APCO REPORTS

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Volume 8 Number 7 July 1992

This issue of APCO Reports includes Parts II and III of the comments filed by the Public Safety Microwave Committee (PSMC) in response to the Federal Communications Commission's Notice of Proposed Rulemaking in the matter of Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies (ET Docket No. 92-9).

PSMC represents state and local government agencies throughout the United States which use more than 6,000 fixed-microwave facilities for critical public safety communications on 2 GHz frequencies. APCO, the National Association of State Telecommunications Directors (NASTD), the International Bridge, Tunnel & Turnpike Association (IBTTA) and the County of Los Angeles, California, comprise the PSMC.

NASTD is an association of telecommunications directors from 49 states whose telecommunications systems serve state public safety agencies including emergency medical service, fire, law enforcement, corrections, public works and transportation.

Many members of IBTTA are state turnpike authorities who use 2 GHz microwave facilities to provide vital communications links for highway patrol and emergency maintenance mobile radio systems.

The Los Angeles County Sheriff's Department is the third-largest police agency in the United States and operates one of the largest and most sophisticated public safety communications systems in the world.

The Federal Communications Commission has proposed reallocating the 2 GHz bands for new technologies such as personal communications services (PCS). PSMC believes that some new technologies, such as private PCS networks, could have important public safety applications. However, PSMC and its members have consistently opposed, and continue to oppose, allocating frequencies for these new services in the 2 GHz microwave bands because of the potential harm to existing public safety communications facilities.

The Commission now proposes that existing state and local government licensees of fixed microwave facilities be allowed to remain on 2 GHz frequencies indefinitely. PSMC strongly supports this "grandfathering" provision, which is rooted in the statutory requirement that public safety radio services receive "top priority" in frequency allocation matters. PSMC remains deeply concerned, however, that the FCC's proposal does not extend similar primary status to new and expanded state and local government 2 GHz systems that will be needed in the future.

Following are the concluding two parts of the PSMC comments:

II. New and Expanded State and Local Government Microwave Facilities in the 2 GHz Bands Should Also Be Licensed on a Primary Basis Where No Viable Alternatives Are Available.

State and local governments are experiencing an increasing demand for additional microwave frequencies to support their critical public safety communications operations. In some situations, those needs can only be satisfied with frequencies in the 2 GHz band. Therefore, the Commission must revise its proposal to ensure that all current and future public safety microwave needs can be met, including those for which 2 GHz frequencies are the only viable option.

A. State and Local Governments Need Additional Microwave Capacity.

There are many factors creating demand by state and local governments for microwave frequencies. In some areas, existing systems are at capacity, requiring additional frequencies on existing microwave paths. New microwave paths are also needed when a police department adds a new base station or remote mobile radio transmitter to reach an under-served area within its jurisdiction. Increases and shifts in population also create needs for new microwave links. Public safety agencies' expanded use of state-of-the-art electronic communications, such as mobile data terminals, also increases demand for efficient, secure point-to-point communications between fixed locations.

> The trend toward consolidation of public safety operations also requires additional microwave facilities to provide greater area-wide coverage. For example, when a small city eliminates its separate police department and contracts with a county or nearby community to provide police service, the contracting agency must often add new microwave links and mobile transmitters to cover its expanded area of jurisdiction.

The most significant factor, however, in the increase in demand for microwave is the migration by public safety agencies to area-wide 800 MHz trunked systems pursuant to the Commission-approved National Plan for Public Safety. These highly spectrum-efficient systems often require numerous interconnected remote radio transmitters to provide mobile radio coverage over a wide area. Many Regional Plans favor transmitters with low antenna heights to reduce interference and increase the number of co-channel operations in the region. Such spectrum-efficient methods, however, require more transmitter sites and, therefore, more microwave links.

> The trend toward simulcast operation also requires microwave links because wireline connections do not provide the necessary synchronization.

