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June 1, 1992

Ms. Donna Searcy
Secretary
Federal Communications Commission
1919 M Street, N.W., Room 222
Washington, D.C. 20554

Re: **ET Docket No. 92-100**
RM-7977, 7782, 7978, 7979, 7860, 7980

Dear Ms. Searcy:

Transmitted herewith on behalf of Paging Network, Inc. are an original and five (5) copies of its Opposition to Petitions for Rulemaking filed in the above-captioned proceeding.

Should any questions arise in connection with this filing, kindly contact the undersigned counsel directly,

Sincerely,

Kathleen A. Kirby

Kathleen A. Kirby

Enclosures

BEFORE THE

ORIGINAL

Federal Communications Commission

WASHINGTON, D. C.

In the Matter of:	)	
	)	ET Docket No. 92-100
Dial Page, L.P.	)	RM-7977
Echo Group, L.P.	)	RM-7782
Mobile Telecommunication Technologies Corporation	)	RM-7978
PacTel Paging (Advanced Architecture Paging	)	RM-7979
PacTel Paging (Ground-to-Air Paging)	)	RM-7860
PageMart, Inc.	)	RM-7980
Petitions for Rulemaking to Amend Parts 2 and 22 of the Commission's Rules to Allocate Spectrum in the 930-931 MHz Band for Two-Way Data and Advanced Paging Services	)	

To The Commission:

OPPOSITION AND COMMENTS ON PETITIONS FOR RULEMAKING

PAGING NETWORK, INC.

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June 1, 1992

SUMMARY

Paging Network, Inc. ("PageNet") opposes the Petitions for Rulemaking filed by Dial Page, L.P. ("Dial Page"), Echo Group, L.P. ("Echo"), Mobile Telecommunication Technologies Corporation ("Mtel"), PacTel Paging both for Advanced Architecture Paging ("PacTel "AAP") and for Ground-To-Air Paging ("PacTel GAP"), and PageMart, Inc. ("PageMart") which seek to initiate various rulemaking proceedings at the Commission to allocate spectrum in the 930-931 MHz band for certain two-way data and advanced paging services.

PageNet is the largest and fastest growing paging company in the United States, and has developed a new voice paging service, VoiceNow, with unprecedented capabilities. PageNet has requested that the Commission institute a rulemaking to allocate the 930-931 MHz band, in ten 25 KHz channel blocks, to enable the provision of this and potentially other innovative paging services for which there is substantial untapped demand.

In reviewing the captioned petitions, the Commission should keep foremost in mind the real world consequences of any proposed allocation scheme for the 930-931 MHz reserve paging band and evaluate how these consequences will serve or disserve the public interest.

The Commission should focus its inquiry on several criteria that are particularly relevant to selecting an allocation scheme for the 930-931 MHz reserve paging band. First, the

Commission should consider whether the proposal meets a broad, unserved consumer need. Second, it should determine the ultimate number of consumers that will benefit from introduction of the proposed service. Third, it should evaluate each request to see if it will be offered at a cost desirable to the consumer in terms of both service and equipment. Fourth, the Commission should determine whether the contemplated service is compatible with other operations in the 929-931 MHz band, and assess whether the proposed regulatory scheme will facilitate maximum economic development.

None of the instant Petitions for Rulemaking in ET Docket 92-100 adequately satisfies criteria demonstrating a broad, unmet public need for service that will also benefit a significant number of consumers. Three Petitions (Echo, Mtel and PageMart) essentially recycle various existing, two-way mobile data proposals. Two other petitions (PacTel AAP and Dial Page) propose to add limited functionality to existing paging systems. Only one Petition (PacTel GAP), proposes to implement a truly new paging service, but its utility to a broad cross section of consumers is marginal. Moreover, issues of cost and frequency compatibility are not adequately addressed by any of the Petitioners. In addition, none of the Petitioners appears to have given serious thought to an appropriate regulatory scheme. Consequently, as will be demonstrated below, none of the captioned petitions appears sufficiently innovative or comprehensive in scope to form the basis for an allocation of spectrum in the 930-931 MHz band.

