverage as necessary to comply with the protected area. Each applicant would be required to file the appropriate application/request with its coordinator setting forth its service parameters and justifying its area of operation. The coordinator would then certify the application to the FCC for the issuance of the appropriate license.

4.3.0 Need for Technical Standards to Govern Migration.

4.3.1 The FCC's primary goal in its refarming proceeding is to increase spectrum efficiency by a factor of approximately four (4) relative to a standard 25 kHz or 30 kHz analog

channel. Even so, the FCC's refarming proceeding remains the subject of great debate, particularly over concerns about the potential difficulties in the implementation process.

4.3.2 Perhaps the most difficult issue presenting in the Report and Order is to develop a rational, systematic program for a migration to narrower channelization technologies that would adequately protect the interests of the thousands of licensed users currently operating in these bands and still achieve significant spectrum efficiency gains. Engineering knowledge teaches that the interference between systems operating at different bandwidth on the same channels is likely to be harmful. The Transition Subcommittee recognizes that the process of transforming current land mobile radio spectrum, including those channels used by public safety, from 25 kHz to 12.5 kHz and, ultimately, 6.25 kHz channels, will be a difficult and delicate transition.

4.3.3 Pursuant to the FCC's refarming plan, in certain bands, if an existing licensee of a 25 kHz system elects to convert to a 12.5 kHz operation, the licensee's new channel spacing will utilize the same center frequency as the existing transmitter. The portion of the 25 kHz channel that is "freed up" consequently comes in two segments of 6.25 kHz each that are located at the opposite edges of the 25 kHz channel. These freed up 6.25 kHz segments, however, become useful for other 12.5 kHz systems in the same geographic area only if they can be paired with adjacent 6.25 kHz segments that have been similarly freed up by other 25 kHz systems.

4.3.4 The conversion of a single 25 kHz system to a 12.5 kHz system, therefore, produces additional spectrum only if other adjacent channel users in the same area also convert. This is difficult to orchestrate because of the shared nature of the private land mobile radio bands below 512 MHz. Although there may be some potential for the use of the new 12.5 kHz adjacent channels by employing a certain amount of geographical separation, this will be limited and require careful coordination. Thus, unless there is a widespread effort to convert to narrower channelization, the improvement in spectrum efficiency may well be "illusory."

4.3.5 To achieve a graceful and meaningful transition the development of uniform technical guidelines that will permit frequency coordinators to coordinate 25 kHz spectrally efficient wideband technologies, as well as 6.25 and 12.5 kHz analog and digital systems, in the existing shared environment is critical. To this end, the Association of Public-Safety Communications Officials, International (APCO) and the Land Mobile Communications Council (LMCC) requested the technical assistance of the Telecommunications Industry Association (TIA) "in facilitating the accommodation of advanced technologies in a post refarming environment." In response to these requests, TIA prepared a *Report On The Technology Independent Methodology For The Modeling, Simulation and Empirical Verification Of Wireless Communications System Performance In Noise And Interference Limited Systems Operating On Frequencies Between 30 And 1500 MHz*, TIA TR8 Working Group 8.8 Technology Compatibility (5 April 1996)).

4.3.6 TIA Working Group 8.8's objective was to resolve procedural differences in measurement techniques and develop and issue procedures and practices for measurement

of compatibility's and/or incompatibilities and interference's between the various technologies offered to achieve the FCC's refarming objectives.

4.3.7 The result has thus far produced a document that describes a common methodology that can be used for modeling, simulating, predicting and empirically confirming performances of current generation systems as well as next generation bandwidth efficient systems operating in a post refarming environment. The document specifically defines system performance parameters and criteria and recommends an electromagnetic wave propagation model.

4.3.8 The TIA Working Group 8.8 product also defines a process and recommends data elements that can be used for spectrum management of various types of analog and digital systems. With regard to this aspect of Working Group 8.8's effort, the document attempts to catalog various current technology offerings and their respective modulation parameters and performance characteristics.

4.3.9 The Transition Subcommittee believes that it is essential that Working Group 8.8's working efforts be finalized as soon as possible and acknowledged by the FCC as the appropriate methods to coordinate and license various radio systems operating in the post refarming environment. For users to upgrade their systems to narrowband channels and advanced technologies, users must know the amount of protection their systems will be afforded from co-channel users. Otherwise, public safety users will be reluctant to seek funds to upgrade their systems to more efficiently use their current frequency assignments if their new systems employing advances in technology will be subject to harmful interference. See, *Laws of Physics Complicate the Spectrum Refarming Process*, Radio Resource Magazine, by Frederick J. Day).