These future public safety microwave needs will not be met with 2 GHz facilities if the Commission decides to grant new 2 GHz licenses only on a secondary basis. Public safety agencies cannot operate on a secondary basis. Public safety agencies cannot operate on a secondary basis because of the danger of interference to vital communications operations. Nor can state and local government agencies afford to build microwave systems, only to be required to expend additional scarce resources to replace those systems when displaced by primary users. Therefore, state and local governments will be forced to look to alternatives to 2 GHz for their future microwave needs. Those alternatives, however, are inadequate and unacceptable in many circumstances.

B. Alternative Microwave Frequencies Do Not Exist for Many Public Safety Microwave Needs.

The Commission's OET (Office of Engineering and Technology) Study concludes that there are alternative radio frequencies available for future 2 GHz fixed-microwave users in the 4 and 6 GHz bands, though it makes little attempt to quantify those future needs. Moreover, PSMC questions the validity of that study because it does not appear to consider fully the technical constraints related to path length, equipment availability, band configuration and frequency coordination that would inhibit public safety agency use of those bands.

It is a simple matter of physics that microwave facilities in the 4 and 6 GHz bands have shorter maximum path lengths than operations in the 2 GHz bands. A path length over the maximum distance for a particular band will be subject to signal attenuation and reduced reliability, even with high-performance antennas. The maximum path length for microwave operation in the 4 and 6 GHz band is approximately 35-40 miles, though even shorter paths are necessary in areas subject to heavy rain and snow, high humidity and substantial temperature inversions.

These path length restrictions would prevent use of 4 and 6 GHz frequencies for many future public safety needs. In some cases, additional capacity may be needed on an existing 2 GHz path that is too long for those higher frequencies. Even when completely new paths are required, 2 GHz frequencies may be needed to accommodate a path length that is dictated by distances between existing facilities, terrain, site availability, temperature inversion and local signal attenuation problems (such as fog, high humidity and heavy annual rainfalls).

PSMC also questions whether appropriate frequency assignments will be available in the 4 and 6 GHz bands, even for path lengths that can otherwise be accommodated in those bands. The OET's analysis of the spectrum availability in the 4 and 6 GHz bands is incomplete. OET divides the nation into grids and examines the number of existing users in each grid, and, from that, estimates the unused frequencies. However, OET's theoretical analysis incorrectly assumes that microwave transmitters and receivers are equally distributed in each grid.

In fact, microwave facilities tend to be grouped together on hilltops, tall buildings and existing multi-user communications towers. Such co-location of facilities leads to parallel or near-parallel paths, substantially reducing the ability to reuse spectrum within a particular grid. Transmitter location, terrain and the location of buildings in transmission paths can also create complex frequency coordination obstacles that often reduce the number of frequencies that can be used from a particular location. Thus, actual frequency availability in a particular grid is likely to be significantly less than the theoretical frequency availability indicated by the OET analysis.

OET's estimate of available spectrum in the 4 and 6 GHz bands also overlooks the limitations imposed by the FCC's technical rules that now apply to those bands. Much of the supposedly available frequency in those bands is allocated for use by common carriers. While the Commission proposes a "blanket" waiver of its eligibility requirements for these bands, it does not propose any changes in its technical rules.

The Commission's technical rules divide the 4 GHz common carrier frequencies into 20 MHz bandwidths, and the 6 GHz common carrier frequencies into 30 MHz bandwidths. However, private microwave systems, such as those operating in the 2 GHz bands, operate on far smaller bandwidths. Narrow bandwidth equipment capable of operating on the 4 GHz band is not even available at the present time. Nor do most private microwave systems meet the minimum channel-loading requirements in the 4 and 6 GHz bands. Absent substantial revisions to the Commission's technical rules, the 4 and 6 GHz bands cannot accommodate nearly the number of private microwave users that OET estimates. (The OET study also does not appear to have considered the potential impact of space-to-earth satellite transmission in the 3.7 to 4.2 GHz band).

Therefore, the Commission's analysis of frequency availability in the 4 and 6 GHz bands appears to be overly optimistic. For many microwave users, path length, frequency congestion, inappropriate bandwidths and lack of equipment will prevent use of the 4 and 6 GHz bands.

