DOCKET FILE COPY ORIGINAL ORIGINAL

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

RECEIVED

JUL 30 1993

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

In the Matter of	)	
	)	
Replacement of Part 90 by Part 88 to Revise the Private Land Mobile Radio Services and Modify the Policies Governing Them	)	PR Docket No. 92-235

To: The Commission

REPLY COMMENTS OF SEA INC.

Norman R. Shivley
Project Manager
SEA, Inc.
7030-220th Street, SW
Mountlake Terrace, WA 98043
(206) 771-2182

Of Counsel:

Thomas J. Keller, Esq.
VERNER, LIIPFERT, BERNHARD,
McPHERSON AND HAND, CHARTERED
901-15th Street, N.W.
Suite 700
Washington, D.C. 20005-2301
(202) 371-6060

July 30, 1993

No. of Copies rec'd 0+9
List A B C D E

TABLE OF CONTENTS

SUMMARY i

I. INTRODUCTION 1

II. DISCUSSION 5

A. SEA Continues to Support The Commission's Proposed Spectrum Efficiency Standard 5

B. SEA Continues To Support A 5 kHz Root Channel Spacing For The Refarmed Bands 7

C. A Transition Plan Directly To A 5 kHz Channel Plan Will Best Serve The Intent Of The Rulemaking . . . 16

D. The Adopted Emission Mask Is The Key To The Proceeding 21

E. Spectrum Exclusivity Should Be Made An Option To Users 24

F. ERP and HAAT Limits Are Required For Spectrum Exclusivity 25

G. Offset Channels Users Must Be Afforded Spectrum For Their Applications 28

H. Consolidation of the Radio Services Should Be Performed With Efficiency In Mind 29

I. Coordinators Should Be Directed To Develop Channel Pairings 29

J. The Adoption of the Commission's Refarming Rules Will Not Impede The Progress of APCO 25 30

K. Review Of And Comment On Basic Objections To The Notice 31

L. Commenters' Interference Concerns Are Overstated . . 35

M. Errata 39

III. CONCLUSION 40

SUMMARY

SEA is encouraged by the response from the land mobile community regarding the Commission's set of proposed rules as presented in the Notice. In this proceeding the Commission is seeking to increase the capacity in the PLMRS bands below 512 MHz, to promote more efficient use of this spectrum, and to simplify and to consolidate the rules governing these bands (collectively referred to as "refarming"). Interested parties to this proceeding have now had the opportunity to comment on the Commission's proposals. SEA offers the following replies to these comments. After review of said comments, SEA still believes the basic framework of the Commission's proposed rules to be sound.

SEA continues to recommend a channel plan which divides the spectrum into the smallest practical single channel width, 5 kHz. A 5 kHz channel spacing is better than all proposed alternatives for implementation into both the 150-172 MHz and 450-512 MHz bands (collectively referred to herein as "the refarmed bands"). We find that the arguments made for alternative channel spacings generally suffer from the mistaken belief that the selection of this channel spacing is a mandate for the use of narrowband technology. SEA believes that no technology should be excluded from use in these bands as long as it meets the spectrum efficiency standard and the emission mask. With the flexibility to "stack" channels, licensees and manufacturers will be able to use a variety of technologies and develop a plethora of new applications and services.

As regards the transition plan, SEA notes that the commenters offer general unanimity of opinion that the refarming transition plan forego the proposed intermediate step of converting present operations to reduced deviation analog FM operations. SEA supports a conversion directly to a 5 kHz root channel plan, which has many advantages regarding economy and efficiency.

SEA still supports the spectrum efficiency standard as proposed in the Notice. Other commenters have proposed that a spectrum efficiency standard be established that takes into account many other parameters besides bandwidth, voice links and data rate. SEA herein points out the advantages of the Commission's proposed standard as compared with those purported of the alternatives.

SEA notes the general support for the Commission's plan to permit channel exclusivity. Service categories eligibles should be given tools to convert designated portions of shared spectrum into exclusive use spectrum in and around urban areas. However, channel exclusivity should not be a goal unto itself. SEA also believes that some type of ERP/Antenna height limit schedule is required to actually implement exclusive use assignments.

SEA is opposed to the innovative shared use concept as proposed in this docket, as are most other commenters. Innovative shared channels, if adopted as proposed, would hinder the introduction of stacked channels.

Finally, SEA supports the granting of additional authority to the frequency coordination committees so that they may develop plans for channel pairings and the implementation of trunking technology into the bands below 512 MHz.