RECOMMENDATION: The Transition Subcommittee recommends that the FCC issue a Public Notice seeking comment on TIA's TR8 Working Group 8.8 *Report On Technology Independent Methodology For The Modeling, Simulation and Empirical Verification Of Wireless Communications System Performance In Noise and Interference Limited Systems Operating On Frequencies Between 30 and 15 MHz* with the goal of acknowledging its use in determining the compatibility between different types of modulation systems in the post refarming environment. Appropriate technical standards accompanied by data elements for the automated processing of PLMR applications and licenses must be developed and placed in operation to assist users to achieve a graceful and meaningful transition.

4.4.0 Consolidation of Radio Service Pools.

4.4.1 In the *Notice of Proposed Rule Making* in PR Docket No. 92-235 the FCC proposed to consolidate the various radio services in the bands below 800 MHz into three broad categories: (1) a Public Safety Radio Service, (2) a Non-Commercial Radio Service, and (3) a General Category Radio Service. The FCC also proposed to allow competitive coordination in each of these new radio services.

4.4.2 The FCC asked for further comment on this in its *Further Notice of Proposed Rule Making* in PR Docket 92-235 because of the wide divergence of opinion on how, if at all, the existing radio services should be consolidated. Hoping to form a consensus, the FCC asked the various user groups to work together to submit a proposal that would reflect the interests and needs of the PLMR community, including the various public safety communities. The FCC also asked how to create competition in the frequency coordination function.

4.4.3 The FCC's underlying reason behind its proposal to consolidate the various radio services "is to distribute assignments between low-use and high-use groups more evenly, to simplify interservice sharing procedures, to organize channel allocations that will enable licensees to more easily utilize advanced technologies, and to organize the services in such a manner to achieve more efficient and flexible spectrum use."

4.4.4 Since the issuance of the Further Notice of Proposed Rule Making in this proceeding, the various radio service groups have been unable to reach a consensus and have filed alternative proposals with the FCC. Indeed, the various private wireless radio groups have submitted no less than twenty (20) different sets of proposals in response the FCC's request for an industry consensus plan on radio service consolidation. Several radio services did not take any position on consolidation except to ask that their particular radio service not be included in any plan adopted by the Commission. The Transition Subcommittee supports a position that the public safety allocation of spectrum remain as currently established under the rules of the FCC, that separate service allocations be retained and that the current method of frequency coordination be retained with the present coordinators. The rules may be modified to identify the agencies to be accommodated frequency allocation and coordination through the public safety part of FCC rules and regulations. Essentially it includes all state and local government operations and some limited private sector operations.

4.4.5 The Transition Subcommittee supports a position that the public safety allocation of spectrum below 512 MHz remain as it is currently established under the rules of the FCC, that separate service allocations be retained and that the current method of frequency coordination be retained with the present coordinators. Recognizing that the FCC may consolidate the radio services, the FCC is encouraged to establish a public safety pool for new frequencies. Further that within the pool, specific coordinators be assigned groups of frequencies for assignment.

4.4.6 Federal government consolidations

4.4.7. It is important note that definitions established by PSWAC are identified as follows:

Public Safety: The public's right, exercised through Federal, State or Local government as prescribed by law, to protect and preserve life, property, and natural resources and to serve the public welfare.

Public Safety Services: Those services rendered by or through Federal, State, or Local government entities in support of public safety duties.

Public Safety Services Provider: Governmental and public entities or those non-governmental, private organizations, which are properly authorized by the appropriate governmental authority whose primary mission is providing Public Safety services.

Public Safety Support Provider: Governmental and public entities or those non-governmental, private organization which provide essential public services that are properly authorized by the appropriate governmental authority whose mission is to support public safety services. This support may be provided either directly to the public or in support of public safety services providers.

Public Services: Those services provided by nonpublic safety entities that furnish, maintain, and protect the nations basic infrastructures which are required to promote the public's safety and welfare.

4.4.8 Notwithstanding the controversy over the FCC's proposal to consolidate the various existing radio services, the Transition Subcommittee believes it is appropriate to consider some consolidation of public safety and public service. Such consolidation should not preclude the assignment of specific channels and blocks of channels to various public safety services as may be deemed necessary. Care must be taken with consolidation to preserve the existing channels which are dedicated for specific purposes such as mutual aid and wide area systems.

4.4.9 The Transition Subcommittee under that circumstance recommends that the current radio service pools be divided into three service categories. The Transition Subcommittee has ranked these service pools according to the relative criticality of these services to carry out the Congressional mandate to promote safety or life and property. The radio service pools recommended are listed in Appendix A.

4.4.10 The Transition Subcommittee's proposal is based on the definitions of Public Safety and Public Services quoted in 4.4.7 of this document that will be utilized to assess the current and future needs for public safety communications.

