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Before the  
FEDERAL COMMUNICATIONS COMMISSION FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554 OFFICE OF THE SECRETARY

In the Matter of

Amendment of the Commission's  
Rules to Establish New Personal  
Communications Services

)  
)  
) Gen. Docket No. 90-314  
) ET Docket No. 92-100  
)

REPLY COMMENTS OF PAGEMART, INC.  
ON NARROWBAND PCS SPECTRUM AND LICENSING ISSUES

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## SUMMARY

Much of the technology to implement narrowband PCS is very close to being operational, and for this reason the Commission should move expeditiously to promulgate spectrum and licensing rules for narrowband PCS. The Commission should accommodate all of the diverse proposals for narrowband PCS technology, thereby laying the groundwork for a competitive narrowband PCS marketplace, by allocating variably sized spectrum blocks coupled with spectrum use requirements. Spectrum use requirements, while allowing providers who have a legitimate technical need for large blocks of spectrum to participate in the lottery, would circumvent anticompetitive behavior such as speculation, warehousing, and the implementation of traditional paging in the spectrum reserved for innovative PCS services.

Unless the Commission is prepared to adopt spectrum use restrictions on large blocks of spectrum, it should not adopt a variably sized spectrum allocation scheme. The Commission would completely defeat its goals of spectrum efficiency and diversity of services if it allocated variably sized spectrum blocks without spectrum use restrictions because lottery applicants could be selected for large spectrum blocks without regard for their need. Lottery selectees could then use spectrum inefficiently or to provide conventional services.

If the Commission decides not to adopt variably sized spectrum blocks with restrictions on the use of large blocks, it should allocate uniform, 50 kHz blocks paired asymmetrically and allow providers to aggregate the spectrum that they

require. For the purposes of this alternative, the Commission must allocate all spectrum in uniform blocks in order to allow the market to function fairly.

A variably sized spectrum allocation with spectrum use requirements will enable the Commission to prevent speculation adequately, especially if it couples the plan with a requirement for a technical showing. However, if the Commission decides to allocate a uniformly sized spectrum blocks and allow providers to aggregate, speculation will be much harder to prevent. With an aggregation alternative, the Commission should implement a channel loading requisite, financial showings, forfeiture bonds, certification that an application is not speculative, and high filing fees.

The Commission must adopt national service areas, but particularly if it decides to encourage aggregation. National service areas will provide economies of scale in manufacturing and seamless, nationwide access for consumers.

Aggregation will make it more difficult to provide nationwide services because providers might not be able to acquire common frequencies in multiple regions. For this reason, if the Commission adopts regional service areas, it should make an exception for multichannel reuse systems such as PageMart's and allocate at least two nationwide 25 kHz channels for system control requirements.

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ON NARROWBAND PCS SPECTRUM AND LICENSING ISSUES

PageMart, Inc. ("PageMart"), by its attorneys, submits these reply comments on the narrowband PCS spectrum and licensing issues in the captioned proceeding. For the reasons discussed herein, the spectrum channelization plan set forth in PageMart's opening comments best promotes competitive diversity in narrowband services and should be adopted by the Commission.<sup>1</sup>

INTRODUCTION

As the comments in this docket demonstrate, narrowband PCS technologies are very close to operational. Unlike broadband PCS, where there remain several substantial technological barriers to overcome, consumers may soon be able to obtain narrowband PCS as the start of a new era in wireless, personal communication. In order for the Commission to facilitate the rapid implementation of narrowband PCS, it must take immediate action on crucial spectrum and licensing issues that will advance the many services proposed in ET Docket 92-100 through the lottery stage and on to licensing and the market.

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<sup>1</sup> In response to the Commission's Notice of Proposed Rulemaking and Tentative Decision ("Notice"), Amendment of the Commission's Rules to Establish New Personal Communications Services, 7 FCC Rcd. 5676 (1992), PageMart filed comments on the proposed rules for PCS and also submitted separate comments on the Commission's "tentative decision" to grant a pioneer's preference for narrowband PCS to Mobile Telecommunications Technologies Corporation ("Mtel") and to deny all other applicants a preference.

The first of these issues is how the Commission will divide the three MHz of spectrum that it proposes to allocate for narrowband PCS. The Commission has traditionally been faced with difficult choices because spectrum is scarce, and this remains true for narrowband PCS. If the Commission structures its channelization plan to maximize spectrum efficiency, however, three MHz will actually enable the Commission to accommodate a very substantial number of different narrowband PCS providers — as many as 35 to 200 — because each narrowband licensee will require only a relatively small subsection of spectrum.