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Replacement of Part 90 by Part 88 to Revise the Private Land Mobile Radio Services and Modify the Policies Governing Them	)	PR Docket No. 92-235

REPLY COMMENTS OF SEA INC.

SEA Inc. ("SEA"), by its undersigned counsel, hereby replies to the initial comments on the Commission's Notice of Proposed Rule Making ("Notice") in the above captioned proceeding.[1] With appropriate modifications, SEA supports the proposed Part 88 rules set forth in the Notice.

I. INTRODUCTION

As SEA noted in its Comments,[2] the complex set of issues involved in this proceeding need to be dealt with in turn. The many commenters in this proceeding have brought their diverse approaches to problem solving, a tremendous breadth of understanding of the issues, and a willingness to proceed. SEA, in its analysis of the comments in this proceeding, has made every attempt to consider the broad range of interests and possible pitfalls that are included in an initiative of this magnitude. SEA's conclusion is that much is

[1] Notice of Proposed Rule Making, PR Docket No. 92-235, November 6, 1992.

[2] Comments of SEA at 3 (filed May 28, 1993).

to be gained from this effort.

We believe that the following elements are critical to the success of this endeavor:

- **A 5 kHz CHANNEL PLAN;**
- **CHANNEL STACKING PERMITTED;**
- **AN EMISSION MASK SUITABLE FOR A STACKED CHANNEL ENVIRONMENT;**
- **AN APPROPRIATE EFFICIENCY STANDARD, AND**
- **SPECTRUM RETENTION INCENTIVES BASED ON MEETING THE EFFICIENCY STANDARDS BY MILESTONE DATES.**

SEA is somewhat dismayed that some commenters apparently interpret that this proceeding is about selecting the next preferred land

alternatives.

At least part of this anti-narrowband mindset is to be attributed to the Notice itself. Indeed, the Commission did make the proposed rules ambiguous in areas and in one instance appear to be biased

communications revolution in terms of user/operator capability and manufacturer technology and competition. SEA supports rules which permit the greatest degree of flexibility. SEA continues to believe that the refarming initiative will only be successful if innovation and efficiency are required, the means to move to new technology are in place, and the required incentives are provided.

II. DISCUSSION

A. SEA Continues to Support The Commission's Proposed Spectrum Efficiency Standard

Several commenters make mention of a TIA spectrum efficiency standard (or definition) in the making. However, there is no consensus regarding the purpose of this definition or how it is to be employed.

NABER sees the standard ("efficiency/loading factor") as a tool to

communications channel paths"[7]. SEA does not see the objective of such a definition as relates to the purpose intended by the Commission in this proceeding.

A discussion of the logistics of the implementation of any alternative to the Commission's enforcement of a simple standard is conspicuously absent from the comments filed in this proceeding. SEA continues to support the 4800 bps/5 kHz efficiency standards proposed in the Notice[8]. Other commenters agree with this position[9]. If adopted as proposed, it will achieve the intended purposes: to compel manufacturers to develop spectrum efficient technologies and products for users to deploy in the timeframe set forth in the rules. Furthermore, SEA continues to believe that

B. SEA Continues To Support A 5 kHz Root Channel Spacing For The Refarmed Bands

As stated in our comments, SEA supports the Commission's proposed root channel spacing of 5 kHz for the 150-174 MHz band. Furthermore, we proposed that the Commission adopt the same 5 kHz root channel spacing for the 421-512 MHz band[11].

Several commenters oppose the Commission's proposed channel spacings and offered support for alternatives. Some believe the channel plan should be based on 6.25 kHz channels. Still others believe the root channel spacing should be 12.5 kHz. Most agree that the root channel spacing should be the same for the all the refarmed bands in order to realize economy benefits from equipment design commonality.

Many of the objections to a 5 kHz channel spacing were predicated on the belief that the new Part 88 would mandate the use of narrowband technology to the exclusion of all other technologies. This has raised the concern that new applications and services which require wider bandwidth would not be permitted. For instance, APCO's comments indicated that public safety users anticipate requiring wider not narrower channels[12] in order to transmit fingerprints, maps, criminal records, video and building diagrams.

---

[11] Id. at 8.

[12] Comments of APCO at 5. Similar concern was expressed by AAR. See comments of AAR at 26.

This concern was expressed even though the FCC proposal will permit wider ("non-standard") bandwidths via channel stacking. APCO suggests that the proposed rules would "...preclude the advancement of such new (wideband) technologies". This, SEA believes, would not be the case. However, it is apparent to SEA that the adoption of a wider root channel space would likely discourage and perhaps preclude the use of spectrum efficient narrowband technologies. We believe it is indisputable that stacking narrow root channels to make a wideband channel will be much easier than it would be to split wideband channels to make narrowband channels.