4.4.11 Based on these definitions, the Transition Subcommittee has included in the Public Safety category those radio services that have traditionally rendered law enforcement, fire control, emergency medical, special emergency, local government, highway maintenance, and forestry-conservation services. The Transition Subcommittee has similarly included in the Public Services category those services that provide support for the protection and restoration of the Nation's basic infrastructure that includes public utilities (e.g., electric, gas, and water services), and services that construct radio systems along extensive rights-of-way with unique operating areas that may extend over large geographic areas (such as the railroads and pipelines).

4.4.12 The Transition Subcommittee also believes that the FCC should rank the radio service categories according to the relative importance of the radio services to respond to emergency and life-and-death situations. To this end, the Transition Subcommittee's proposal parallels existing Federal government efforts to prioritize access to public communications services in times of national emergency. See *Report and Order* in General Docket No. 87-505, 3 FCC Rcd 6650 (1988); see also Appendix A, Part 64 of the FCC Rules, 47 C.F.R. Part 64. The *Telecommunications Service Priority System* (TSP) represents an effort to develop a unified national policy on the priorities for provisioning and/or restoring telecommunications circuits in the event of general service disruption. The TSP system generally ranks those service identified by the Transition Subcommittee in the proposed Public Safety and Public Services categories as essential telecommunications services. Accordingly, the Transition Subcommittee would rank Public Safety users first in the order of importance, then Public Services users, and finally, Business/Commercial users.

4.4.13 The Transition Subcommittee also believes that interservice sharing should only be permitted from a higher ranked service into a lower ranked service, but not *vice versa*. Hence, Public Safety users could secure access to channels in the Public Service or Business/Commercial category, and the Public Service users could secure access to channels in the Business/Commercial category, but the Business/Commercial users could not secure channels in either the Public Safety or Public Services categories. This method of interservice sharing will not only preserve public safety channels for their intended use, but also will lead to improvements in channel utilization and spectrum efficiency.

4.4.14 The Transition Subcommittee observes that the equipment and operational requirements of many public safety and public service radio users are identical. It is not uncommon, moreover, that public safety and public service radio users have the need to cover a rural, wide area.

4.4.15 In rural areas, public safety users may have more channels than they need, but no funds to construct a spectrum efficient system. On the other hand, public service companies, such as utilities, may not have sufficient channels or funds available to build out a modern, more efficient system. Combined systems may be built, provided the licenses must be held by the organization in the higher block. Thus public safety frequencies must be licensed to public safety agencies, but could be used in a combined system with public service or commercial systems.

4.4.16 Conversely, there may be instances where the public safety entity want to lease service from another public service such as a utility. The utility has the channels in the rural area and has constructed the system and would like to lease out capacity. The utility, however, may encounter difficulties doing this because of the prohibition of leasing out excess capacity on a for-profit basis and risk being classified as a Commercial Mobile Radio Services carrier.

4.4.17 As noted earlier, the Transition Subcommittee has serious reservations about private radio users, including public safety agencies, being permitted to sell excess capacity on their systems. The Transition Subcommittee also believes that public safety spectrum

should be protected from other users. Nonetheless, the Transition Subcommittee believes that the rules governing the use of radio spectrum should provide sufficient flexibility for public safety agencies to acquire service from public service radio providers either on a for-profit or cost shared basis. Spectrum efficiency can be promoted when public safety and public service users collaborate and share frequencies in some circumstances.

Recommendations: (1) That the FCC retain the current public safety allocation of spectrum established under the rules of the FCC, that separate service allocations be retained and that the current method of frequency coordination be retained with the present coordinators

(2) That, in the event the radio service pools governing spectrum below 512 MHz be consolidated, that three pools be established, namely: (i) Public Safety; (ii) Public Services; and (iii) Business/Commercial, however, public safety frequencies should be identified by service.

(3) That these radio service categories be ranked according to their relative importance in performing essential public safety responsibilities and preserving and restoring the Nation's infrastructure.

(4) That interservice sharing be authorized from the higher ranked categories to the lower rank categories, but not vice versa, except in situations where Public Safety and Public Services users collaborate to establish a "shared" system.

(5) That any public safety consolidated pool be serviced by the present authorized public safety coordinators serving their current constituency and that newly created frequencies be footnoted to the appropriate services.

4.5.0 Migration Path to Narrowband Channelization.

4.5.1 As previously observed, the FCC did not establish specific dates for public safety entities to migrate to its new narrowband channelization plans for spectrum below 512 MHz. The Transition Subcommittee believes that this migration will be driven by the life cycle of presently employed equipment and the need for additional communications capacity by public safety agencies. As the equipment used by public safety entities becomes more outdated, and as they need additional channels to serve their needs, the Transition Subcommittee believes that they must be in a position to migrate to the new channelization plan established by the FCC and employ more advanced technologies.