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To The Commission:

OPPOSITION AND COMMENTS ON PETITIONS FOR RULEMAKING

Paging Network, Inc. ("PageNet"), by its attorneys, pursuant to Section 1.405 of Commission's Rules and Public Notice Mimeo No. 22914, released April 30, 1992, hereby submits its partial opposition and comments on the Petitions for Rulemaking of Dial Page, L.P. ("Dial Page"), Echo Group, L.P. ("Echo"), Mobile Telecommunication Technologies Corporation ("Mtel"), PacTel Paging both for Advanced Architecture Paging ("PacTel AAP") and for

Ground-To-Air Paging ("PacTel GAP"), and PageMart, Inc. ("PageMart"), which seek to initiate various rulemaking proceedings at the Commission to allocate spectrum in the 930-931 MHz band for certain two-way data and advanced paging services. None of these petitions proposes a truly innovative advanced paging service. Furthermore, none demonstrates that the services they propose are responsive to broad, unmet consumer demand or capable of deployment in a cost effective and spectrally efficient manner.

I. INTRODUCTION

In 1982, when the Commission allocated 3 MHz in the 928-931 MHz band for paging services,[1] PageNet was one of the first to recognize the full potential of this spectrum. PageNet immediately applied for and received authorizations to offer paging service in the 931 MHz band, and was the first in the country to operate a 900 MHz common carrier paging system. Since then, PageNet has expanded its 900 MHz paging operations to 22 states and the District of Columbia and has pioneered the development of regional paging systems. Throughout its history, PageNet has sought to respond to consumer demand for reasonably priced advanced paging services and to fulfill the promise of the 900 MHz band through its innovative, state of the art paging systems.

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1 Amendment of Parts 2 and 22 of the Commission's Rules to Allocate Spectrum in the 928-931 MHz Band and to Establish Other Rules, Policies, and Procedures for One-Way Paging Stations in the Domestic Public Land Mobile Radio Service, 89 FCC 2d 1337 (1982).

In the past ten years, as PageNet's operations have grown, its paging services have evolved from primitive tone and voice services to include numeric, alphanumeric paging and voice messaging services. In response to customer demand to communicate by voice, PageNet currently offers low priced, automated voice messaging and personalized automated answering service marketed under the names PageMail™ or PageMailBox™.

Based on its investigation of the mass consumer and small business markets, PageNet has concluded that there is also strong consumer desire to communicate by voice through instantaneous, reasonably priced advanced paging services.[2] None of the Petitions for Rulemaking presently before the Commission proposes such a service. In fact, the majority of the petitions in ET Docket No. 92-100 propose very little that is innovative in terms of service, price or technology.

Conversely, PageNet's proposed "VoiceNow" service fills a unique need and will generate great demand by providing an innovative service at low cost. Moreover, while PageNet strongly believes in its VoiceNow service, PageNet's proposed licensing scheme does not in itself preclude the provision of other advanced paging services proposed.

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[2] PageNet is filing, concurrent with this Opposition, a Request for Rulemaking to Allocate the 930-931 MHz Reserve Band for the provision of voice paging services, referred to as "VoiceNow." With VoiceNow Services, a voice page will be sent to the paging receiver, the pager will alert the user that a page has been received and stored in the pager, allowing the user to listen immediately to the message or play it back at a time of the user's choosing.

II. PROPOSED CRITERIA FOR EVALUATING THE 930-931 MHZ PETITIONS FOR RULEMAKING

As expressed in the Communications Act, the FCC's public interest mandate is to make available, so far as possible, to all the people of the United States a rapid, efficient, nationwide and worldwide. . . .radio communications service with adequate facilities at reasonable prices. 47 U.S.C. § 151. As with all its other actions, the Commission's allocation of spectrum should be in furtherance of that public interest mandate. In reviewing the captioned petitions, the Commission should keep foremost in mind the real world consequences of any proposed allocation scheme for the 930-931 MHz reserve paging band and evaluate how these consequences will serve or disserve the public interest.

The Commission has established a general, useful framework for assessing these consequences in its rules and policies pertaining to the grant of a Pioneer's Preference.[3] In delineating the characteristics worthy of an preference award, the Commission has implicitly already recognized that a Pioneer's Preference is not a certificate that hangs on the wall of the recipient, but the withdrawal of a frequency from the general pool open to other potential users or services. As such, the Commission must carefully weigh not only the innovativeness but also the consequences of a specific proposal, including whether the proposed service will increase spectrum efficiency, add

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[3] See, 47 C.F.R. § 1.402 (1991); Establishment of Procedures to Provide a Preference to Applicants Proposing an Allocation for New Services, 6 FCC Rcd 3488 (1991) ("Preference Order"), amended on reconsideration, Memorandum Opinion and Order, FCC 92-57 (released February 26, 1992) ("Reconsideration Order").

functionality and reduce cost.[4] In other words, before the Commission agrees to award limited and valuable spectrum, whether through a pioneer's preference or a spectrum allocation, it must look at a continuum and determine exactly how the proposal serves the public. If there is no need or demand for a particular service, or no demand at the cost proposed, its innovativeness serves no purpose, and it offers the public no benefit.

