Right-sizing Spectrum Auction Licenses: The Case for Smaller Geographic License Areas in the TV Broadcast Incentive Auction

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by WILLIAM LEHR AND J. ARMAND MUSEY*

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The wireless sector is a key contributor to economic activity and growth. Wireless service providers are spending approximately $30 billion annually to upgrade and expand their networks to deploy fourth generation ("4G") mobile broadband across the nation. Wireless broadband investment, along with the services and innovation supported by such investment, are expected to add between $259 billion and $355 billion to the U.S. Gross Domestic Product ("GDP") each year through 2017.

Part II of this article will provide background of the Federal Communications Commission’s ("FCC") goals in designing several spectrum auctions, including the Incentive Auction—the largest ever auction of terrestrial wireless spectrum—currently planned for 2016. The purpose of the Incentive Auction is to free up to 120 MHz of the 294 MHz in the 600 MHz band of prime spectrum currently licensed for over-the-air broadcasting for mobile broadband and other high-value wireless services. To accomplish this goal, the FCC proposes the use of a two-part auction process in which broadcast television license holders submit bids for relinquishing their licenses ("Reverse Auction"), while commercial broadband providers bid to acquire licenses for the spectrum made available ("Forward Auction").

The FCC is currently evaluating various auction design elements to promote competition in the auction. For example, the FCC is considering spectrum aggregation limits, constraints on the types of bidding allowed, and the most appropriate framework for the license territories to be used in the Forward Auction. This article focuses solely on this last design element. Adopting relatively small geographic territories is necessary to promote competition and other important economic and social goals, but may not alone be sufficient to ensure adequate competition and participation in the Forward Auction. For instance, the FCC could adopt small geographic license sizes, but still end up with an auction where the two largest wireless carriers aggregate the entire amount of spectrum

4. Id. at 12,358, 12,372–73.
5. Id. at 12,372–77 (Reverse Auction); id. at 12,377–79 (Forward Auction).
offered. This outcome would be inconsistent with the goal of promoting competition in wireless services.

The territory size used for spectrum licenses is as important for valuing spectrum as parcel size is to valuing real estate. For example, if all parcels were fifty acres, parcels in Manhattan would be too expensive and too large for most buyers. In turn, this circumstance would necessitate buyers seeking a small parcel to bid for more land than they actually need. Alternatively, otherwise qualified buyers might be prevented from buying land altogether. Similarly, wrong-sizing spectrum license territories to be used in future spectrum auctions—in particular, the Incentive Auction—would likely result in significant, yet avoidable, inefficiencies in the allocation of scarce radio frequency spectrum. For carriers that are compelled to bid for wrong-sized spectrum license packages, the added cost (which can total tens of millions of dollars per license territory) may be sufficient to discourage their participation altogether, even if they do actually participate. If bidding carriers are successful, then they will have fewer resources available to deploy services using the spectrum. Thus, the efficiency of the auction and the larger goals of the process will suffer in each case.

Part III of this article will explain why small geographic areas, such as Cellular Market Areas (“CMAs”), provide an appropriate license territory framework to ensure that licenses are right-sized in the Forward Auction. Small territories are preferable to the larger Economic Areas (“EAs”) and even intermediate-size Partial Economic Areas (“PEAs”) given their compatibility with the bidders’ spectrum needs. Using small areas would ensure that the planned auction will reallocate spectrum resources efficiently, while also promoting competition, economic growth, and universal broadband service. The FCC has successfully used smaller geographic license sizes to auction spectrum in the past, and doing so with the Forward Auction will enable important advantages.

Small license areas are more likely to maximize the amount of spectrum that is repurposed for the Forward Auction. Specifically, small areas allow for more granular segmentation in areas where limited amounts of spectrum are procured through the Reverse Auction, while also reducing the spectrum that is lost due to international border coordination with Canada, Mexico, and other encumbrances. Small geographic license sizes should also maximize opportunities for participation by both large and small wireless service providers, while promoting efficient build-out of spectrum acquired in the Forward Auction.

Evidence gathered from past auctions suggests that auction proceeds are optimized through the use of small areas. Moreover, using small territories is consistent with the long-term direction of efficient spectrum
management reform and the evolution of wireless markets, including secondary market transactions. Finally, Part IV will rebut some of the arguments made to date against the use of small geographic license areas.

Interested parties, particularly the Competitive Carriers Association ("CCA") and its members, have pressed the FCC to conduct the Forward Auction with small territory sizes for licenses. Since initially announcing its position in 2012, the FCC has moved from recommending that the Forward Auction be licensed using EAs to recommending a compromise territory size based on PEAs.  