Narrowband PCS therefore presents this Commission with the opportunity to establish a spectrum allocation plan flexible enough to accommodate the full technical diversity available in narrowband PCS, allowing the market to determine which technology is best suited to consumers' needs. A variable spectrum allocation, with differently sized spectrum blocks for the different spectrum needs of competing narrowband PCS technologies, best accomplishes this objective. In addition, anti-speculation measures and nationwide service areas will promote service growth while precluding anticompetitive or speculative abuse of the licensing process. By making these minimal but crucial policy decisions, the Commission can structure a narrowband PCS regulatory scheme that maximizes market forces, minimizes the need for long-term Commission oversight, and brings PCS to consumers as soon as possible.

## DISCUSSION

### I. THE COMMISSION SHOULD ALLOCATE VARIABLY SIZED SPECTRUM BLOCKS FOR NARROWBAND PCS LICENSEES

PageMart's opening comments proposed dividing the three MHz of spectrum allocated for narrowband PCS into five 200 kHz, ten 50 kHz, and twenty 25 kHz segments, with the remaining one MHz reserved as a "quiet" band for asymmetrical return links.<sup>2</sup> The driving force behind this proposal for variably sized spectrum blocks is that none of the alternatives suggested in the Commission's Notice would allow all of the many narrowband PCS technologies developed to date, let alone narrowband services of the future, to compete in the market. The Commission's allocation alternatives, by channelizing narrowband PCS into fixed, uniform blocks, would prevent the market from determining which technical approach to narrowband PCS consumers desire.<sup>3</sup> Therefore, as PageMart argued in support of its allocation plan, a variably sized spectrum allocation would better advance the goal of competitive delivery of PCS, which represents one of the central objectives established by the Commission for this docket.<sup>4</sup> Numerous other commenters

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<sup>2</sup> Comments of PageMart, Inc. on Notice of Proposed Rulemaking, at 7. In Exhibit A to its opening comments, PageMart outlined how it would divide the three MHz provided for narrowband PCS. In the 940-941 MHz band, PageMart would place five 200 kHz data channels for multichannel messaging systems with two-way capability to be paired with one 25 kHz polling channel in the 930-931 MHz band. In the 901-902 MHz band, PageMart would locate ten 12.5 kHz for return link channels for acknowledgement paging and 40 12.5 kHz channels for acknowledgement paging when paired with conventional paging. PageMart would divide the 930-931 MHz band into ten 50 kHz channels, five for Time Division Duplex applications and five for one-way high-speed messaging. Also included in the 930-931 MHz band would be twenty 25 kHz channels for acknowledgement paging, symmetrical two-way and multichannel messaging systems.

<sup>3</sup> The Commission proposed three different spectrum allocation schemes in the Notice. The first would divide the narrowband PCS spectrum into 20 paired and 20 unpaired 50 kHz blocks. Notice at ¶ 51. In its second alternative, the Commission would allocate four pairs and four blocks of 250 kHz each. *Id.* at ¶ 52. Finally, the Commission proposed an allocation of two paired blocks of 500 kHz each and a single MHz block. *Id.*

<sup>4</sup> *Id.* at ¶ 6. PageMart also argued that lottery applicants should have to provide technical data showing that they will implement a multichannel system before they would be eligible for large spectrum blocks. Comments of PageMart at 11. This issue is discussed below in Section II.

agreed in principle that a variety of differently sized spectrum blocks is necessary to accommodate the rich diversity of services available from narrowband PCS providers.<sup>5</sup>

It can hardly be disputed that a vigorously competitive narrowband PCS marketplace will be best achieved by establishing a spectrum allocation scheme that enables as many different service options as possible to emerge. The various narrowband PCS proposals already before the Commission in this docket range in their need for spectrum from 25 to 250 kHz. A single, uniformly sized spectrum allocation would therefore be inadequate to meet the requirements of all of these different proposals. For example, a uniform 50 kHz allocation for each narrowband licensee would be too small for some systems, such as those that would employ frequency reuse technology, and too large for others, such as those that would offer advanced acknowledgement paging. Thus, any fixed channelization plan would be too inflexible to support the full technical diversity of narrowband PCS offerings, and would risk de facto standardization of the PCS market before these services are even implemented.<sup>6</sup>

No commenter in this docket has submitted a spectrum proposal that would accomplish technical diversity as effectively as PageMart's plan for variably sized spectrum blocks with restrictions on the use of large blocks. Indeed, some of the proposals made to the Commission on their face demonstrate the basic inadequacy

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<sup>5</sup> Paging Network, Inc. and PacTel Paging also proposed plans for variably sized spectrum blocks in their comments on the Notice. Comments of Paging Network, Inc. at 12; Comments of PacTel Paging on the Notice of Proposed Rulemaking at 29. PacTel Paging's plan, as discussed below in Section III, however, in fact conflicts with this principle by excluding larger (250 kHz) spectrum blocks necessary for narrowband PCS technologies such as PageMart's 10-channel frequency reuse PIMS system.