It would be inappropriate, then, for the Commission to allocate spectrum for innovation alone. A petitioner should demonstrate that there is an unmet need for the services it proposes, and that it is feasible to offer those services at prices which will permit those the service is intended for to subscribe. This is particularly important in considering whether to allocate spectrum for an Advanced Messaging Service. There is but 1 MHz of spectrum proposed to be allocated, compared, for example, to the 50 MHz of spectrum allocated for cellular service.

In this context, PageNet cautions the Commission that in evaluating the captioned Petitions, it should not be persuaded that "this would be a good idea if there were demand. . .someday." Spectrum is too valuable a resource to be given away on such a speculative basis. Instead, the Commission should focus on

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[4] Among the characteristics that may be considered innovative and worthy of an award of a preference are: 1) added functionality; 2) a new use of the spectrum; 3) changes in the operating or technical characteristics of a service; 4) increased spectrum efficiency; 5) increased speed in the transmission of information; 6) increases in the quality of information transfer; and 7) a significant reduction in cost. Preference Order at para. 48.

whether it can put its arms around the service now, and clearly determine how it benefits the public by serving an unmet need.

PageNet also believes that maintaining compatibility and consistency with the adjacent 929 MHz and 931 MHz paging bands is an important criterion in assessing whether to allocate spectrum for a particular service. Consistent channelization of the 3 MHz paging band will lead to flexibility that will encourage system expansion and development in response to marketplace demand. Advanced Messaging Systems ("AMS") which are deployed on this band will have access to potentially underutilized adjacent existing channels. For example, it is likely that the 1 MHz of spectrum allocated for a service such as VoiceNow will quickly be depleted. At such time, it is logical that an AMS licensee would desire to annex channels in the adjacent bands to increase messaging capacity. These channels might already be licensed to the VoiceNow carrier, or they might be acquired. In this fashion, the continued evolution and growth of such systems would lead to more re-farming of the adjacent paging channels and result in a continuous 3 MHz paging band in response to marketplace demand.

It is also essential that consistent channelization be established within the 930 MHz band. The growth of AMS would be severely hampered if manufacturers were expected to produce pagers to multiple specifications. The economies of scale necessary to realize a beneficial, low cost pager would never be realized. In addition, some manufacturers would choose not to participate in certain segments, given the limited market size. Conversely, if the spectrum is managed so that one type of subscriber device is

produced for the entire band, the cost of terminal equipment would be minimized and the participation of multiple manufacturers would be assured.

The Commission should also evaluate whether the regulatory framework proposed by the Petitioner will promote the efficient use of the spectrum and encourage the maximum economic development of paging technology to meet the changing needs of a competitive marketplace. Only a flexible regulatory approach will (1) provide the best price to the end-user, (2) maximize spectrum utilization, (3) increase innovation and (4) enhance competition. This broad regulatory framework must be designed to ensure compatibility and allow advanced messaging services to deploy a wide variety of service options and concepts responsive to consumer needs.

In sum, the Commission should focus its inquiry on several criteria that are particularly relevant to selecting an allocation scheme for the 930-931 MHz reserve paging band. First, the Commission should consider whether the proposal meets a broad, unserved consumer need. Second, it should determine the ultimate number of consumers that will benefit from introduction of the proposed service. Third, it should evaluate each request to see if it will be offered at a cost desirable to the consumer in terms of both service and equipment. Fourth, the Commission should determine whether the contemplated service is compatible with other operations in the 929-931 MHz band, and assess whether the proposed regulatory scheme will facilitate maximum economic development.