II. Background

In 2010, the FCC released the National Broadband Plan ("Plan"), its long-term plan for increasing spectrum for wireless broadband. A key element of the Plan calls for the reallocation of up to 120 MHz from the TV broadcast spectrum to the wireless broadband. Although the FCC has used auctions as its primary method of allocating spectrum licenses since 1994, Congress recently granted the FCC authority to conduct the first-ever Incentive Auction under the Middle Class Tax Relief and Job Creation Act of 2012 ("Spectrum Act"). This auction will reclaim spectrum in the 600 MHz band by offering incentive payments to TV broadcasters to surrender their licenses and make their spectrum available for other wireless uses, including mobile broadband.

A. Incentive Auction Goals

Congress established lofty goals for the Incentive Auction. The Incentive Auction is intended to encourage investment and innovation by repurposing the maximum amount of broadcast spectrum for flexible licensed and unlicensed uses, while preserving diversity in broadcast TV services. Congress also reaffirmed the FCC’s authority to adopt rules of general applicability to promote competition, including those concerning spectrum aggregation.

6. See Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, Report and Order, 29 FCC Rcd. 6567, 6600 (2014) [hereinafter Incentive Auction R&O] (explaining that the number of license territories is expanded from 176 EAs to 416 PEAs).
9. The FCC identifies key policy goals for the Forward Auction band plan, including utility, certainty, interchangeability, quantity, and interoperability. See Incentive Auction NPRM, supra note 3, at 12,361–62.
10. See Spectrum Act, Pub. L. No. 112-96, § 6404. Spectrum aggregation limits are a policy consideration that should be evaluated apart from the advantages of small geographic
1. **Unleash Innovation and Investment**

In 2013, U.S. wireless service providers had revenues of $185 billion and capital investments of $33.1 billion.\(^ {11} \) A recent study estimated that wireless broadband investments, along with the services and innovation they support, will add between $259 billion and $355 billion to U.S. GDP each year through 2017.\(^ {12} \) Over the next several years, wireless services providers are expected to invest $25 billion to $53 billion upgrading and expanding their networks to deploy 4G mobile broadband across the U.S.\(^ {13} \) Mobile broadband is a critical infrastructure for innovation and investment in a host of new technologies and services, such as machine-to-machine (“M2M”), smart health, smart farming, and mobile commerce, to name a few.\(^ {14} \)

Radio frequency spectrum is an essential resource for realizing the benefits that emergent wireless technologies and services promise. The Incentive Auction has the potential to promote significant innovation and investment in the wireless industry by expanding access to prime spectrum resources. To actualize this potential, the Incentive Auction must maximize competition and broaden participation across all levels of the industry by ensuring that smaller operators can participate. Small operators are critical for addressing the needs of traditionally underserved rural markets and contribute significantly to enhancing consumer choice, competition, and wireless investment.\(^ {15} \) For example, the third through tenth largest wireless providers in the U.S. made a total of $5.5 billion in capital expenditures in 2013, representing a significant level of infrastructure investment.\(^ {16} \)

2. **Maximize Spectrum Availability**

The innovative use of mobile broadband is stimulating the rapid growth in mobile traffic. Cisco’s Visual Networking Index forecasts that global
mobile traffic will grow at a compounded annual rate of sixty-six percent through 2017, and predicted that the number of mobile-connected devices would exceed the world’s population by the end of 2014. To meet projected demands, the FCC plans to reallocate prime spectrum from underutilized broadcast television bands to wireless broadband. Two challenges associated with meeting the increased wireless broadband demand are accommodation of variable spectrum supply and clearance of sufficient spectrum channels in high-demand metropolitan markets in the Reverse Auction. Estimates of how much spectrum will be cleared have varied. Although the Incentive Auction originally targeted the full 120 MHz of spectrum, more recent forecasts have anticipated somewhat lower amounts.

3. *Promote Consumer Welfare, Economic Growth, and Competitiveness*

Enhanced competition among wireless service providers will reduce prices, expand customer choice, and encourage innovation. In turn, the realization of these goals will help promote consumer welfare, economic growth, and the U.S. wireless service providers’ ability to compete globally. The FCC recognizes that “[p]romoting competition is a fundamental goal of the Commission’s policymaking. Competition has played and must continue to play an essential role in the mobile wireless industry, leading to lower prices and higher quality for American consumers and producing innovation and investment in wireless networks, devices, and services.”