EGE objects to the use of a "very narrow bandwidth" (VNB) channel spacing because "...the required future use of 6.25 kHz and 5 kHz VNB channels presents a substantial risk to the PLMR user community in view of the fact that VNB technology is unproven technology."[13] EGE goes on to point out that "...in the two years since the 220 MHz Proceeding there are still no VNB systems in operation in the 220 MHz band demonstrating that the Commission's well founded technical concerns have yet to be resolved.[14]"

Regarding EGE's first point, SEA observes that this is a good example of a commenter confusing a channel spacing with a technology. The purpose of EGE's argument apparently is to persuade the reader to believe that a 5 kHz channel plan will mandate a

---

[13] Comments of Ericsson GE at 10.

[14] Id. at 11-12.

single technology. We believe it is clear that selection of a 5 kHz channel plan and permitting channel stacking[15] will not "mandate VNB technologies" as such commenters suggest. Rather it will permit a variety of technologies with two common traits: high spectrum efficiencies and the use of the lowest common denominator channel increments[16].

EGE's second comment can only be attributed to a lack of awareness of the on-going 220 MHz licensing process. Suffice to say that the small number of constructed 220 MHz systems has nothing to do with "technical concerns". SEA presently has 220 MHz systems constructed and operating in Chicago, Houston and Seattle. As of August 15, 1993, SEA will also have systems constructed and operating in Minneapolis, Kansas City, Dallas, and Indianapolis.

NABER's comments reflect a clear understanding of the concept of channel stacking (referred to as "slotting"). NABER notes that this approach ".. permits a mixture of technologies, without favor to

---

[15] EGE supports the concept of channel stacking. Id. at 3. "As a matter of policy, Ericsson supports:...a channel allocation plan which stacks channels by user group to enable the use of narrowband or wideband channels to accommodate a variety of technologies..."

[16] The <u>real</u> FCC mandate that is properly proposed is: use new technology to achieve a reasonable and measurable level of spectrum efficiency. Beyond that, the FCC must define a flexible approach to meeting that requirement. We believe that a 5 kHz channel plan, a suitable emission mask, an efficiency standard, permitting channel stacking, and spectrum retention incentives will provide such an approach.

any technology."[17] SEA would add that it is the selection of an appropriate emission mask that is the key to the truth of this statement.

NABER identifies the following criteria[18] for their selection of the root channel spacing ("lowest common denominator"):

1) permit natural channel size reductions during the transition phase;

2) permit single channel use with a spectrum efficient technology;

3) permit the ability to combine slotted channels for efficient, wideband technology with minimal wasted bandwidth; and

4) reduce the number of different types of equipment which manufacturers would need to produce, that is, the 150 MHz band and the 450 MHz band should be refarmed with the same root channel spacing for equipment commonality.

NABER's argument eliminates 5 kHz as a choice for the following reasons:

1) NABER states that "...5 kHz channel 'slots' would prevent 6.25 kHz narrowband equipment from being utilized

---

[17] Comments of NABER at 2.

[18] NABER Whitepaper, 5/4/93 at 2. Basic argument repeated in comments of NABER, filed 5/28/93 pp. 12-14.

efficiently"[19].

SEA cannot agree with this reasoning because if a 5 kHz root channel plan is adopted the market will most likely have available 5, 10, 15, 20, and 25 kHz (and perhaps greater) channel-spaced technologies but we doubt manufacturers will develop 6.25 kHz technologies that would be prevented from "being utilized efficiently". NABER's first reason for elimination of 5 kHz as a choice also includes reference to "...the substantial problems associated with antenna combining of 5 kHz channels...", which, "...can be substantially reduced by placing the channels slightly farther apart." SEA has no knowledge of such a problem and is confident it does not exist.

2) NABER's second reason for not supporting 5 kHz is that the "...transition plan proposed below for the 450 MHz band would not proceed as smoothly."

NABER's described plan requires "two (2) natural channel splits". SEA questions that a transition plan which requires an intermediate transition to 12.5 kHz channels can be characterized as "smooth". Further, we do not agree that any conceivable transition from the current 15/30 kHz channel spacing at 150 MHz to a 6.25 kHz channel plan can be described as either "smooth" or "natural". NABER claims that its plan retains the existing channel centers; this is not true. Only the channel centers for the 450 MHz band would be retained, and the 150 MHz band, where most channels operate on a primary basis, will change completely. In contrast, a 5 kHz channel

---

[19] Id.

plan would retain all channel centers in both 150 and 450 MHz bands, except for the 450 MHz offset channels, most of which have secondary status. In terms of the benefit of retaining the existing channel centers[20], 5 kHz is clearly the logical choice.