None of the instant Petitions for Rulemaking in ET Docket 92-100 adequately satisfies criteria demonstrating a broad, unmet public need for service that will also benefit a significant number of consumers. Three Petitions (Echo, Mtel and PageMart) essentially recycle various existing, two-way mobile data proposals. Two other petitions (PacTel AAP and Dial Page) propose to add limited functionality to existing paging systems. Only one Petition (PacTel GAP), proposes to implement a truly new paging service, but its utility to a broad cross section of consumers is marginal. Moreover, issues of cost and frequency compatibility are not adequately addressed by any of the Petitioners. In addition, none of the Petitioners appears to have given serious thought to an appropriate regulatory scheme. Consequently, as will be demonstrated below, none of the captioned petitions appears sufficiently innovative or comprehensive in scope to form the basis for an allocation of spectrum in the 930-931 MHz band.

III. SPECTRUM IS CURRENTLY ALLOCATED FOR THE PROPOSED TWO-WAY SERVICES AND NO NEW ALLOCATION IS WARRANTED

The Petitions of Echo, Mtel and PageMart seek to allocate the 930-931 MHz band primarily to provide interactive wireless data services. All three petitions should be denied for the same primary reason: The same types of mobile data services are currently provided, or are capable of being provided, under several different sections of the Commission's rules,[5] therefore

[5] See, e.g., 47 C.F.R. §§ 22.930, 90.603, 90.703.

there is no need for the allocation of additional spectrum for two-way services. Existing two way services are discussed below. Moreover, as PageNet will also demonstrate, any allocation for two-way services in the 930-931 MHz band will destroy the consistency and compatibility of the Commission's scheme for paging services. Aside from these overriding deficiencies, each Petition fails to make a showing under the criteria detailed above that it warrants an allocation of limited spectrum.

A. Demand for Two-Way Services is Already Being Met

As demand for two-way services is currently capable of being met, the Commission can find no public interest justification whatsoever to allocate the 930-931 MHz band for this purpose. Several companies already offer, or plan to offer, two-way data services to support mobile laptop and notebook computers and to enable these work stations to communicate with public data networks.[6]

The largest such wireless data network is ARDIS, Inc., a joint venture between IBM and Motorola which is available in over 400 metropolitan areas. ARDIS provides interactive services over a shared mobile radio system at speeds up to 4.8 kilobits per second ("kbps"), with plans to increase to 19.2 kbps. ARDIS' largest competitor is Ram Mobile Data, owned 49.9% by BellSouth

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6 See Emerging Wireless Services Promise to Set Workers Free, Network World, April 6, 1992; Wireless Nets Aren't Just For Big Fish Anymore, Business Week, March 9, 1992 (copies attached hereto at Appendix 1).

Corporation, which operates in the 900 MHz private specialized mobile radio ("SMR") band. Ram is able to transmit packet-switched data at rates of 8.0 kbps and plans to boost its bandwidth to 19.2 kbps by year end.

In addition, cellular operators and their subsidiaries, such as PacTel's Wireless Business Unit, already have, and are marketing, the capability to carry data using their existing allocation. In April 1992, IBM, PacTel and eight other cellular carriers announced plans to upgrade their cellular networks to offer enhanced mobile data communications which will be more reliable and secure than existing systems. This joint venture will create a virtually nationwide interactive mobile data network capable of transmitting information at rates upwards of 19.2 kbps.

In the future, two-way mobile data services may also be provided via low-earth orbit ("LEO") satellites and by personal communications services ("PCS") networks. LEO systems will enable users to utilize a low-cost device to send and receive electronic mail throughout the world. PCS encompasses a broad range of radio communications services and it is contemplated that PCS will provide voice and data from day one. Given the variety of existing and proposed wireless data services in the marketplace today, public need can be easily satisfied and no new allocation for two-way mobile data services in the 930-931 MHz band is warranted.

B. An Allocation for Two-Way Services Would Destroy the Compatibility and Consistency of the 928-931 MHz Allocation Scheme

The Commission should not allocate the 930-931 MHz band for two-way services because to do so would be completely inconsistent with the Commission's original intent to carve out a 3 MHz block of spectrum from 928-931 MHz dedicated to one-way paging services and would limit the public's ability to receive innovative, low-cost, one-way services. In reserving the 930-931 MHz band for advanced technology one-way paging systems, the Commission sought to assure the further development of the "lowest cost service" -- the essential attribute of one-way messaging. The introduction of two-way services, particularly those with different channeling plans than the adjacent paging spectrum, would destroy the compatibility and consistency of this allocation scheme.