4.5.2 The Transition Subcommittee strongly supports the goal of achieving a net gain in spectrum utilization by use of more efficient technologies in the presently overcrowded bands below 512 MHz. Indeed, the spectrum below 512 MHz is extremely congested in many urban areas of the country. Due to this congestion and other factors, current spectrum usage does not generally lend itself to the deployment of advanced wireless radio technologies.

4.5.3 A migration from 25/30 kHz wideband channels to more spectral efficient solutions like 12.5/6.25 kHz narrowband channels coupled with technologies like trunking can increase the system capacity of many public safety agencies. Exclusive use of channels is essential however if we are to expect public safety agencies to upgrade their current systems to narrowband channels and advances in technology.

4.5.4 Spectrum efficiency is, of course, a critical assessment criteria when migrating wideband systems. Increasingly, inadequate public safety communication spectrum must accommodate increases in personnel and support future applications like fingerprints, mug shots, slow and full motion video, and a host of other data transactions when responding to emergency situations. Migration to narrowband channels, standing alone, may provide some small gains in spectrum efficiency. Migration to narrowband channelization alone, however, will not increase the bandwidth to support these demands. In fact, some of these techniques will require much wider bands than presently used. Conversely, the Transition Subcommittee observes that a combination of narrowband technology and trunking technology can provide a significant improvement in spectrum efficiency in many instances.

4.5.5 The Transition Subcommittee fully supports the FCC's efforts to make more effective and efficient use of the public safety bands below 512 MHz. Clearly, spectrum efficiency gains will be significant over time. The conversion to narrowband channels and more efficient technologies, however, is expected to be an evolutionary rather than revolutionary process that will take many years to carry out and thus will have little immediate impact on the need for additional spectrum to meet the needs of the public safety community.

4.5.6 The Transition Subcommittee observes that the Commission has elected to manage the migration of the private land mobile radio bands below 512 MHz to advanced technologies through the type acceptance process, rather than require existing licensees to change out their systems by a date certain. It is suggested that unless a date certain is imposed it is unlikely that public safety agencies, particularly those in the urban areas, will reap any benefits of narrowband for many years to come.

4.5.7 The Transition Subcommittee believes that the Advisory Committee must be careful not to recommend, nor the FCC to mandate, any action that would impinge on the independent judgment and financial affairs of the wide variety of small, medium and large public safety entities that use radio spectrum. Their systems have been developed in full compliance with the Commission's rules governing private land mobile radio systems. To mandate migration to narrower channels and advances in technology before the users are ready and able to convert their existing systems would interject the hand of big government into planning activities and financial affairs of communities throughout the nation.

4.5.8 The Transition Subcommittee recognizes, however, that the efficient use of current spectrum allocations clearly has an impact on the amount of spectrum needed to meet existing and future needs of public safety community. If conversion to improved technology is dependent only upon type acceptance of equipment, it is probable that it will be a long drawn out process, and that significant benefits from the refarming process will be many years in coming. Thus, some compromise between forcing users to convert, by a date certain, with

adverse financial problems, and allowing them to continue to use wide band equipment indefinitely is in order.

4.5.9 The Transition Subcommittee notes, in this regard that there are possible approaches to this type of compromise. The first would be to establish dates certain by which all equipment would have to FCC requirements for spectrum efficiency. If not converted by that date the system would revert to secondary status. This would allow users in many rural and low density areas to extend the useful life of equipment. Urban areas, and other areas with high spectrum demands would be forced to convert or face the prospect of harmful interference or even loss of license. Dates for any mandated conversion could be different for rural and urban areas. The other approach, as new spectrum is allocated, is to require users to demonstrate how they are using existing spectrum efficiently before they receive any new allocations. In any event, all new spectrum should require the use of spectrum efficient technology and any users migrating would relinquish their existing spectrum as soon as the move was complete. A major concern in either alternative is that public safety systems are generally composed of units of various ages. Thus, any conversion, either voluntary or mandatory, could preclude full amortization of existing equipment.

RECOMMENDATIONS: (1) The Federal Communications Commission retain the mandated dates for type acceptance, and due to the extreme congestion and need for immediate relief, particularly in urban environments, conversion to meet FCC present requirements for spectrum efficiency (12.5 kHz) by January 1, 2005 in those areas. Rural areas, while also being required to convert, could be given somewhat longer periods of time. In each event, failure to meet the specified requirements by specified dates would result in reversion of authorization to secondary status.

(2) Agencies should be encouraged to convert to more spectrum efficient systems at the earliest possible date. This includes the potential for negotiating with others in near by areas to also convert.

(3) Encouragement for conversion should be provided in the form of funding assistance from federal or other resources.

5.0 More Efficient Use of Spectrum Assigned to Federal Public Safety Users.

5.0.1 NTIA, as noted earlier, is responsible for managing the Federal Government's use of the radio spectrum. Aside from the use of spectrum by the military, many Federal departments and agencies use the radio spectrum to support their unique missions. These missions include, but are not limited to, protecting the President and foreign officials, assuring the safety of the airways, water transportation, Federal Law enforcement, disaster relief, protection of natural resources, ensuring the security of power generation and nuclear material, and the efficient operation of the postal service.

