# APCO REPORTS

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The Federal Communications Commission has adopted a Notice Of Proposed Rule Making (PR Docket No. 92-235), the replacement of Part 90 by Part 88 to revise the Private Land Mobile Radio Services and the modification of the policies governing those services. The following is the text of that notice, minus the 385 pages that are the actual rewritten Part 88.

## I. Introduction

1. On July 2, 1991, we released a Notice of Inquiry (Inquiry) to gather information on how to promote more efficient use of the frequency bands below 512 MHz allocated to the private land mobile radio (PLMR) services. Based on the input received in response to our Inquiry, today we are adopting this Notice of Proposed Rule Making (Notice) that contains a comprehensive set of proposals designed to increase channel capacity in these bands, to promote more efficient use of these channels and to simplify our policies governing the use of these bands by a wide variety of small and large businesses and public safety agencies throughout this nation. The magnitude of these proposed policy changes makes this an ideal time to create Part 88, and thus correct many unrelated deficiencies that exist in our current rules governing the PLMR services. The proposed rules are in many ways radically different from our current rules. We have, however, attempted to develop a new set of rules that are flexible and simple with regard to the technical and operational characteristics of the private land mobile radio services as well as our mechanisms for licensing users in these services.

2. We are convinced that, without significant regulatory changes in the bands below 512 MHz, the quality of PLMR communications will likely deteriorate to the point of endangering public safety and the national economy. In this proceeding, therefore, our goal is to develop a regulatory scheme that increases channel capacity for PLMR users. We are also sensitive to the need for a reasonable transition period for users to convert their radio systems to newer, more spectrum efficient technologies. These proposals are complex and deserve the full time and attention of all interested parties. In sum, the Notice is a critical step in providing for the future communications needs of private land mobile radio users. We are, therefore, looking forward to their comments and any alternatives that they may have to the proposals we have developed for their consideration.

3. It may be helpful to outline how the proposals in this Notice are presented for consideration. The Notice itself merely presents our proposals in a broad and general form. Readers will find more detail regarding each of our proposals in Appendix A, which explains each major proposal.

## II. Background

4. In the past seven decades, PLMR has become one of the largest, most important areas regulated by the Commission. When making new PLMR spectrum allocations, we have generally been innovative and required or induced industry to be innovative. The rules for the bands in use longest have often been amended, yet remain based on much earlier technologies and regulatory concepts. Many PLMR channels are now unacceptably crowded and our rules for certain bands are unacceptably archaic and

convoluted. The Inquiry solicited comments on a wide range of technical and policy issues related to the use of the PLMR bands below 512 MHz, with the overall goal of developing modern rules to support future technologies.

5. We received over 120 comments and reply comments. The Private Radio Bureau, in cooperation with the Annenberg Washington Program, Communications Policy Studies, of Northwestern University, also sponsored a conference on this topic on November 14, 1991. Nearly all the commenters appreciated that the Inquiry was a necessary step for insuring that the long term communications needs of the PLMR community are met. Many comments highlighted the invaluable and irreplaceable need for radio spectrum for one and two-way mobile communications. Most commenters suggested that we proceed immediately to increase spectrum efficiency through technical changes as well as various policy changes. In preparing this Notice, we again carefully reviewed the existing environment, with the goal of determining the best possible regulatory framework.

## III. Discussion

6. We propose below a series of major changes in the way we regulate the PLMR services below 512 MHz. There are four major proposals. First, we propose spectrum efficiency standards that should increase the capacity, in terms of number of available channels, of several bands by 300 to 500 percent. These standards would generally reduce channel spacing to 6.25 kHz or less, while at the same time providing technical flexibility. Second, we propose a channel exclusivity option in the bands above 150 MHz. This would be accomplished using a market-based approach called "exclusive use overlay," which involves achieving exclusivity through concurrence of existing users. We would, in addition, leave a significant number of channels available for licensing on the traditional shared use basis. Third, we propose to consolidate the current 19 radio services. Fourth, we propose new technical and operational standards. For example, we propose significantly reducing permissible transmitting power levels. This would permit efficient geographic co-channel reuse. In addition, we propose to permit centralized trunking, set aside channels for specific operational characteristics, designate channels for new high-technology type of operation, and generally simplify our rules. These changes would greatly expand capacity and improve quality of service, without imposing unreasonable burdens on present or future licensees.