C. The Petitions Proposing to Offer Two-Way Services Do Not Satisfy the Criteria Necessary to Merit an Allocation of Spectrum

1. Echo Group, L.P.

Echo seeks an exclusive two-way data allocation in the 930-931 MHz band to provide a terrestrial mobile data radio service ("MDRS"). Essentially, MDRS encompasses the same types of services as existing wireless networks but would operate at lower transmission rates. See Echo Petition for Rulemaking at 8, 10. For example, the joint venture announced by ten cellular carriers including IBM and PacTel, discussed above, will create a

nationwide mobile data network that will transfer information at much higher speeds (19.2 kbps) than the MDRS network, which proposes operation at rates of 2,400 to 9,600 bits per second.

a. Echo's Proposal Fails to Demonstrate that It Will Fill a Broad, Unserved Consumer Need

The variety of existing and proposed mobile data and location services indicates that Echo's proposal is neither new nor sufficiently innovative to warrant a separate allocation in the 930-931 MHz band. By Echo's own admission, MDRS could be developed in any number of alternative frequency bands, including 901-902 MHz and 940-941 MHz. Echo Petition for Rulemaking at 9. Accordingly, because MDRS does not reflect a substantial enhancement over existing mobile data services and can be implemented easily in other frequency bands, the Commission should refrain from allocating any spectrum in the one-way 930-931 MHz band for Echo's proposed MDRS service.

MDRS is modeled on narrowband technology developed for the 220 MHz band in which Echo also is an applicant. Echo proposes to offer the same types of services as provided under Section 90.701 et seq of the rules in the 220 MHz band,[7] including remote security monitoring, credit card verification, delivery service monitoring, and point-of-sale information. To differentiate its MDRS proposal, Echo claims, without support, that the MDRS system will offer greater in-building penetration

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[7] 47 C.F.R. § 90.701 et seq. (1991).

than systems operating at 220-222 MHz. Id. at 10. This limitation can be easily overcome, however, through appropriate system design. Moreover, both Ram and Ardis already operate on frequencies with in-building penetration that is comparable to 930 MHz.

Other MDRS services include automobile radio location or tracking services and emergency search and rescue services. Id. at 8-9. Non-voice automatic vehicle location ("AVL") and monitoring services are currently authorized under Section 90.239 of the rules in the 904-926 MHz band. Commercial operations in this band include the new AVL mobile data system offered by Pinpoint Communications, Inc. Pinpoint claims that its network can transmit data for fleet management at rates up to 330,000 bps with sustained throughput at 38,400 bps. Emergency automobile radio services, such as the trunked data-only system proposed by Echo, are presently authorized under Section 90.95 of the rules in the 896-901 and 935-940 MHz bands. These systems provide data communications to repair trucks and other road vehicles. In addition, a proceeding is currently underway at the Commission to implement an enhanced personal emergency locator service to help rescue crews locate those in distress.[8]

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8 Personal Emergency Locator Transmitter Service (Notice of Proposed Rulemaking), PR Docket No. 89-599, 4 FCC Rcd 8657 (1989).

b. Echo's Proposal Fails to Show That It Will Serve a Significant Number of Consumers

Echo's Petition, while describing many different service options, only addresses the demand for mobile services generally; it fails to demonstrate a particular need for MDRS that cannot be met by existing and proposed services. It offers no concrete evidence that a significant number of consumers will benefit from the introduction of its proposed service. Without a showing that a large number of consumers will benefit from the allocation of spectrum, the Commission cannot justify removing limited spectrum from its pool.

c. Echo's Proposal Offers the Public No Net Cost Benefit

Echo also fails to support the "cost breakthroughs" it claims to have achieved with the MDRS system. See id. at 17. The Petition merely describes expected equipment costs for Echo's proprietary mobile units and installed base stations. No mention is made of projected service costs, or how such costs would compare to charges for existing mobile data services. The Commission, therefore, is lacking an important piece of information necessary to assess the relative merits of Echo's Petition -- the net cost to the consumer.

d. Echo's Proposal Has Not Established an Adequate Regulatory Framework

Echo's proposed "flexible" regulatory treatment for MDRS is as vague as the balance of its Petition. Echo asks that the

Commission issue blanket licenses, each for 50 KHz of spectrum, to three nationwide applicants and three local Metropolitan Statistical Area ("MSA") and Rural Service Area ("RSA") applicants. Echo itself seeks a Pioneer's Preference for a nationwide license. Echo Preference Request at 12. No detailed rules pertaining to application filing or selection criteria are described. In fact, Echo suggests that the Commission seek comment on whether to offer MDRS as a private radio or common carrier service.

e. Echo's Proposal is Not Compatible With the Channelling Plan Utilized in the Adjacent Paging Spectrum

Echo's proposal, like that for 220 MHz, is based on a continuous 5 kHz channel assignment plan. Such a plan does not correspond at all with 25 kHz channelling plan utilized in the adjacent 929 and 931 MHz paging bands. As noted above, consistent channelization will permit flexible system expansion throughout the 929-931 MHz paging spectrum and will stimulate the introduction of low cost paging equipment.