<sup>6</sup> Comments of PageMart at 4.

of a uniform allocation scheme. For example, Mtel believes that the Commission should place all 50 kHz narrowband services in the 930-931 MHz band, leaving "all other 25 or 50 kHz narrowband proposals incompatible with Mtel's in the 901-902 MHz and 940-941 MHz band."<sup>7</sup> Yet, Mtel does not even address narrowband technologies that require greater than 50 kHz, merely referring to any system that does not require 50 kHz as "incompatible" with its own.<sup>8</sup> Thus, Mtel's plan would fail to support the full technical diversity of narrowband PCS and would have the Commission's rules, instead of the market, determine whether frequency reuse services, such as PageMart's PIMS, should be offered to consumers. If the Commission were to adopt Mtel's plan, the only type of competition in narrowband PCS that would be feasible would be between the several 25 or 50 kHz systems licensed. In effect, the Commission would only license those narrowband PCS providers that were clones of Mtel or were slightly more advanced than today's paging technology. This would not satisfy the Commission's competitive delivery and diversity objectives in this docket.<sup>9</sup>

Some commenters have suggested that the Commission should not allocate any spectrum blocks larger than 50 kHz at all, alleging that these smaller increments would be more spectrum-efficient.<sup>10</sup> The Commission cannot assume that simply because a particular PCS technology would offer narrowband services in relatively small rather than large increments that it is necessarily more efficient. Simulcast

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<sup>7</sup> Comments of Mobile Telecommunication Technologies Corporation at 8.

<sup>8</sup> *Id.* at 9.

<sup>9</sup> Notice at ¶ 6.

<sup>10</sup> *See, e.g.*, Comments of Dial Page, Inc. at 5.

message delivery at higher data rates in 50 kHz channels is actually far less efficient than the geographic reuse of several smaller 25 kHz channels to deliver more messages at relatively lower data rates.

PageMart has demonstrated in its comments throughout ET Docket No. 92-100 that although frequency reuse technology will require more spectrum than simulcast technology, it would actually deliver almost ten times more throughput per kHz in a given amount of time than simulcast systems.<sup>11</sup> In addition, subscriber equipment for frequency reuse systems, which will not require the intricate modulation capabilities and high power requirements of high-speed simulcast messaging, will be much less costly than for simulcast architectures.<sup>12</sup> In any event, for all the policy reasons discussed previously, the market should decide which technology for narrowband PCS messaging is most efficient. This can occur only if the Commission allows as many of the different narrowband PCS technologies to proliferate as feasible, and avoids making spectrum allocation decisions on the basis of premature and uncertain conclusions on relative spectrum efficiency.

Freeman, another narrowband PCS proponent, like PageMart believes that a uniform, 50 kHz allocation would prevent PCS providers that require more spectrum from implementing services that consumers might desire.<sup>13</sup> However,

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<sup>11</sup> Comments of PageMart at 5, Reply Comments of PageMart Inc., ET Docket No. 92-100, PP-35, PP-36, PP-37, PP-38, PP-39, PP-40 at 25 (June 16, 1992). PageMart has consistently demonstrated throughout this docket that its PIMS system is more efficient than the systems of other narrowband PCS proponents. For example, PageMart's PIMS system would be more than 30 times more efficient than Mtel's Nationwide Wireless Network measuring spectral efficiency in terms that translate meaningfully into real-world service, namely system subscriber throughput capacity per city. See Comments of PageMart Inc., ET. Docket No. 92-100, PP-35, PP-36, PP-37, PP-38, PP-39, PP-40 at Exhibit 1 (June 1, 1992).

<sup>12</sup> See Comments of PageMart, Inc., ET Docket No. 92-100, PP-35, PP-36, PP-37, PP-38, PP-39, PP-40 at 4 (June 1, 1992).

<sup>13</sup> Comments on Notice of Proposed Rulemaking by Freeman Engineering Associates, Inc. at ¶ 5.

Freeman's answer to this dilemma is as unsatisfactory as Mtel's. Freeman would allocate at least four 150 kHz channels with 50 kHz return channels, two for regional use and two for nationwide use.<sup>14</sup>

Freeman's plan fails for the same reasons as Mtel's. Although Freeman's plan is slightly more flexible than Mtel's in that it allows for both forward and return links, it is still too rigid because it could not accommodate the many other proposals before the Commission. Neither systems that were smaller nor those that were larger than 150 kHz could be implemented, and virtually all narrowband systems could only be built after costly and time-consuming frequency disaggregation.