5.0.2 Like spectrum use in the non-Federal sector, spectrum requirements of the Federal Government also tend to increase with population growth and are heaviest in areas of high population density.

5.0.3 The Federal Government, recognizing its growing spectrum requirements, has undertaken significant planning efforts in order to increase the spectral efficiency and capacity of their current spectrum allocations. The Federal Government's non-tactical land mobile operations are accommodated primarily in portions of the 30-50 MHz, 138-150.8 MHz, 162-174 MHz, 220-222 MHz, and 406.1-420 MHz bands. The 162-174 MHz and 406.1-420 MHz bands are the most widely used by Federal Departments and agencies.

5.0.4 As noted in an NTIA Special Publication,¹ the number of assignments in Federal land mobile bands has been increasing over the past few years, particularly in the 138-150.8 MHz, 162-174 MHz, and 406.1-420 MHz bands. There are forty-eight (48) Federal agencies that operate in the 162-174 MHz band and forty-seven (47) Federal agencies that operate in the 406.1-420 MHz band. The land mobile radio service is the dominant service used by Federal agencies in these bands, and trunking technology is primarily employed in the 406.1-420 MHz band.

5.0.5 The National Telecommunications and Information Administration (NTIA), its predecessor agencies, and its interagency advisory group, the Interdepartment Radio Advisory Committee (IRAC), have long sought to keep Federal government usage of the spectrum as efficient as both economic and mission requirements would permit. In 1992, completing a two-year effort, NTIA halved channel widths in the 162-174 MHz band, the band most heavily used for Federal non-military land mobile communications. This change accommodates expanding requirements of all agencies in this band by doubling the number of available channels and permitting the use of alternative communications technologies that can achieve equivalent spectrum efficiencies. Also in 1992, NTIA, working with the Federal Communications Commission (FCC), converted the 220-222 MHz band from the radio location service to the mobile service for Federal and non-Federal narrow band land mobile use. In addition, eight years ago NTIA urged industry to develop and market trunking communication systems in the bands available to Federal government users and urged the FCC to revise regulations that prohibited Federal government agencies from using commercially offered specialized mobile radio services.

5.0.6 Federal use of the mobile spectrum includes both traditional and specialized aeronautical-mobile, maritime-mobile, military tactical, and mobile satellite applications, which operate under rules and regulations established by international conferences. Any changes in the ways in which the frequencies allocated for these services are managed would require international agreement. Therefore, this plan is limited to policies and procedures for the regulation of the civil and military non-tactical use of those land mobile radio communication services that do not involve international matters by the agencies of the Federal government.

¹ *U.S. National Spectrum Requirements: Projections and Trends*, 94-31 (March 1995)

5.0.7 NTIA's plan, mandated in the National Telecommunications and Information Administration Organization Act (NTIAOA), continues earlier NTIA efforts to help relieve demands by Federal government agencies for more spectrum to expand existing types of service. Under the NTIAOA, NTIA is to advance policies "[f]ostering national safety and security, . . . and the delivery of critical social services through telecommunications. . . . [f]ostering full and efficient use of the radio spectrum by the Federal Government, in a manner which encourages the most beneficial uses thereof in the public interest." The NTIAOA requires that "[i]n assigning frequencies for mobile radio services . . . , the Secretary of Commerce [acting through NTIA] shall promote efficient and cost-effective use of the spectrum to the maximum extent feasible," and "the Secretary of Commerce shall adopt and commence implementation of a plan for Federal agencies . . . to use . . . technologies that are at least as spectrum-efficient and cost-effective as readily available commercial mobile radio systems." Furthermore, the NTIAOA authorizes the Secretary "to withhold or refuse to assign frequencies for mobile radio services . . . in order to further the goal of making efficient and cost-effective use of the spectrum."

5.0.8 To meet the Congressionally set goals regarding mobile service operations of the Federal government and general policies regarding satisfying the national safety and security and the delivery of critical social services by the Federal government and encouraging beneficial uses of the spectrum by the Federal government, the objectives of this plan are to ensure that Federal agencies using land mobile radio technologies and services:

- use spectrum-efficient and cost-effective radio technologies to satisfy land mobile radio communication requirements, thereby minimizing both the amount of spectrum used and the long-term cost; and,
- use commercial sources or shared systems to provide land mobile radio communication services unless services or systems that can meet telecommunication mission requirements are not available or the available services or systems would cost more than alternatives.