### A. Spectrum Efficiency Standards

7. Creation of narrowband channels and adoption of spectrum efficiency standards. A great deal of the Inquiry focused on specific technologies and technical regulation. We asked about a variety of technologies, including trunking, packet radio, spread spectrum and narrowband. We also discussed the concept of a spectrum efficiency standard, which would require that systems be at least as efficient as some benchmark technology, as a method of providing technical flexibility while at the same time prohibiting spectrum inefficient technologies. Commenters emphasized that our proposals must provide technical flexibility and encourage use of new technologies in the existing bands, particularly in urban markets. The comments clearly indicate that the benchmark technology should be narrowband.

8. Thus, we are proposing a set of spectrum efficiency standards based on narrowband technology. The standards would provide for greater efficiencies over time, moving from the current 25 kHz channel spacing eventually to 6.25 kHz in the 421-430, 450-470 and 470-512 MHz bands and to 5 kHz channel spacing in the 72-76 (for low-power mobile operations) and 150-174 MHz bands. The process would occur in two stages, with the first stage requiring existing users to reduce their occupied bandwidth. These proposed standards are designed to promote technical flexibility, allowing the economic and public safety considerations to determine the best technology for each application, while at the same time requiring that PLMR allocations be used efficiently.

9. This proposal is consistent with comments of most frequency coordinators, the Land Mobile Communications Council (LMCC), Motorola, Inc., American Telephone & Telegraph Company (AT&T), and the Telecommunications Industry Association (TIA). In addition, several parties favor spectrum efficiency standards, but not necessarily a channel split. Commenters also indicate they want the option to use 25 kHz Time Division Multiple Access (TDMA) technology. This proposed plan would permit this

option.

10. We also propose loading standards that provide existing licensees an opportunity to take advantage of the newly created narrowband channels. Even if they lack the per-channel loading standard, existing licensees could still retain two narrowband channels for every existing channel by implementing this technology at least two years sooner than required. Together with exclusivity, this would provide licensees with an incentive to use narrowband channels as soon as economic and public safety conditions indicate. Thus, additional capacity would become available at a quick and smooth pace. Licensees could fund conversion to narrowband by reassigning part of an existing wideband channel to a party willing to reimburse them.

## B. Exclusivity.

11. Creation of a channel exclusivity option. Currently our rules governing the bands below 470 MHz do not provide for channel exclusivity. The Inquiry focused a great deal on the concept of exclusivity, combined with flexible technical standards, as an incentive to promote spectrum efficiency. Most commenters favor some sort of channel exclusivity. The Joint Commenters, for example, state that they "agree wholeheartedly . . . that exclusive channel assignments provide a strong stimulus for licensees to employ efficient modes of operation. Exclusivity makes technical flexibility more viable. For example, centralized trunking is currently based on exclusivity. Thus, we propose permitting exclusive channel assignments in most of the 150-174 MHz, 421-430 Mhz and 450-470 MHz bands.

12. The Inquiry discussed three methods of converting the bands below 470 MHz to exclusive assignments: stopping new licensing, emptying a band, and exclusive use overlay. Of these three methods of achieving exclusivity, commenters generally opposed the first two plans. Several commenters, however, specifically favor the exclusive use over plan. Thus we propose that exclusivity would be achieved through an exclusive use overlay (EUO) plan similar to that discussed in the Inquiry. Our proposal would permit a temporary freeze of licensing on specific channels at specific locations if applicants obtain sufficient concurrence from existing large (as defined by loading criteria) licensees. If concurrence of all large licensees is achieved, then we would permanently freeze licensing, i.e., no additional use of that channel within 50 miles would be permitted without concurrence of the EUO licensee. Thus, the EUO option is an opportunity to obtain exclusivity. Several other commenters favor converting de facto exclusive licenses to actual exclusive licenses. Our proposal, including its preferences to existing licensees, achieves that goal. Other licensees favor use of loading standards, as at 800 MHz. Our proposal applies loading criteria, but in a different manner.