In sum, if the Commission were to carve the narrowband PCS spectrum into equal blocks of any uniform size (even if these blocks were paired with return channels), it would effectively standardize the PCS market by creating substantial, if not fatal regulatory obstacles for providers needing spectrum blocks of another size. Because a uniformly sized allocation would not promote competition, the Commission should allow applicants for narrowband PCS spectrum to obtain the amount of spectrum that their services require, consistent with the full technical diversity of narrowband services, by allocating a range of variably sized spectrum blocks between 25 and 250 kHz. Diversity and competition could therefore develop

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<sup>14</sup> Id. at ¶ 8. Freeman does propose a "completely flexible channelization scheme" in the alternative, which would allow applicants requiring more than 50 kHz of spectrum to demonstrate in their applications the amount of spectrum they need and justify that amount with sufficient technical showings. This is similar to what PageMart proposes below as a means by which the Commission could evaluate whether lottery applicants in fact required a given amount of spectrum. This is discussed in Section III below. PageMart argues that a plan like Freeman's would be cumbersome because either the Commission should adopt a variable spectrum plan or it should adopt a uniform allocation. Freeman's "flexible" plan appears to be a hybrid of these two approaches, which might have the inequitable effect of favoring wealthy groups.

in narrowband PCS, unimpeded by the artificial or unintentional constraint of the Commission's spectrum plan.

II. SPECTRUM USE REQUIREMENTS WOULD ENSURE THAT LARGE BLOCKS OF SPECTRUM ARE AWARDED TO NARROWBAND PCS SERVICES THAT HAVE A DEMONSTRABLE TECHNICAL NEED FOR LARGER ALLOCATIONS

One of the principal questions raised with respect to allocations of large blocks of spectrum for narrowband PCS is how to prevent the Commission's lottery process from being used for anticompetitive or inefficient purposes. PageMart's opening comments argued that abuses such as warehousing or speculation might result from a variably sized narrowband spectrum plan if PCS lottery participants do not have to show a legitimate need for large spectrum blocks.<sup>15</sup> To avoid these potential abuses, the Commission should couple a variable spectrum allocation plan with concrete spectrum use requirements under which a multichannel service architecture, or similar technical justification, would be a condition of eligibility for an award of 250 kHz.<sup>16</sup>

The Commission can implement spectrum use restrictions easily and with minimal regulatory intrusion in two related ways. First, the Commission can determine that certain types of narrowband services warrant the allocation of large blocks of spectrum, and that only applicants who propose such a system would be qualified to participate in that portion of the narrowband lottery. For example, the

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<sup>15</sup> Comments of PageMart at 11.

<sup>16</sup> Under PageMart's plan, 200 kHz in the 940-941 MHz band would be paired with one 25 kHz return channel in the 901-902 MHz band and one 25 kHz polling channel in the 930-931 MHz band to provide a total of 250 kHz for a multichannel (10-channel) frequency reuse service. By dividing the 940-941 MHz band into four 200 kHz segments, at least four national providers of this type of narrowband PCS could be licensed.

Commission could decide that because frequency reuse systems require more spectrum but are far more efficient than simulcast systems, applicants would be eligible for large blocks of spectrum if they plan to implement frequency reuse multichannel narrowband PCS systems. Under PageMart's proposed channelization plan, those initial service criteria would require that any lottery applicant for a 250 kHz block propose a frequency reuse multichannel system. All 50 kHz and 25 kHz blocks would be reserved for simulcast services.

The Commission might also be concerned, appropriately, that it lacks sufficient technical foresight to make long-term decisions now on which narrowband PCS services have a demonstrable need for larger blocks of spectrum. PageMart recognizes this concern, and therefore urges the Commission to allow lottery applicants to show a legitimate need for a large block of spectrum, on any basis, without regard to any initial service categories established in this docket. Thus, if an applicant develops a technology that does not fall within the scope of the multichannel services reserved for 250 kHz blocks, it could still qualify for the award of a large block of spectrum by making an appropriate technical showing. This would be particularly beneficial if technology were to change in the future.

If the Commission adopts this two-part method for establishing initial service eligibility criteria for a variably sized spectrum allocation plan, it should also impose the condition that all lottery selectees construct the type of narrowband PCS system that they propose. This condition would ensure that after the Commission's initial evaluation of an applicant's technical proposal, the applicant could not thereafter implement another service and evade the technical justification for the large

spectrum block it was awarded. If applicants were allowed to build other technologies, for instance simulcast systems in 250 kHz blocks, they might use spectrum inefficiently or warehouse spectrum to exclude their competitors from the market. These results would fundamentally conflict with the Commission's recognized competition and spectrum efficiency objectives in this proceeding.