2. Mobile Telecommunication Technologies Corporation (Mtel)

Mtel seeks to establish a new Nationwide Wireless Network ("NWN") service which, like Echo's MDRS network, is designed primarily to meet consumer demand for two-way portable data communications services. In contrast to existing radio-based technologies, Mtel claims that the NWN service will offer superior

data transfer, an acknowledgment capability, better building penetration, lower service costs and wider system coverage. Mtel Petition for Rulemaking at 9.

a. Mtel's Proposal Fails to Demonstrate That it Will Fill a Broad, Unserved Consumer Need

As indicated above, demand for wireless data applications is being met or can be met by existing SMR and cellular operations. All of these enhancements Mtel proposes could be offered in the 220 MHz band for which Mtel is an applicant.

b. Mtel's Proposes to Serve a Relatively Insignificant Number of Subscribers

Mtel does predict that a "mature" NWN system will accommodate from 600,000 to 800,000 users per 50 KHz channel. Id. at 17. Significantly more users could be accommodated under a frequency reuse scheme similar to that proposed by PageNet. Specifically, in the top 20 CGSAs, PageNet's VoiceNow system could potentially serve 6,600,000 subscribers. It does not make sense to allocate additional spectrum for a spectrally inefficient, untested service that supports relatively few users.

c. Mtel's Proposal is Not Compatible With the Channel Plan Utilized in the Adjacent Paging Spectrum

Mtel proposes to configure its NWN service as a simplex system using a single 50 kHz channel for both forward and reverse operations. Mtel's 50 kHz channelization plan does not correspond

with adjacent 25 kHz channelization in the 929 and 931 MHz paging bands. Thus, it may limit the expansion of future advanced paging systems into adjacent spectrum. Moreover, it will effectively preclude a consistent channelization scheme at 930 MHz, which may delay introduction of equipment and full utilization of the band.

3. PageMart, Inc.

PageMart requests allocation of the 930-931 MHz band for Personal Information Messaging Service ("PIMS") which will offer "answer back" paging along with textual and graphic messages transmitted on a two-way basis to portable subscriber units.

a. PageMart's Proposal Fails to Demonstrate That It Will Fill A Broad, Unserved Consumer Need

PageMart claims PIMS will serve currently "unmet" or "underserved" consumer needs for data messaging. PageMart Petition for Rulemaking at 2. As previously noted, similar two-way data messaging services are currently available through several sources, including 900 MHz SMR and cellular radio systems. To the extent the mobile data market is underserved because of spectrum shortages, other frequency allocations, including 800 MHz SMR and 220 MHz, are in a better position to provide enhanced two-way data services than the 930-931 MHz band. New subscriber equipment developments and other technological enhancements on these frequencies will result in a more cost-effective and spectrally efficient provision of mobile data services than PageMart's proposal.

b. PageMart's Proposal Fails To Show That It Will Serve a Significant Number of Consumers

PageMart's system proposes to support 100,000 subscribers per MSA. In contrast, PageNet's Voice Now service will potentially serve 330,000 customers per CGSA.

c. PageMart Fails to Show How It Will Offer a Net Cost Benefit

PageMart claims the PIMS architecture is superior to existing simulcast paging technologies and proposed data delivery systems because it is based on the concepts of cell technology and frequency reuse employed in cellular radio systems. According to PageMart, overlay of these technologies will result in higher volume, lower cost transmissions to more users. Id. at 9. Capacity increases are projected to be between 13 and 30 times greater than simulcast messaging. The cost benefits of PIMS are difficult to assess, however, as PageMart only addresses costs in terms of costs per character. Id. at 17. PageMart does not reveal expenses incurred in building out infrastructure and subscriber equipment costs. Therefore, the net cost to the customer is impossible to calculate.