13. Several frequency coordinators request that exclusivity be administered through them. AAR (American Association of Railroads), for example, claims that exclusive assignments can better be achieved through coordination. These proposals would leave frequency coordinators with a major role in administering exclusivity. The standards for exclusivity, however, must be determined through the rule making process. If user groups have a need to be provided a greater degree of exclusivity for certain types of systems, then they should explicitly state what the standards and eligibility requirements for expanded protection should be. (FCC Footnote: For example, we propose protecting systems for which failure of their PLMR system would create an imminent danger to the public safety. This would provide automated railroad systems protection that we believe to be necessary).

## C. Radio Services

14. Consolidation of the Private Land Mobile Radio Services. The Inquiry discussed the possibility of consolidating the present 19 PLMR services or increasing intercategory sharing. We pointed out that channel utilization is not consistent across the 19 user groups. A study of our licensing data base in April 1992 showed very wide variations in usage, often exceeding factors of 10 for channels in the same frequency band designated for different radio services. We also noted that "the current allocation system . . . inhibits spectrum efficiency by making certain spectrum-efficient technologies more difficult to implement."

15. The Inquiry also discussed the merits of private carriers. We noted that the "private carrier option

may be a practical method of making spectrum-efficient communications services available to small licensees" and that "(p)rivate carriers have more incentive to enhance spectrum efficiency . . . "

16. Consolidation of service pools generated the widest range of comments to the Inquiry. Several frequency coordinators oppose a proposal to consolidate the current radio services on the grounds that current interservice sharing rules work. They are supported in their views by licensees within these services categories. On the other hand, the Joint Commenters, Associated Public-Safety Communications Officers, Inc. (APCO) and Utilities Telecommunications Council (UTC) all generally favor consolidation. (FCC Footnote: APCO is less firm on this issue, generally recognizing that it is a reasonable step, but noting problems such as users having confidence in the coordination system. UTC favors consolidation, but recommends different services from those that we are proposing). Together, these three sets of comments represent over 75 percent of the licensed transmitters in the affected bands, plus all the licensed PLMR activity above 800 MHz. The Joint Commenters note that, "(w)ithout such a consolidation, the industry may find it cumbersome to implement spectrum-efficient technologies . . . in the bands below 470 MHz." These commenters also maintain that the current interservice sharing rules do not provide adequate relief to an applicant to obtain channels allocated to other service pools because the system is expensive, time-consuming and burdensome to the applicant, and typically does not provide the applicant the needed spectrum. Numerous other parties favor consolidating radio pools. The State of California states that the "current practice of allocating specific frequency bands to the unique divisions of public safety . . . causes complications in areas where some bands are underutilized, while others are overcrowded."

17. Based on the comments, we believe that some consolidation of the current alignment of radio services may be necessary to realize the maximum benefits of the PLMR spectrum. We thus propose two specific alternatives in this proceeding, both of which are designed to protect all existing users, to assure a smooth transition that minimizes cost to users, and to promote flexibility. Specifically, we propose either to (1) consolidate the current radio services into three broad categories (Public Safety, Non-Commercial and Specialized Mobile Radio) plus a General Category Pool encompassing all three services, or (2) retain the current services and assign to those services their existing frequency assignments but assign all new frequencies to the proposed new broad categories and the General Category pool. The rules proposed . . . present a model based on consolidating the existing services into the three broad service categories, which provides a picture of what a new Part 88 would look like under one set of assumptions. We want to emphasize, however, that we do not have a preference for either of the alternatives set forth herein. Rather, we invite comment on both proposals as well as any other alternative that will fulfill the goals and objectives of this proceeding. Commenters offering alternatives should provide, to the maximum extent possible, the text of specific rules to implement their proposal.