It has been suggested that spectrum use requirements for large blocks of narrowband PCS spectrum might not be an effective means to prevent the inefficient use of spectrum. Yet the Commission has promulgated spectrum use requirements in its licensing of Part 90 private land mobile radio service in the 220-222 MHz band for precisely these reasons. In the 220-222 MHz band, where a lottery recently took place, applicants for private land mobile service licenses are limited to five channels unless they can show that they need more.<sup>17</sup> If applicants can demonstrate a need for additional channels, there is no limit to the amount of spectrum they can be assigned. The Commission allowed applicants to be assigned to "only the number of channels justified to meet their requirements."<sup>18</sup> The Commission also set at five the maximum number of channels any one applicant could win, except if the applicant qualified for a 10-channel nationwide assignment.<sup>19</sup>

Not only are spectrum use requirements therefore not alien to the Commission's regulatory process, but the Commission has affirmatively accepted

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<sup>17</sup> Amendment of Part 90 of the Commission's Rules to Provide for the Use of the 220-222 MHz Band by the Private Land Mobile Radio Services, Report and Order, 6 FCC Rcd. 2356, 2364 (1991).

<sup>18</sup> 47 C.F.R. § 90.723(c) (1992).

<sup>19</sup> Id.

them as a means to "discourage speculative applications" in other emerging narrowband technologies.<sup>20</sup> Spectrum use requirements have several other positive effects as well. Because initial spectrum use requirements would limit participation in segments of the narrowband PCS lottery to certain defined categories of service, they would have the inevitable result of decreasing the number of applicants for any particular block of spectrum. This would save Commission resources by decreasing the time the Staff would have to spend in processing lottery applications.

The Commission's Office of Engineering and Technology has indicated that the Commission might be hesitant to promulgate spectrum use requirements because they would appear to require the Commission to "meddle" with the fledgling narrowband PCS market. Of course, by establishing use requirements for some segments of the narrowband PCS spectrum, the Commission will by definition be excluding other applicants from a given spectrum block. Yet a "fixed" or uniform allocation plan, as discussed above, would have even greater exclusionary consequences for narrowband PCS by foreclosing entire PCS technologies from the market. More importantly, spectrum use requirements will promote and maximize intermodal competition in narrowband services by establishing a simple, flexible procedure under which the Commission's lottery can support the full technical diversity available to the market. By making some initial technical determinations, the Commission would actually minimize total regulatory intrusion and maximize its reliance on the marketplace. This would allow a fair market test among many competing PCS alternatives and would also

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<sup>20</sup> 6 FCC Rcd. at 2365.

avoid the risk that its narrowband spectrum plan might foreclose technically viable service options.

Furthermore, without spectrum use requirements, the PCS lottery would be biased toward deep pockets and entrenched interests from the start. If all applicants were eligible for large spectrum blocks without regard to their actual need for the spectrum, the "cost" of spectrum would not be based on the value of the services that it could provide to consumers. Rather, applicants who received large blocks of spectrum in the lottery would have the incentive to use their spectrum inefficiently or warehouse it to keep spectrum from their potential competitors. Thus, an overriding premium would be placed on capital resources in the lottery. This would further conflict with the Commission's objective of promoting competitive delivery in narrowband services by excluding entrepreneurial firms that lack the massive financial resources of the Bell Companies and other large, well-financed public companies.<sup>21</sup>

Spectrum use requirements are the most effective means by which the Commission can ensure that legitimate groups win spectrum and all of the various types of narrowband PCS reach the marketplace. Either by creating service categories or requiring showings of need, the Commission can, like it has in its 220-222 MHz rulemaking, guard against speculation, warehousing, and other abuses of the lottery process.

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<sup>21</sup> Use requirements would not be the equivalent of cross-ownership limitations that limit the financial stake certain groups can have in particular ventures. Instead, use requirements would simply require the groups that win a narrowband PCS license, whoever they might be, to use that spectrum efficiently and in the manner they have stated in their applications.

III. AN ASYMMETRIC CHANNELIZATION PLAN PERMITTING AGGREGATION OF UNIFORMLY SIZED SPECTRUM BLOCKS IS CLEARLY PREFERABLE TO A VARIABLE PLAN WITHOUT SPECTRUM USE SAFEGUARDS

Spectrum use safeguards to prevent inefficient or anticompetitive use of large spectrum blocks are an integral part of PageMart's channelization plan for narrowband PCS. If the Commission decides not to establish preliminary spectrum use requirements, it should not allocate variably sized spectrum blocks. Without use requirements, variably sized spectrum blocks would be the worst of the alternatives before the Commission because they would defeat the Commission's goals of spectrum efficiency and diversity. Therefore, if it is unwilling to develop spectrum use requirements, the Commission should instead allocate uniformly sized spectrum blocks and allow applicants unlimited opportunity to aggregate narrowband channels to achieve the spectrum requirements of each particular narrowband service.