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4. Allow for More Flexible Spectrum Usage Longer Term

Both the Plan and the President’s Counsel of Advisors on Science and Technology (“PCAST”) Report found that merely auctioning cleared spectrum could not fully satisfy spectrum needs.\(^{21}\) The PCAST Report recommended additional mechanisms to optimize spectrum utilization and encouraged the development of more efficient mechanisms to enable spectrum sharing.\(^{22}\) As the FCC noted in the Incentive Auction Notice of Proposed Rulemaking, well-tailored license sizes will:

facilitate the efficient use of spectrum by providing licensees with the flexibility to make offerings directly responsive to market demands for particular types of services, increase competition by allowing market entry by new entrants, and expedite provision of services to areas that might not otherwise receive service in the near term.\(^{23}\)

In the future, we expect that a more dynamic reassignment of spectrum rights will become the industry norm on both a time and geographic basis. Ultimately, adopting smaller territory sizes will allow for the flexibility necessary for reassigning spectrum.\(^{24}\)

5. Raise Auction Revenue

The Incentive Auction is expected to raise significant revenues. The funds to be raised in the Reverse Auction must compensate television broadcasters for the licenses they relinquish and for the costs of repacking the continuing channels into the remaining broadcast spectrum. These repacking costs alone are estimated to be $1.75 billion.\(^{25}\)


\(^{22}\) See PCAST REPORT, supra note 21, at xi-xiiv (Recommendations 2.1, 2.2, 3.1, 5.4, 7.1).

\(^{23}\) Incentive Auction NPRM, supra note 3, at 12,485.


The Incentive Auction and other spectrum auctions—such as the H-Block (FCC Auction 96, completed in February 2014) and AWS-3 (FCC Auction 97, completed in February 2015)—will serve as a source for funding FirstNet, a $7-billion nationwide emergency communications system.\textsuperscript{26} The Incentive Auction must also recover the costs associated with its administration, as well as raise funds for public safety research, deficit reduction, state and local implementation funds, and emergency response grants.\textsuperscript{27} According to a report that Greenhill & Co. prepared for the FCC, independent studies, including one conducted by the Expanding Opportunities for Broadcasters Coalition, estimate that total Incentive Auction proceeds could approach $45 billion.\textsuperscript{28}

6. \textit{Spectrum Act Requires the FCC to Consider a Variety of Territory Sizes}

The Spectrum Act requires the FCC to “consider assigning licenses that cover geographic areas of a variety of different sizes.”\textsuperscript{29} Right-sizing license territories using small geographic license sizes like CMAs offers the best way to match spectrum needs and licenses to geographic areas.

7. \textit{The FCC Has an Obligation to Promote Participation by Small and Rural Entities}

The Communications Act obligates the FCC to implement auction regulations to promote a number of objectives, including providing opportunities for small rural entities to participate:

> consistent with the public interest, convenience, and necessity, the purposes of this chapter, and the characteristics of the proposed service, [the FCC shall] prescribe area designations and bandwidth assignments that promote (i) an equitable distribution of licenses and services among geographic areas, (ii) economic opportunity for a wide variety of applicants, including small businesses, rural telephone companies, and businesses owned by members of minority groups and women, and (iii) investment in and rapid deployment of new technologies and services.\textsuperscript{30}

Moreover, the FCC must “ensure that small businesses, rural telephone companies, and businesses owned by members of minority groups and

\textsuperscript{26} Spectrum Act § 6402, 126 Stat. 208–09.
\textsuperscript{27} Id. § 6413, 126 Stat. 235.
\textsuperscript{29} Spectrum Act § 6403(c)(3), 126 Stat. 228.
women are given the opportunity to participate in the provision of spectrum-based services.\textsuperscript{31} Geographic license size is a critical risk factor in promoting such participation. The relevant risk is that the FCC might adopt license territories that are too large for small rural or regional operators to bid on or use efficiently.

B. History of the FCC’s Use of Different Auction Territory Sizes

The FCC has a long history of using a variety of territory sizes ranging from CMAs to a single, national license. It issued the original cellular band licenses on the basis of 734 CMA’s\textsuperscript{32} in a process ending in 1991, but the FCC now favors a single framework.\textsuperscript{33}