18. Frequency coordination. We propose that frequency coordinators continue to play a major role in managing the PLMR spectrum. We propose that if we adopt option 1 from paragraph 17 above, Public Safety Radio Service applicants would be permitted to use any of the current public safety frequency coordinators. Non-Commercial and General category applicants could use any recognized frequency coordinator. (FCC Footnote: This would prevent applicants from being forced to go to non-representative entities for frequency assignment recommendations, as opposed in the numerous reply comments by state highway department. . . . ). We propose that if we adopt option 2, channels designated for the current 19 narrow radio services would continue to be coordinated only by their current coordinator. Channels designated for the Public Safety Radio Service could be coordinated by any of the existing coordinators for the public safety radio services, and channels designated for the Non-Commercial Radio Service and General Category Pool could be coordinated by any recognized frequency coordinator. Finally, above 800 MHz APCO, NABER and SIRSA would coordinate the same channels they currently coordinate.

19. Currently, frequency coordination is a process in which each applicant was given the best assignment possible. In the future, frequency coordinators should strive to retain as large a spectrum reserve as possible. For example, frequency recommendations should place systems as close geographically as possible without causing interference. Small systems not qualifying for an EUO

preference should be stacked on the same channel (vertical loading), rather than be assigned separate channels (horizontal loading).

D. Technical and Operational Rule Change.

20. Adopt reduced ERP and HAAT Limits. The Inquiry requested comments on reducing the maximum permitted transmitter power levels. We noted the advantages of greater reuse of spectrum over geographic space. Many commenters favor some method of limiting emissions, recognizing that many current licensees use far more power than necessary. The State of California cites "a small town of three square miles operat(ing) 250 watt base stations. Public safety entities tended to favor service area contours rather than simple power limits. A 75 watt power limit was recommended by various Land Transportation frequency coordinators. As they point out, the railroad, taxi and trucking industries all have needs as complicated and critical as most users. Users in these services have all found 75 watts to be an acceptable power limit. Use of high-gain antenna systems can, however, result in overly powerful systems. Thus, we propose for the 150-174 and 450-470 MHz bands reducing the standard limits on effective radiated power (ERP) to 300 watts, with lower ERP limits for systems with antenna heights above average terrain greater than 60 meters. (FCC Footnote: Systems requiring greater geographic coverage could build additional sites). This proposal is closely tied to our exclusive use overlay proposal because it would enable us to propose co-channel separations of 50 miles, rather than the 70-mile separation used in the bands above 800 MHz.

21. Providing for alternative operations. Although a main focus of this Notice is the creation of a large number of exclusive use channels, we also propose that applicants be offered a full array of options. For example, the entire 25-50 MHz band and a number of channels in the 150-174 MHz and 450-470 MHz bands will not include a channel exclusivity option. Furthermore, our proposed rules would provide for alternative types of systems, such as low power, itinerant wide-area and mutual aid operations. Finally, we propose a set of channels in the 150-162 MHz band be set aside for large innovative operations.

22. Promotion of Interoperability. Interoperability is a key concern of public safety entities. The work of APCO Project 25 is discussed by several commenters. The initial output of this committee will be digital standards using 12.5 kHz channels. Agencies in various jurisdictions must be able to communicate with each other. Although we are not proposing to mandate such standards, we might eventually propose standards on mutual aid channels. This would provide an impetus for de facto standardization, yet still permit competing technologies.

23. Designation of Channels for Innovative Shared Use. We propose designating 258 channel pairs in the 150-162 mHz band for innovative, highly spectrum-efficient radio systems. Although we request a full range of comments concerning use of these channels, we propose that most of these channels be designated as shared use voice/data channels, with a very limited number of channels assigned on an exclusive basis for control purposes. Licenses would be made available in seven regions using lotteries. Licensees would be required to update the technology used in their systems periodically to increase its spectrum efficiency. Thus, this proposed operation would serve as a base for technical innovation that could be used by other PLMR licensees. As an alternative, we propose issuing five 50-channel exclusive use licenses per region.

24. Permitting trunked operations. A trunked system is a multi-channel system in which a user can transmit on any of the channels through specific base station facilities. The system automatically searches for and assigns a user an open channel assigned to that system. Trunked technology provides significantly more efficient use of the radio spectrum in terms of the number of users that can be supported. Centralized trunking is not currently permitted in the bands below 800 MHz. The vast majority of commenters favor permitting centralized trunking when a licensee has at least de facto exclusivity. Thus, we propose that centralized trunking immediately be explicitly permitted where exclusivity is recognized by the Commission or when all co-channel licensees within 50 miles concur.