In SEA's view, NABER's criteria for selection of a root channel spacing seem reasonable. However, the choice of 6.25 kHz clearly fails the first criterion in the 150 MHz band: "natural reductions during the transition phase". We believe it is arguable that 6.25 kHz fails the third criterion as well. In conclusion, NABER's reasoning to eliminate 5 kHz as an option, in our view, lacks merit and is partially based on a non-existent technical concern.

AAR suggests an "offset overlay" band plan for the 150 MHz band where 12.5 kHz wide channels would be spaced 7.5 kHz apart. Adjacent channels would be geographically separated[21]. This proposal fails the fourth NABER criterion since there is no compulsion to utilize 7.5 kHz channel spaced equipment in the 450 MHz band. SEA also questions the AAR assertion that "...the offset overlay plan would preserve the option of future migration to a 6.25 kHz band plan..."[22]. Indeed, AAR's Exhibit 8[23] indicates how

---

[20] Retaining today's channel centers is an important step in an developing a graceful migration and backward compatibility. It will simplify manufacturer's requirements for multi-mode radios.

[21] See comments of AAR at 28.

[22] Id. at 31.

extremely difficult (and unlikely) this scenario would be. This proposal, too, fails NARFP/s "smooth and natural" test

as it is to 12.5 kHz channels. Data rates of over 12 kbps (using 16 QAM) are possible in a 5 kHz spaced channel (4 kHz bandwidth). Motorola touts a 9.6 kbps system (using QPSK) which they claim requires only 12.5 kHz channel spacing.

SEA notes that many commenters support the concept of channel stacking[27]. The general rationale for this support is that stacking will permit a wide variety of advanced technologies to be implemented in order to meet the many diverse user needs. EGE claims that "(t)he channelization plan proposed by the FCC will make it extremely difficult to "recombine" (stack) 6.25 kHz or 5 kHz channels to create wider bandwidth...channels to transmit significant amounts of data."[28] It is not clear to SEA whether this concern is due to the innovative shared use initiative and the plan to retain the offset channels or concern about the root channel spacing itself. It could even be a concern about converting channels used by installed "mandated" narrowband systems into wideband channels[29].

---

[27] See, e.g., Comments of AAR at 38, Comments of NABER at 18, Comments of EGE at 3.

[28] Comments of Ericsson at 18, footnote 21.

[29] Id. EGE states "...the FCC will have to go through the exercise of splitting channels in two steps...then in a third step recombine (narrowband) channels so alternative technologies can be used as required to serve the practical needs of users." The likelihood of such a scenario is, in our view, nonexistent. If EGE is of the belief that the proposed rules do not permit transition directly to wideband spectrum efficient technologies (again the "narrowband mandate" fear), they would be better served by proposing rules that do.

The way SEA visualizes the transition from today's technology is quite different from that expressed by many of the commenters in opposition. We foresee potential users of new spectrum efficient technology being offered a choice by manufacturers. Users would make their choice of technology based on all the parameters they should be able to: system requirements including capacity, coverage, functionality and performance, time value of information flow, equipment cost, trust in manufacturer, and availability of spectrum. We do not visualize (or support) any extra regulatory requirements to obtain "non-standard bandwidth" channels and in fact we believe they would be easy to coordinate and very popular. Further, we anticipate that equipment will eventually become available which accommodates multiple modulation and bandwidth types and that systems will be devised that dynamically allocate the amount of spectrum required for a given message or intercourse (bandwidth on demand). Finally, we believe the adoption of a 5 kHz channel plan will facilitate such innovation.

In summary, most of the objection to the proposed narrowband channel plan is argued in terms of an objection to a "narrowband technology mandate", which, it appears to SEA, was never the intent nor is it a likely result of this proceeding. Since this "mandate" is not a factual concern, most of the objections are moot.