Without conditions on the award and use of large blocks of narrowband PCS spectrum, a variable spectrum allocation plan would present several clearly unacceptable consequences. First, the Commission would receive thousands of lottery applications from parties who had no intention of actually building a narrowband PCS system.<sup>22</sup> These parties would enter the lottery as a purely speculative venture because, if they won, they would hold very valuable large blocks of spectrum that they could later sell for many times the cost of applying. And, absent spectrum use requirements, the Commission would have no way of

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<sup>22</sup> Most of the commenters in this docket have recognized the evils of speculation. See, e.g., Comments of PacTel Paging at 33, Comments of Mtel at 11.

ensuring that an applicant was not participating in the lottery merely to break up a large spectrum block for sale without first, or ever, providing PCS services. This would geometrically increase the cost of obtaining spectrum and bias the lottery process in favor of large, wealthy groups.

Parties obtaining large spectrum blocks in a Commission lottery might also warehouse their spectrum to keep it from other competing technologies without using it themselves. PacTel Paging, among others, also recognizes this concern.<sup>23</sup> For instance, a simulcast paging provider might hold a large block of narrowband PCS spectrum in "reserve" for several years in order to prevent a competing multichannel PCS technology from being implemented. This is obviously inefficient because spectrum would lie fallow when it could otherwise be used to offer different services.

Finally, applicants who were awarded large blocks of narrowband PCS spectrum, without restrictions, might use their new spectrum to implement plain old paging service ("POPS"). The Commission initiated this rulemaking to encourage the growth of innovative personal communication services, not to provide expanded spectrum for Part 22 or private carrier paging services.<sup>24</sup> Especially given the abundance of unused spectrum for POPS in the bands allocated to Part 90 service, the Commission should not allow the narrowband PCS spectrum to be squandered on POPS. Also, using narrowband PCS spectrum to provide 25 kHz POPS would not be contributing new and innovative "personal" rather than

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<sup>23</sup> Comments of PacTel Paging at 56 n.84.

<sup>24</sup> Notice at ¶ 28.

business-oriented services to the marketplace. Large spectrum blocks without use restrictions would therefore encourage providers to favor current services and contradict the objective of bringing a diverse array of new PCS alternatives to consumers.

Clearly, a spectrum allocation scheme of variably sized blocks must be coupled with use requirements in order to prevent these kinds of abuses. If the Commission does not establish spectrum use criteria as part of its narrowband PCS allocation plan, it should instead allocate uniformly sized spectrum blocks and allow licensees free opportunities to aggregate and disaggregate. With the option to aggregate and disaggregate, providers can efficiently distribute spectrum in the aftermarket. Spectrum winners with too much spectrum will have the incentive to transfer their excess spectrum instead of warehousing it or putting it to traditional, less efficient uses like plain old paging service. Spectrum winners with too little spectrum will also be able to seek the amount they need. The financial demands of aggregation would still favor larger entities, of course, but the increased supply of spectrum channels available by breaking the PCS band into smaller blocks would somewhat mitigate this economic advantage.

For the purposes of an aggregation alternative, it is particularly important that the Commission allocate uniform spectrum blocks applicable to all PCS applicants. If the Commission intends to rely on the market to distribute spectrum, it must allow the market to function properly. It is therefore vital that all narrowband providers be required to aggregate spectrum if they need it, instead of the Commission setting aside some specially sized blocks of spectrum for particular

providers or uses. In short, if the Commission decides not to reserve differently sized spectrum blocks for all different narrowband PCS technologies, it should establish a level playing field for all PCS services by requiring all PCS providers to aggregate or disaggregate spectrum in the lottery aftermarket.<sup>25</sup>

At least one commenter believes that aggregation is not necessary. PacTel Paging states that its "channel plan is flexible enough to accommodate multiple system approaches without being unduly preclusionary."<sup>26</sup> PacTel Paging proposes a variety of narrowband PCS channel sizes from 25 kHz to 100 kHz in multiples of 25 kHz.<sup>27</sup> On the one hand, PacTel Paging notes that in some cases larger bandwidths are necessary for different narrowband PCS technologies, specifically referring to PageMart and PageNet.<sup>28</sup> Curiously, however, PacTel Paging also suggests that 100 kHz is the "most that would be needed for narrowband PCS services."<sup>29</sup> PacTel proposes, without rationale or authority, that those requiring spectrum blocks larger than 100 kHz should look instead to the 2 GHz broadband allocation.

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<sup>25</sup> The Notice suggests 50 kHz as a possible channel size for a uniform spectrum allocation plan. Notice at ¶ 51. As long as it is coupled with asymmetrical pairing, in which providers may pair return links with multiple data channels, a 50 kHz channelization plan is consistent with all of the current proposals for narrowband PCS, which require between 25 and 250 kHz. Asymmetry is important because narrowband PCS will not be a two-way service. Rather, it will likely send more information over the forward link than over the return or acknowledgement link. Comments of PageMart at 6-7. As Motorola has indicated, narrowband services will likely remain asymmetrical for some time. See Motorola Ex Parte, ET Docket No. 92-100 (filed Oct. 6, 1992). A Commission requirement for symmetrically paired narrowband PCS channels would therefore be spectrum inefficient. See Attachment A for a graphic depiction of the inefficiency of symmetrical pairing. Fifty kHz blocks are large enough not to require too many aggregation transactions, but they are small enough to increase the supply of channels in the aftermarket and therefore keep down their costs.