5.0.9 In developing the plan, NTIA analyzed existing Federal government use of the spectrum for mobile services, the status of mobile communication technology, and existing NTIA and other agency policies regarding mobile services. Other Federal government regulations concerning acquisition of telecommunication resources were reviewed to determine appropriate types of regulation for Federal land mobile communication services and to ensure that NTIA regulations did not conflict with them.

5.0.10 NTIA reached several conclusions regarding how to continue expanding its efforts to use Federal government land mobile spectrum as efficiently as both economic and mission requirements will permit. Several of these would increase the number of channels available to the Federal government for land mobile communication without increasing the amount of spectrum dedicated to that use. Others would increase the number of users that can operate on each communication channel. In addition, NTIA reviewed its policies and procedures for managing Federal government use of land mobile radio communication

services and has developed findings concerning introduction of more spectrum-efficient technologies. These findings are:

- The doubling of Federal land mobile frequency assignments between 1980 and 1992 reflects the rapid growth in government demand for land mobile services over the same period. During the same period, the number of private sector frequency assignments tripled, reflecting similar but larger growth.
- Federal mission requirements often involve local, national and worldwide service areas that include remote, rural, suburban, and urban environments. These missions, which have been mandated by the Congress and the President, have few counterparts outside the Federal government, although, in some cases, state and local government missions are similar and result in similar uses of the radio spectrum.
- Federal land mobile radio systems use a wide range of equipment types in a variety of geographic environments for voice and data communications. Common types of equipment include base and repeater stations, mobile stations, and hand-held, portable stations. This equipment is generally the same "off-the-shelf" analog FM equipment used outside the Federal government, operating on different frequencies. Moreover, because the technology is the same, the spectrum-efficiency and cost-effectiveness of the radio technologies used by the Federal government usually are identical to that used in readily available commercial radio systems.
- NTIA has selected a 12.5 kHz channel width for rechanneling, which will double the number of basic channels available using currently available technology. This will also allow trunking systems to increase efficient use of the spectrum by a factor of 3-8 and systems using time division multiple access by a factor of 3-6, depending on the type of system. Federal agencies have already begun procurement of these new radios for the 162-174 MHz and 406.1-420 MHz bands.
- Under certain conditions, trunking systems are more efficient than conventional systems. When there are a large number of users with a high volume of short duration messages, a trunking system can significantly increase total traffic throughput on individual communication channels and still provide a high probability of immediate access to users. Agencies with large numbers of users spread throughout a contiguous geographic area, such as a military base, have found trunking systems to be especially useful. Wide area systems, which allow users to roam over large areas, such as a state or several counties, or between several areas are being implemented. In addition, systems operated by commercial vendors offering services on a for-fee-basis to all government agencies and systems jointly owned and operated by the user agencies have been successfully implemented.
- Government use of commercial Cellular systems and PCS will supplement the Federal land mobile service infrastructure, and appropriate plans are currently being formulated by the potential user agencies. The Federal government expects to use and own unlicensed PCS devices, such as wireless PBXs and wireless Local Area Networks. The Federal government

also expects to obtain PCS and cellular radio services from commercial service providers, as well as other services extending the public switched telephone network to mobile users.

6.0 Transition to New Frequency Bands

Overview of New Frequency Band(s) Recommended by Spectrum Subcommittee. (Explanation: One of the major endeavors of PSWAC is to determine whether the public safety community needs additional spectrum, and if so, how much and where that spectrum should come from. Once the Spectrum Requirements Subcommittee makes these determinations, the Transition Subcommittee must examine how the public safety community will migrate to the frequency band(s) identified. The purpose of this section is to examine the technical, licensing and other issues that the public safety community may encounter as they migrate to the new frequency bands). Information regarding this transition can be found in Appendix B.

7.0 Spectrum Management Options to Increase Spectrum Efficiency By Non-Federal Public Safety Agencies.

7.0.1 As discussed above, the Transition Subcommittee believes that *refarming* current spectrum allocations can provide some additional capacity to State and local governments to support their law enforcement, fire, emergency medical, forestry-conservation, highway maintenance and other public safety services. Additional spectrum capacity will also be required, particularly in major metropolitan areas, to keep pace with the ever growing demand for basic voice and data communications and to permit public safety to implement new telecommunications technologies that will provide State and local public safety entities with new tools for the protection of life and property.

7.0.2 Aside from issues relating to the more efficient use of current spectrum allocations *and* the critical need for additional spectrum for existing and new public safety communications services, the Transition Subcommittee believes that there are a variety of administrative undertakings the Federal Government can pursue to improve the overall efficiency of public safety's spectrum usage. These matters range from restudying the Federal Governments existing licensing mechanisms to improving the overall coordination of public safety issues between Federal and non-Federal public safety entities.