It is obvious that when selecting the "lowest common denominator" channel spacing for two bands, one of which is 15/30 kHz spaced and

the other 25 kHz spaced, the result is 5 kHz. Most of the other advantages of the selection of a 5 kHz band plan are the result of this fact, which cannot be changed or contradicted. Furthermore, we believe that it is indisputable that 5 kHz will support basic voice dispatch communications, trunked operation, and significant data rates. Therefore, in these bands where the Commission wishes to permit channel stacking so a wide variety of technologies may be used (to meet the wide variety of user needs and achieve a higher

the following reasons:

- converting the present channelization into a 12.5 kHz scheme will provide little if any extra efficiency to the bands. At best it would merely eliminate the geographic separation requirements at 150 MHz. At 450 MHz, if the offset channels are retained, a 12.5 kHz scheme would offer no extra mobile radio efficiency over that which exists today.

- the concept of conversion to 12.5 kHz channel spacings for the refarmed bands is deeply rooted in an interest in promoting analog FM and the APCO 25 standard. We will not debate the wisdom of selecting a channel spacing on this premise. However, it is clear that the emission mask proposed by TIA for 12.5 kHz is a technological "dead end", since it offers little hope of realizing the efficiencies associated with other technologies, notably narrowband. SEA argues this in detail in Appendix A.

The discussion regarding the selection of channel spacing in this proceeding has lead to a comparison of different land mobile equipment technologies. Some have argued that a channel spacing should not be selected "based on unproven technology". This argument naturally implies that the technology upon which the advocate's channel spacing is based is, indeed, proven. SEA notes

that, even though 12.5 kHz analog FM technology has been proven to be useful in some cases, the implementation of systems above 896 MHz has demonstrated that it is not good practice to co-locate adjacent 12.5 kHz channels. Though in many cases this is because of the difficulty in transmitter combining[31], interference from adjacent channel operations has been found to be a significant problem as well. In reality, geographic restrictions between adjacent 12.5 kHz analog FM channels may need to be applied in the refarmed bands. Furthermore, there is the unknown factor of susceptibility to interference of 12.5 kHz analog FM receivers in the presence of adjacent channel APCO 25 digital transmitters. Consequently, the 12.5 kHz technologies that are supported by various commenters in this proceeding are not entirely proven with regards to its application to the refarmed bands.

LMCC proposed two avenues for transition[32], referred to as Option A and Option B. In short, Option A proposes to transition to 12.5 kHz, permit voluntary 6.25 kHz operation, with a plan for Commission reconsideration regarding a second (required) transition to narrower channels in 1999. Option B suggests a transition

likely make difficult or impossible any further efficiency gains through channel splitting in the future. Further, even if a second step were technically possible, the expense of a second wholesale transition[33] would be prohibitive, even in LMCC's extended time frame of 20 years.

SEA found a reasonable approach in the LMCC's Option B, except that, as we argue above, 6.25 kHz is not the best choice for the narrowband channel spacing. Option B would offer, as LMCC notes, certainty of direction, only one wholesale (mandatory) conversion, and short term as well as long term efficiency gains. LMCC expresses the following reservations about the Option B approach:

1) "...the introduction of more spectrally efficient measures would be slow initially and would not be fully implemented until the year 2004...";

2) "...there would be no concerted effort to clean up the noise which accompanies operations in the 150-174 MHz band as a result of 30 kHz equipment on frequencies separated by 15 kHz...";

3) "...option B would place the Commission in the posture of having to develop rules for equipment bandwidths with which there

[33] Note that this second transition would not in reality be a transition strictly to narrowband technologies, as implied by LMCC. It would be a transition to narrowband or equivalent technologies, based on the ultimate efficiency standard. This second transition would be no less costly, however, since first-stage 12.5 kHz technology hardware could not be expected to be forward compatible with whatever technologies might be deployed during a hypothetical second transition.

is currently little "real world" experience."

Item 1 above does not appear to be a significant concern, particularly when compared with the Option A plan which would only require 12.5 kHz operation by the year 2004.

Item 2 should not be a concern. With the Commission's emission mask proposal, as new technology systems are deployed, geographic restrictions between adjacent new technology systems will not require strict observance. The geographic restrictions may be relaxed and eventually deleted from the coordination procedures as new adjacent systems come on line. As pointed out below, this emission mask facilitates a "cleaning up" of these frequency bands.

If the item 3 reservation is associated with the "narrowband mandate" concern, we would hope that LMCC's fears would be allayed at this time. If the concern is with the basic philosophy of the Commission proposing to establish technical rules which encourage the development and use of new spectrum efficient technologies, we should point out that this is not without precedent. The approach used by the Commission here is reminiscent of past EPA and NTSB regulations which require minimum standards on automobile emissions, fuel economy and passenger safety equipment. Without intervention by these agencies, the automobile industry would not have expeditiously updated its design approaches in the 1970's. In fact, the automobile industry protested and vigorously lobbied