<sup>26</sup> Comments of PacTel Paging at 56.

<sup>27</sup> Id. at 24.

<sup>28</sup> Id. at 23 n.40 and preceding text.

<sup>29</sup> Id. at 24.

PacTel Paging's suggestion would have the impermissible, although perhaps intended, effect of excluding frequency reuse technologies from the narrowband PCS marketplace. In fact, PacTel Paging's approach combines the two worst elements of any plan proposed to date. First, it would impose no conditions on the award of a large (100 kHz) spectrum block, thus placing no constraints on speculation or impermissible use of PCS spectrum merely for traditional paging services. Second, this plan would accommodate all of the PCS technologies proposed to date except PageMart's and PageNet's frequency reuse systems. By requiring only one type of narrowband PCS service to accumulate necessary spectrum through aggregation — or perhaps prohibiting aggregation entirely — PacTel Paging's plan defeats the overriding principle of competitive diversity. Decisions on whether narrowband PCS services are best provided in small spectrum segments by simulcast or larger spectrum segments by frequency reuse should be made by consumers in the market, not the Commission. Any plan that excludes or discriminates against multichannel narrowband services must therefore be rejected.

Aggregation is thus a pivotal issue. Unimpeded and universal aggregation is the necessary complement to any uniform spectrum allocation. An asymmetric channelization plan permitting aggregation of uniformly sized spectrum blocks is clearly preferable to a variable plan without spectrum use criteria. For example, a 50 kHz allocation, combined with asymmetrical return links and unlimited aggregation, would enable all of the proposals before the Commission to be implemented while subdividing the spectrum into manageably sized, reasonably

priced blocks. Although aggregation would be more complicated than a variably sized spectrum allocation with use requirements, it is still a workable alternative.<sup>30</sup>

There is general agreement on one aspect of PageMart's channelization plan. An industry consensus has developed that the Commission should place all return links for narrowband PCS in a "quiet band" at 901-902 MHz.<sup>31</sup> A quiet band would decrease adjacent channel interference problems by grouping all low-power signals in a single band. The Commission has previously recognized the need for geographic separation due to adjacent channel interference in its 220-222 MHz proceeding.<sup>32</sup> Frequency separation for return messages would be particularly necessary if providers are forced to buy spectrum from various locations in the three MHz bands allocated for narrowband PCS because a chaotic array of adjacent channel interference might otherwise result. Providers would have no control over the power levels employed by adjacent services, and power level differences could be as high as 1000 to 1, dramatically increasing the design difficulties and expense of network equipment. A quiet band would therefore mitigate this problem considerably by containing only low-power return signals, enabling them to be unhindered by high-powered forward signals.

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<sup>30</sup> While feasible, aggregation might force PageMart and other multichannel frequency reuse narrowband PCS providers to limit service options. If frequency reuse providers were forced to aggregate many local or regional signals, they might only be able to accumulate a limited number of channels. Multichannel frequency reuse providers who were able to acquire, for example, five channels would still be more efficient per channel than simulcast providers, but because they were limited to fewer channels would be able to offer less throughput than a fully functioning 10-channel frequency reuse system.

<sup>31</sup> See, e.g., Comments of Paging Network at 13 n.13; Comments of Dial Page at 7; Comments of PacTel Paging at Attachment 2; and Comments of Metriplex, Inc. at 12.

<sup>32</sup> 6 FCC Rcd. at 2369.

VI. HOW THE COMMISSION GUARDS AGAINST LOTTERY SPECULATION  
DEPENDS ON THE LICENSING MECHANISM IT CHOOSES

Because the lottery process can be easily abused by speculators, there is no basic disagreement that the Commission should craft rules that will undermine the potential for this abuse. Speculators drive the price of spectrum up, needlessly drain Commission resources, and delay the implementation of new services.

Many commenters have proposed specific methods by which the Commission could deter speculation. These include detailed technical showings,<sup>33</sup> financial qualifications,<sup>34</sup> high filing fees,<sup>35</sup> forfeiture,<sup>36</sup> minimum construction and service requirements,<sup>37</sup> certification that an application is not speculative,<sup>38</sup> limits on the transferability of licenses,<sup>39</sup> prohibitions on pre-lottery settlements,<sup>40</sup> and a channel loading threshold.<sup>41</sup>

Although each of these proposals to avoid speculation might be more or less effective in the abstract, the appropriateness of any given anti-speculative measure depends on the channelization plan that the Commission selects for narrowband PCS in the first instance. If the Commission adopts PageMart's plan for allocating variably sized spectrum blocks with spectrum use requirements, detailed technical

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<sup>33</sup> *Id.* at 35.