C. Fiber Is Not an Alternative to 2 GHz Frequencies for Most Public Safety Needs.

The Notice of Inquiry seeks comment as to whether fiber could be used as an alternative for 2 GHz

microwave facilities. Some state and local governments already use fiber for certain non-critical applications. However, fiber is rarely an alternative for microwave because it is far less reliable and far more expensive.

Radio communications systems used by state and local government public safety agencies are in greatest demand during emergencies such as storms, fires, earthquakes and other disasters. Those same occurrences (as well as breaks in the line caused by construction crews) can cause serious disruptions in fiber and other wireline communications systems. Such outages are obviously unacceptable for public safety agencies, especially when their services are in greatest demand.

Furthermore, fiber is simply inappropriate for linking many locations currently linked by microwave, such as remote mountain-top mobile radio transmitters. Installing fiber also requires rights-of-way which often take years to acquire and can be extraordinarily expensive (even with the power of eminent domain). In short, fiber is rarely an alternative to 2 GHz microwave facilities.

D. The FCC Must Accommodate Future State and Local Government Needs for 2 GHz Microwave Paths.

PSMC urges that the Commission allow state and local governments to add new microwave capacity on 2 GHz frequencies on a primary basis, at least where there are no viable alternatives. As described above, state and local governments are experiencing increasing demand for microwave communications facilities which in many situations can only be located in 2 GHz frequencies.

The Commission should establish rules that allow a state or local government applicant to receive a new primary authorization on 2 GHz if the applicant demonstrates that

(1) the proposed microwave path is such that frequencies higher than 2 GHz would not be feasible, or

(2) that alternative frequencies are not available because of frequency congestion or coordination difficulties.

The Commission should also continue to allow existing state and local government microwave systems to add new 2 GHz links and modify their systems on a primary basis where they have an established need for those additions and changes. This would have a minimal impact, if any, on the aggregate use of 2 GHz frequencies.

PSMC also suggests that if the Commission goes forward with its overall reallocation, it should allow existing state and local government 2 GHz licensees to switch to other frequencies within the 2 GHz band without losing their primary status. This would make it feasible for a PCS operator to create a block of unused 2 GHz spectrum by paying existing state and local government users to move to other 2 GHz frequencies. Such a relocation would be less expensive and disruptive than a move to an entirely different frequency band. It might also reduce the possibility of interference between PCS and public safety fixed-microwave operations.

The Commission should also continue to work with the NTIA to determine the feasibility of allowing non-federal government licensees to share the 1.7-1.85 GHz band. If state and local government agencies are not permitted to expand existing 2 GHz facilities on a primary basis, they should be allowed to obtain licenses in the 1.7-1.85 GHz band. The propagation characteristics of this band are very similar to the 2 GHz bands.

Therefore, it would be a better alternative than the 4 and 6 GHz bands for certain future state and local government microwave needs that cannot be easily accommodated in the higher bands. The federal government band might be particularly appropriate for sharing with other "government" users such as state and local government public safety agencies.

III. The Commission Must Take Steps to Prevent Interference From Mobile Users to Critical Public Safety Microwave Systems.

The Commission's proposed rules, if adopted, would allow new mobile services to be licensed in the 2 GHz bands on a co-primary basis with existing state and local government fixed-microwave licensees. (Other existing users would remain primary for a limited time period, and then revert to secondary status). PSMC is deeply concerned that the Commission has not yet fully explored the potential that this creates for disruption of vital public safety communications operations. Indeed, the Notice barely mentions this issue in a single sentence requesting "comment on the technical feasibility of our proposal to permit sharing between new services and the existing 2 GHz fixed microwave operations on a co-primary basis."

As explained above, state and local governments use 2 GHz microwave systems to provide the backbone for critical police and other public safety mobile radio communications systems. The lives of public safety officers and the public are, quite literally, on the line. Therefore, these public safety operations cannot tolerate even the slightest level of interference.

PSMC has yet to see any hard evidence that mobile operations such as PCS can coexist with fixed-microwave operations on the 2 GHz bands without causing interference. The jury is still out on the several dozen PCS experimental authorizations which are trying out a variety of mobile technologies designed to avoid interference with fixed users. Until more is known, wholesale reallocation of the 2 GHz band would be reckless and premature.