7.0.3 Indeed, while there have been changes in the regulatory procedures administered by the FCC over the years, in essence the licensing mechanisms followed by this agency have remained essentially the same since the statutory provisions set forth in the Communications Act of 1934 were adopted. The Transition Subcommittee believes that there are alternatives to the current regulatory process that could result in more expeditious licensing of public safety entities, better coordination between and among Federal and non-Federal public safety entities, and finally, more efficient use of spectrum allocated for public safety use. These alternatives range from streamlining current procedures to completely

revamping the way in which the Federal Government administers public safety spectrum management activities.

7.1.0 Current Non-Federal Licensing: An Overview.

7.1.1 The Communications Act of 1934, as amended, 47 U.S.C. Sec. 151 et seq., (Communications Act), provides for the regulation of interstate and foreign commerce in communication by wire or radio. The Communications Act requires Federal approval of any emission of radio transmissions by any person other than the Federal government. In essence, the Communications Act preempts the entire field of radio transmissions for exclusive Federal control, particularly in licensing the use of radio spectrum.

7.1.2 The Communications Act also retains Federal regulatory control of the radio spectrum to the exclusion of "private" interest. The Communications Act specifically states that its purpose is to maintain the control of the United States over all the channels of interstate and foreign radio transmissions. While the Communications Act provides for the use of radio channels by others under licenses granted by Federal authority, it does not provide for the ownership of such channels.

7.1.3 Indeed, the Communications Act makes it absolutely clear that no such license shall be construed to create any right, beyond the terms, conditions, and periods of the license. To make sure that Federal control is pre-dominant, the Communications Act provides that an applicant for a license must sign a waiver of any claim to the use of any particular frequency as against the regulatory power of the United States because of the previous use of the channel, whether by license or otherwise.

7.1.4 Private land mobile radio users, including public safety users, have thus had to seek authorization to use a particular frequency or channel by filing an application with the Federal Government's agent, the FCC. Once processed and approved, the FCC issues licenses for periods of up to ten (10) years, which periods may be renewed for successive terms of up to ten years.

7.2.0 New Licensing Alternatives: Non-Federal.

7.2.1 Private radio licensing statistics dwarf those of any other communications service regulated by the FCC. In 1994, total private radio stations licensed by the FCC exceeded 2.9 million (accounting for some 18.8 million transmitters). The FCC received nearly three-quarters of a million private radio authorization requests. There were more than a quarter of a million licensees in the six categories considered public safety. Some 50,651² public safety authorization requests were processed. By comparison, there were some 13,044 radio and television broadcast licensees, and the agency received fewer than 5,000 broadcast applications of all kinds that year. *Id.* at pp. 65-67.

² See 1994 FCC ANNUAL REPORT at pp. 120-21 (1995).

Shared vs. Exclusive Licensing. Today, frequencies in the private land mobile radio bands at 25-50 MHz, 150-174 MHz, and 450-470 MHz are shared among different users in the same area. Frequencies, however, in the 470-512 MHz, 806-824/851-869 MHz, and 869-901/935-940 MHz bands are assigned on an "exclusive" basis determined by channel loading and mileage separation. The coordination process is also different for these frequency bands. In the bands above 470 MHz a frequency can be shared where loading is below that required or mileage separation exceeds the minimum. If the other criteria is met, the channel is protected for its licensed area of operation. In the bands below 470 MHz, the FCC's application process only requires the identification of the "the most appropriate frequency."

7.2.3 Hence, applicants are currently granted a license for a specific channel or group of channels on either a shared or exclusive basis. As previously discussed, licensing channels on a shared, non-exclusive basis tends to prevent the implementation of spectrum efficient technologies. This is primarily due to the likely crowding of the radio environment and the difficulty in getting all those that share a channel to upgrade their system to a more efficient technology.

7.2.4 Clear evidence of this difficulty is available in the older private land mobile radio bands where, as indicated, channels are assigned on a shared, non-exclusive basis. While the presumption that a shared radio market is inherently inefficient may be debated, the FCC's refarming proceeding clearly indicates it is nearly impossible to implement advances in technology in the bands below 450 MHz because of the multiplicity of users in those bands. Where, on the other hand, channels are assigned on an exclusive basis, (e.g., in the MHz band), licensees have been more inclined to implement trunking and digital technologies.

7.2.5 Also as previously discussed, public safety licensees, should be given the option and tools to obtain exclusivity (PSA) on their channels below 512 MHz to permit and encourage the implementation of more efficient radio technologies. This must not be implemented by mandating the removal of any currently licensed systems operating on the requested frequencies.

7.2.6 Local, Area-wide or Statewide Licensing. Public safety entities are currently given authority by the FCC to serve their local areas. Spectrum efficiency may also be increased by greater sharing of the spectrum by a multiplicity of public safety users within a given area (e.g., all agencies within a township, city, or county). Today, many jurisdictions are combining resources to develop one advanced radio system to serve all the public safety agencies within the area.