<sup>34</sup> *Id.* at 37.

<sup>35</sup> *Id.* at 39.

<sup>36</sup> *Id.* at 48.

<sup>37</sup> Comments of Mtel at 11.

<sup>38</sup> *Id.* at 12.

<sup>39</sup> *Id.*

<sup>40</sup> Comments of Telocator on 900 MHz Personal Communications Services at 15.

<sup>41</sup> Comments of Dial Page at 9.

showings and a requirement that winning applicants must build what they propose might be sufficient. However, if the Commission decides in favor of a uniform spectrum allocation with opportunities for aggregation and disaggregation, speculation could be much harder to prevent. An aggregation scheme will by its nature provide incentives for investment in the lottery process solely for the purpose of "flipping" spectrum for short-term profit instead of providing communication services.

Some anti-speculation measures, for instance restrictions on license transferability, would be entirely inappropriate to an aggregation-based spectrum plan. A prohibition on license transferability would be directly incompatible with aggregation because narrowband PCS providers must be able to buy and sell spectrum in order to accumulate the amount of spectrum that they need. Thus, with a limit on license transferability, aggregation would be virtually impossible. Construction deadlines and minimum service requirements would also be illogical because spectrum would by definition need to be traded and sold before any system was built or service implemented. Any of these anti-speculation measures would make it impossible, for instance, for a multichannel PCS provider like PageMart to aggregate a 250 kHz block of spectrum necessary to implement a frequency reuse system. If the Commission opts for an aggregation alternative, it must therefore avoid imposing anti-speculation rules that would impair an efficient and free market for spectrum aggregation and disaggregation.

Several anti-speculative measures, however, would be useful if the Commission decided to allow aggregation and disaggregation. In particular, a

channel loading requisite would ensure that spectrum would not be aggregated only to be sold again for profit. Once narrowband PCS providers obtain the channels that they need, they must be required to load those channels in order to prevent the cost of spectrum from escalating. Also, financial showings, forfeiture bonds, certification that the application was not speculative, and high filing fees would discourage speculative applicants from entering the lottery without placing impossible burdens on serious applicants.

V. IF THE COMMISSION OPTS FOR UNIFORM ALLOCATIONS WITH THE ALTERNATIVE TO AGGREGATE, IT SHOULD ALSO PERMIT LARGE SERVICE AREAS

PageMart argued in its comments that the Commission should set national service areas because small service areas would make spectrum aggregation difficult and costly.<sup>42</sup> National service areas would also enhance economies of scale, providing the critical economic stimulus for manufacturers to build narrowband PCS equipment in mass-market quantities.<sup>43</sup>

Some commenters favor more limited, regional service areas. For example, PacTel Paging suggests that the country should be divided into five geographic regions.<sup>44</sup> Dial Page also supports five geographic regions on the stated grounds that the paging industry has become regional in nature.<sup>45</sup>

Although regional service areas are feasible, they will not provide several important benefits offered by nationwide service areas, especially if the Commission

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<sup>42</sup> Comments of PageMart at 10.

<sup>43</sup> Id.

<sup>44</sup> Comments of PacTel Paging at 14.

<sup>45</sup> Comments of Dial Page at 7.

decides to encourage aggregation. In addition to the advantage that consumers would enjoy if they could be reached using common equipment on common frequencies wherever in the country they traveled, nationwide service areas would also offer opportunities for economies of scale and spectrum efficiency.

The Commission has acknowledged the advantages of nationwide service areas in its 220-222 MHz proceeding. Citing a growing demand for nationwide mobile services, the Commission has stated that "nationwide assignments are a critical means of achieving the greater spectrum efficiency we expect from narrowband technology research and development."<sup>46</sup> In addition, the Commission found that nationwide service areas will stimulate investment in narrowband technology, "ultimately provid[ing] a broader base of radio technology support for the marketplace."<sup>47</sup> Without a nationwide allocation, the Commission believed that the growth of nationwide systems in the 220-222 MHz band would be impractical or impossible.<sup>48</sup>

Without national service areas, the transaction costs involved in aggregating spectrum might be so high as to make aggregation economically prohibitive. PageNet correctly observes that the huge number of acquisitions that would be required if the Commission opts for local licenses with small bandwidths would virtually stall any efforts to implement advanced paging systems in this century.<sup>49</sup>

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<sup>46</sup> Report and Order, supra note 17, 6 FCC Rcd. at 2361.

<sup>47</sup> Id.

<sup>48</sup> Id. Indeed, the Commission declined to set aside any frequencies in the 220-222 MHz band for regional channels. Id. at 2362.

<sup>49</sup> Comments of PageNet at 4-5.