If the Commission does go forward, nevertheless, in its proposed creation of a spectrum reserve in the 2 GHz bands, it must establish rigid interference protections. In particular, PSMC recommends that the Commission establish regional frequency coordination committees consisting of both fixed-microwave and PCS operators. This is especially important in urban areas where there are likely to be dozens of different PCS operators, each with a different technology.

The Commission should also impose mandatory transmitter identification for any new service operating in the 2 GHz bands. Each mobile (or portable) unit must have its own identifier using a standard identification system. This should not be unduly burdensome since many proposed PCS technologies are premised on the ability to locate a particular hand-held unit. Interference can only be prevented and eliminated if its source can be easily ascertained. However the Commission proceeds, it must error on the side of over-protection, because the opposite approach would endanger the safety of life and property.

CONCLUSION

The Public Safety Microwave Committee commends the Commission for recognizing the need to prevent relocation of existing public safety use of the 2 GHz microwave bands. However, PSMC urges the Commission to take further steps to allow state and local governments to add new and expanded microwave facilities in the 2 GHz bands, at least when alternatives are unavailable. If co-primary mobile operations are licensed in the 2 GHz band, the Commission must also establish rules to prevent any interference to state and local government microwave communications, which are critical to the safety of life and property.

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OVERVIEW OF REGULATORY AND LEGISLATIVE ISSUES OF THE PAST YEAR: The following is a brief overview by Robert M. Gurss of Wilkes, Artis, Hedrick & Lane, APCO's Legal Counsel, of some of the regulatory and legislative issues from the past year that have, and will continue to have, a significant impact on public safety radio communications.

Spectrum Reframing

Without question, the single most important FCC proceeding for land mobile radio users during the past

year was the Notice of Inquiry to explore methods to improve spectrum efficiency in bands below 470 MHz (PR Docket 91-170). Commonly referred to as "spectrum refarming," this major proceeding seeks public comment on a wide range of technical and policy questions.

The technical questions focus on methods for squeezing more users into a fixed amount of radio spectrum, such as trunking, packet radio, spread spectrum, channel splitting and digital voice modulation. The most likely immediate result of these technical proposals is some form of incremental channel splitting as narrowband equipment becomes available on the market. The refarming Notice also addresses a number of highly controversial policy proposals to alter the way in which frequencies are divided up and assigned. These include expanded use of interservice sharing through frequency pools, which have proven successful in the 800 MHz bands. However, the Notice also discusses the far more controversial issue of possible consolidation of the 19 separate radio services into a smaller number of broader categories.

The Commission's Notice also sought comment on using fees as an incentive to encourage more efficient use of the spectrum, which APCO has long opposed, at least for state and local government users. Other policy issues discussed in the refarming proceeding include greater reliance on third-party licensing (such as SMRs), band licensing, reducing power levels, and formal grants of exclusive licenses. APCO filed extensive comments and reply comments in the proceeding. This proceeding is particularly important as the record before the Commission could provide the basis for a number of major rulemaking proceedings in the not-too-distant future.

2 GHz Microwave

The proposed reallocation of 2 GHz microwave frequencies also continues to be a major issue for public safety. The band is currently used by many state and local government agencies for microwave links that provide the backbone for area-wide public safety mobile radio systems. The FCC has tentatively targeted the 2 GHz band for new emerging technologies and, in February, issued a Notice of Proposed Rulemaking to reallocate the band (ET Docket 92-9). Fortunately, the FCC proposal provides that existing state and local government users would not be forced to move. This was at least in part the result of work by APCO, Los Angeles County and others during the past year to educate the FCC as to the important public safety uses of 2 GHz microwave facilities. The Public Safety Microwave Committee, of which APCO is a member, has filed extensive comments (see last month's APCO Reports and this month's) supporting the "grandfathering" of existing state and local government microwave users.