7.2.7 Regional Plans Regional plans have demonstrated that they are useful tools, particularly in metropolitan areas where spectrum is scarce. Of a number of regional plans several regions have been extremely effective. The Los Angeles area, congested areas of Northern California, New York and several other metropolitan areas have demonstrated effectiveness of regional plans. However, in rural areas or areas of the country that do not have a critical spectrum shortage they have been of little use.

7.2.8 The Transition Subcommittee endorsed the idea of intensive regional planning for congested areas where there is a spectrum shortage and a simple generic plan for rural and uncongested areas. The Transition Subcommittee would object strenuously, however, if agencies were held hostage to accomplish such planning endeavor as a condition of the release of any new spectrum. No other users of the spectrum are required to provide such planning as a condition of spectrum. It would be a discriminatory practice to require such of public safety.

Examples of Wide-Area Shared Systems

The system described in the preceding paragraph has not yet been matched in fact. However, some systems have been proposed and are apparently moving towards implementation which seem to be driven by many of the same considerations as in the vision. We have included a brief description of a sampling of these systems for two reasons. First, they tend to validate the arguments describing a need for such shared systems. Second, they illustrate various approaches for achieving the fact of these systems. Possibly some synthesis of the approaches described here will offer the best of all organizations for these systems.

State of Colorado The State of Colorado is planning a statewide digital trunked radio system (DTRS), based on APCO-25 standards. Planning began in 1991 within the Division of Telecommunications, studying advanced designs for an improved statewide system for the State Patrol. Eventually, components of the Highway Maintenance and Natural Resources Departments were included. Beginning in 1992, an extended series of information meetings were undertaken to gather public support this system. A series of working committee meetings were set up to provide advice on the services and the administration of the system. These meetings included many public safety and municipal communication professionals, as well as industry, Federal agency, and FCC and NTIA personnel. This working committee issued a report in June 1995.

A 6-phase schedule of implementation has been proposed for DTRS, beginning with the Denver Metropolitan area in 1996. The system is expected to cost somewhere near \$120 million, not counting the microwave backbone which is already mostly in place. It is anticipated that the system will be built using the 800 MHz public safety bands. The state legislature would be expected to provide much of the funding, with some expenses recovered from monthly fees and some reimbursed construction costs. The Division of Telecommunications will own and operate DTRS, but local governments and Federal agencies have been invited to participate. A strong user's group is expected to be set up to help govern the system.

The implementation model assumes that several types of users will want to associate themselves more-or-less closely with the state network. The State Patrol, Highway Maintenance, Natural Resources, and Corrections will be full members, based on legislative fact.

Client members will be given service on DTRS, in exchange for the monthly subscription fee. Client members are typically small communities that have traditionally not built their own radio systems.

Integrated members will forego building their own radio systems, but will contract with the Division of Telecommunications to design and build a system for them, which will become part of the DTRS. Integrated members will probably pay a monthly service fee, as well as the incremental cost of building their part of the system. Typical Integrated members include small-to-medium size towns, whose communications needs are too large to piggy-back on the unmodified DTRS capabilities, but which have chosen not to build their own facility.

Cooperating members will build their own radio facilities to meet their own needs, but will design it to become part of the Colorado network. Cooperating members might include city/counties with a large population who are currently operating an extensive radio system. The Cooperating network might replace the DTRS Network in areas where the Cooperating network provides coverage. In exchange for providing services to all members of the Colorado network, the cooperating members might receive payment for services, as well as roaming rights on the remainder of the Colorado Network.

Associated members, like Cooperating members, build their own systems, but do not fully integrate them into the DTRS. Sharing between the Associated network and the DTRS is on a voluntary and limited basis, though an Associated network is fully capable of operating as part of the DTRS. An Air Force base might become an Associated member, maintaining full control over its own system, though finding it convenient to share limited roaming privileges with DTRS members. Some municipalities may initially join the DTRS as Associated members, using this status as a halfway point while deciding whether to become Cooperating members.

Finally, a limited number of **Commercial members** might be allowed, especially in areas of the state where other communications were not available. Commercial members might include guides in wilderness areas or ranchers in remote areas of the state. Commercial members would pay a monthly fee.

The Colorado DTRS is currently proceeding on schedule. Several municipalities are in conversation with the Division of Telecommunications regarding coordination of their municipal radio improvement plans with the DTRS.

The availability of a frequency band that could be used by Federal agencies and state agencies remains a problem, though the Division of Telecommunications has indicated that sufficient spectrum exists near 800 MHz to meet current needs. The FCC has indicated that the 800 MHz public safety bands could be used for this purpose.

State of Michigan The State of Michigan is building a statewide digital trunked radio system based on Motorola Astro technology. The system will include 168 sites, including upper and lower peninsulas, with an estimated cost of \$187 million. This will provide mobile