E. Miscellaneous Proposals.

25. Modification of Existing Systems. A key concern to many commenters is that current licensees be

given sufficient time to amortize the cost of existing equipment prior to the date that narrowband equipment is mandated. Adjustments to existing systems would, however, accelerate implementation of narrowband and other spectrum-efficient technologies. The Joint Commenters state that "it appears that the reduction in transmitter deviation can be accomplished without great expense through a combination of manual adjustment of existing equipment and software. Thus, we propose requiring certain changes to existing systems. All existing systems between 150 and 512 MHz would be required to reduce their transmitter deviation to no more than 3 kHz and meet the new power limitations by January 1, 1996.

26. Retaining offset channels in the 450-470 MHz band. Between the primary channels in the 450-470 MHz band are channels offset by 12.5 kHz, generally available on a secondary basis for low-power mobile operations. These channels are heavily occupied and are considered essential by several commenters. We propose that these channels remain licensed on a secondary basis. Their bandwidth would also be subject to the general spectrum efficiency requirements. (FCC Footnote: Thus, these would become 6.25 kHz wide channels offset 3.125 kHz from the full-power channels). These channels would be available in the Public Safety Radio Service and the General Category Pool. In addition, we would permit, without a separate authorization, very low-power (20 mW or less) telemetry operations on additional offset channels in the 450-470 MHz band. We believe these proposed changes, particularly taken in conjunction with the general proposed ERP limitation will, for example, help serve the significant spectrum needs for such low-power operations.

27. General simplification of Part 90. Our proposed rules, renamed Part 88, are generally much simpler and clearer than current rules. Some of the proposed changes are a) eliminating the majority of footnotes to frequency tables, b) improving the glossary, c) adding an index, d) consolidation of many grandfathering provisions, e) radiolocation as an operation rather than a radio service, f) consolidating Subparts L, S and T into the main sections of Part 88, and g) making a general editorial reorganization.

## Comment Dates

. . . Interested parties may file comments on or before February 26, 1993, and reply comments on or before April 14, 1993. For further information about this Notice, contact Doron Fertig, Private Radio Bureau (202) 632-6497 or for technical issues, Eugene Thomson, Private Radio Bureau (202) 634-2443.

## Appendix A - Proposed Rules Discussion

This Appendix discusses the major proposed rules amendments that we propose to adopt to improve spectrum efficiency in the PLMR bands below 512 MHz. (FCC Footnote: Minor rule changes [rules that we propose to delete because they are redundant or unnecessary, or that are changed in format or style, reworded or renamed, or only reflect non-substantive changes] are not discussed in this Appendix.) .

### Major Proposals

### Channel Spacing.

Our primary proposal is to reduce channel spacing in the spectrum between 72 and 512 MHz. We propose to reduce channel spacing to 5 kHz for low-power mobile frequencies in the 72-76 MHz and for all frequencies in the 150-174 MHz bands. We also propose to reduce channel spacing in the 421-430 MHz, 450-470 MHz and 470-512 MHz bands to 6.25 kHz. (FCC Footnote: We propose different channel spacing in different bands to minimize transition costs to existing users. The 6.25 kHz channelization is as or more efficient than the 5 kHz because the 6.25 kHz channelization permits the creation of over 1,700 additional offset channels for low-power use in the 450-470 MHz band.). All new assignments would be required to use this narrowband technology.

### Transition Period.

At 421-512 MHz, we propose to require existing users to reduce transmitter frequency deviation to reduce occupied bandwidth to 10 kHz by January 1, 1996. (FCC Footnote: Adjacent channel interference

protection would not be provided. To avoid such problems, licensees should reduce the bandwidth of their receivers). Thus, three channels would be created from every existing channel. A 12.5 kHz channel would be centered on the original channel's center frequency and be licensed to all existing users. The other two channels would be 6.25 kHz wide, spaced just above and below the 12.5 kHz channel, and would be available for new users. We also propose requiring all users in the 421-512 MHz band to employ 6.25 kHz equipment by the dates set in the proposed § 88.433. Thus, existing users would be required to temporarily adopt pseudo-12.5 kHz equipment. (FCC Footnote: For the purpose of this proceeding, we will consider minor changes made to a transmitter's modulation stage to achieve reduced bandwidth as a Class I permissive change under the provisions of § 2.1001[b][1].). They would then gradually replace their equipment with true 12.5 kHz equipment that could later be modified to further reduce occupied bandwidth. Finally, existing users would move their carrier frequency either up or down 3.125 kHz and continue operation on either or both of the new 6.25 kHz channels. (FCC Footnote: A licensee can only keep the lower 6.25 kHz channel pair if they convert to narrowband technology at least two years before the deadline specified in the proposed § 88.433).