Reallocation of Federal Government Spectrum and Auctions

Once again this year, legislation (H.R. 531 and S. 218) was introduced and advanced in Congress to force the federal government to release up to 200 MHz of spectrum for other users. The chief sponsors are House Commerce Committee Chairman John Dingell (D-Michigan) and Senate Communications Subcommittee Chairman Daniel Inouye (D-Hawaii). APCO has worked with their staffs on the bill, recommending language that will lead to some of the released spectrum being allocated for state and local government public safety agencies.

As in the past, however, the spectrum legislation is being stalled because of the insistence by the Bush Administration that the bill include authorization for the FCC to assign at least some of the 200 MHz through auctions. APCO has opposed auctions, even if public safety bands are exempt, since auctions would create a further incentive to allocate more spectrum, and more desirable spectrum, for services subject to auctions so as to raise more revenue. At this writing, there appears to be the possibility of compromise, at least on the Senate side, regarding auctions. APCO has suggested language for the compromise bill that would require the FCC to identify and take steps to satisfy long-term public safety needs first, before it allocates spectrum for assignment through auctions.

Spectrum User Fees

The President's proposed budget once again included a proposal to raise additional revenue by charging

FCC licensees a fee for using the radio spectrum. However, unlike last year, the FCC's proposed fees under the President's proposal would exclude state and local government licensees.

Finder's Preference

Last November, the FCC adopted rules creating a finder's preference, which provides that an entity which notifies the FCC that a licensee has violated certain construction or operational requirements will be entitled to a preference if and when the alleged violator's license is revoked and made available for new applications. At APCO's urging, the Commission made two important exceptions to this policy. The FCC excluded frequencies subject to assignment through Regional Plans and provided that non-public safety entities, though eligible for frequency sharing in the 800 MHz Public Safety Pool, cannot use a finder's preference to obtain frequencies in that pool occupied by a public safety entity. SIRSA objected to this exception (and to APCO's request for a clarification of the first exception). APCO filed responses to SIRSA. At this writing, the issue is still pending at the FCC.

UHF Channel 14/69 Interference

An ongoing problem for some public safety users is interference caused by UHF television channels 14 and 69, which operate on frequencies adjacent to land mobile channels. Last year, the Commission tightened the interference protections, though its new rules still fall short of what is necessary. APCO has supported a Petition for Reconsideration filed by Motorola seeking better interference protections.

Digital Radio Standards

The FCC has deferred any decision on digital radio standards. In the meantime, APCO Project 25 is moving forward to establish digital equipment standards at least for public safety. A potential roadblock to that process was eliminated last year when each of the major manufacturers agreed that if their technology is selected as part of the standard, they will license that technology to other manufacturers on "fair and reasonable" terms. This will help create competition, and lower prices, for digital radios meeting the standard.

UHF/Land Mobile Sharing

The long-pending proceeding to allow greater land mobile use of the UHF band remains in limbo because of plans to use the UHF television channels for High Definition Television (HDTV). Some of the latest HDTV proposals involve signal compression making it possible to transmit several television signals within a single 6 MHz channel. Reserving the UHF band for HDTV has created controversy recently, as some policy makers are questioning whether it is the most-efficient use of spectrum. While FCC Chairman Alfred Sikes is among the strongest supporters of HDTV, he has warned the broadcasting industry that if it does not use the UHF band within a specified time frame, it will be reallocated for other pressing needs, such as land mobile radio.

450-470 MHz Sharing

In at least a tentative victory for APCO, the Commission dismissed SIRSA's Petition for Rulemaking seeking rules to allow co-equal sharing with Local Government of a portion of the 450-470 MHz band in nine mid-western states. The FCC indicated that the issue was premature, pending further action in the spectrum refarming proceeding.

Frequency Coordination

Another old proceeding pending at the Commission is its evaluation of the frequency coordination process, which includes a controversial proposal to allow direct licensing. That proceeding is being held in abeyance pending the Inspector General's audit of several frequency coordination operations, including APCO's. At this writing, we are unaware of any significant problems that have arisen regarding APCO's operations. APCO has also completed the process of creating its own frequency coordination computer programs and data base, eliminating the need for expensive outside contractors. APCO will also soon be the first frequency coordinator to implement electronic filing.

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