At 150-174 MHz, we propose to require existing users to reduce transmitter frequency deviation to reduce occupied bandwidth to 12 kHz by January 1, 1996. This would reduce adjacent channel noise and permit us to eliminate adjacent channel mileage separations (thus, increasing assignable channels by approximately 20% in most urban markets). We also propose requiring all licensees in the 150-174 MHz band to employ 5 kHz equipment by the dates shown at § 88.433. The new 5 kHz channels would be centered at the existing channels, plus 5 kHz above and below the current channel centers. Existing licensees could remain on one or two of the three channels created from the channel for which they were originally licensed. (FCC Footnote: A licensee can only keep the upper 5 kHz channel if they convert to narrowband technology at least two years before the deadline). The other channel would be designated for innovative shared use operations.

Finally, we propose to require existing users in the 72-76 MHz band to reduce transmitter frequency deviation to reduce occupied bandwidth to 10 kHz by January 1, 1996. Thus, three channels would be created from every existing channel. A 10 kHz channel would be centered on the original channel's center frequency and be licensed to all existing users. The other two channels would be 5 kHz wide, spaced just above and below the 10 kHz channel, and would be available for new users. We also propose requiring all users in the 72-76 MHz band to employ 5 kHz channels by the dates set in proposed § 88.433.

The channel split proposal is a critical element of this Notice. We request comment on each aspect, including the ultimate channel size in each band (5 kHz and 6.25 kHz), whether the channel split should be done in two steps as proposed or one step, the dates of the proposed steps, the specific allotments, and the distribution among new and existing users. In particular, should we adopt a two-phase plan leading to 5 kHz channelization between 421 and 512 MHz, where the first phase splits the current channels into a 15 kHz channel, with two 5 kHz channels, spaced just above and below the 15 kHz channel?

The proposed channel splitting in the frequency bands below 800 MHz will result in narrower channel spacings that require new technical standards. These proposed standards are simpler and more flexible than those they replace.

## Channel Bandwidth.

We propose occupied bandwidths of 4 kHz and 5 kHz for frequency bands with channel spacing of 5 kHz and 6.25 kHz, respectively. We also propose appropriate channel bandwidths for the transitional stage. Because modulations other than frequency modulation may be utilized, frequency deviation limits are no longer specified. Following industry standards, transmitter frequency stability is now specified in parts per million (ppm) rather than in percent of the carrier frequency.

## Spectrum Efficiency Standards.

We propose new spectrum efficiency standards that would permit use of non-standard bandwidths

provided that such use is at least as efficient as narrowband technology. These proposed spectrum efficiency standards are intended to increase technical flexibility. An important aspect of these rules is that the proposed § 88.433(d) contains the deadlines for existing systems to completely convert to narrowband equipment.

Emission Masks.

We propose two new emission masks. The first is for transmitters operating on frequencies with 5 kHz spacing in the 72-76 MHz band designated solely for low-power mobile use, and also for transmitters operating on frequencies in the 150-174 MHz or 216-222 MHz bands. The second mask is for transmitters operating on frequencies with 6.25 kHz spacing in the 421-512 MHz band. Both of the proposed masks are based on the mask developed for the 5 kHz channels in the 220-222 MHz band. The masks are designed to provide 40 dB of attenuation at the edge of the authorized channel, 50 dB attenuation at the edge of the authorized bandwidth of the adjacent channel, and 65 dB of attenuation thereafter. Because the technical flexibility afforded licensees could result in the use of non-standard wide-band channels, mask attenuations are specified from the edge rather than from the center of the authorized bandwidth. (CONTINUED NEXT MONTH)

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