The early auctions were based on a “trading area” system. The U.S. was divided into 493 Basic Trading Areas (“BTAs”) comprising up to 51 Major Trading Areas (“MTAs”) and 5 Regional Personal Communication Areas (“RPCs”).\textsuperscript{34} In 1994 and 1995, the FCC conducted the first spectrum auctions (for the PCS spectrum).\textsuperscript{35} The first auction included nationwide license territories and was quickly followed by the auction of RPC licenses. Five licenses were awarded in each of the six RPCs,\textsuperscript{36} and an auction of PCS Blocks A and B in each of the 51 MTA’s.\textsuperscript{37} In 1996, an auction of additional spectrum in the Personal Communication Service (“PCS”) band (“C Block”) in smaller territories consisting of the 493 BTAs followed.\textsuperscript{38} In late 1996 and early 1997, the FCC auctioned the PCS D, E, and F Blocks of spectrum in BTA territory licenses.\textsuperscript{39}

\begin{footnotesize}
\begin{enumerate}
\item Id. § 309(j)(4)(D) (2012).
\item The first cellular licenses were awarded in the 850 MHz band. The 734 CMAs were created in 1990 from the Office of Management and Budget’s 1980 Metropolitan Statistical Areas (MSA) (CMAs 1 to 305), the Gulf of Mexico (CMA 306), and the Rural Service Areas (RSA), which were defined by the FCC and do not cross state boundaries (CMAs 307 to 734). See Maps, FCC, http://wireless.fcc.gov/auctions/default.htm?job=maps#Geographic Licensing Schemes, for additional information about FCC territories.
\item See FCC Areas, FCC, OFFICE OF ENG’G & TECH, http://transition.fcc.gov/oet/info/maps/areas/ (explaining the FCC’s territory plans, including formation of EAs in 1997 and how they nest to larger FCC areas).
\end{enumerate}
\end{footnotesize}
In the late 1990s, the FCC began to utilize a new licensing framework that divides the country into 176 EAs.\textsuperscript{40} EAs nest up to 52 Major Economic Areas ("MEAs") and six Regional Economic Groupings ("REAGs").\textsuperscript{41} Several recent auctions, including auction number 73 (700 MHz), number 78 (AWS-1), and number 92 (Lower 700 MHz), have used a combination of both CMA and EA territories. In 1997, the FCC issued Wireless Communication Service ("WCS") licenses in a combination of the 52 MEAs and the 12 REAGs.\textsuperscript{42}

The FCC shifted from using a multiplicity of license territory sizes toward using a single framework based on EA-sized license territories.\textsuperscript{43} Initially, the FCC proposed using EAs in the Incentive Auction—\textsuperscript{44} the H Block spectrum auction\textsuperscript{45} and the AWS-3 auction.\textsuperscript{46} Some commentators have advocated for smaller license territories, or at a minimum, for the use of multiple license territory sizes.\textsuperscript{47} Currently, the FCC’s plan is to license the 600 MHz band using 416 PEAs, which are a new FCC license territory that attempt to segment the EAs into urban and rural areas and can be combined into EAs.\textsuperscript{48}

C. Review of Industry Size and Concentration

Certain structural features in the wireless service industry raise concerns about the sustainability of competition in the industry. As the
FCC acknowledges, acquiring necessary spectrum resources poses an important entry barrier that spectrum policy must address.49

1. Market Share and Revenue Concentration

According to the FCC, the wireless services industry is highly and increasingly concentrated.50 The Herfindahl-Hirschman Index (“HHI”)51 for the wireless industry was estimated to be 3027 in the year 2013,52 which is up from 2151 in the year 2003.53 Since 2011, the industry has been consolidated even more as a consequence of significant mergers and acquisition activity.54 Forces driving consolidation include the desire to realize both scale and scope economies. Moreover, the industry is increasingly capital intensive as operators have upgraded network capacity and deployed new technology to expand service offerings, improve quality, and support traffic growth. Enabling ever-faster mobile broadband to support a growing diversity of interactive and rich multimedia services requires increased spectrum and capital resources (i.e., more cell sites). The industry is currently upgrading networks from 3G to 4G LTE technology, which offers important spectral efficiency benefits and supports the dynamic assignment of wider bandwidth channels for more diverse and noncontiguous spectrum resources.55 Small regional operators, rural operators, and new entrants

49. See FCC’s Sixteenth Wireless Competition Report, supra note 20, at 3765 (“If a potential entrant were to attempt to enter the mobile wireless services market, obtaining access to spectrum is crucial. . . . Therefore, spectrum policies affect the ability of potential entrants to access spectrum and to build out or expand capacity.”).
50. FCC’s Sixteenth Wireless Competition Report, supra note 20, at 3858.
51. HHI is the metric used for assessing the degree of “market concentration.” U.S. DEP’T OF JUSTICE & FTC, HORIZONTAL MERGER GUIDELINES § 5.3 (2010), available at http://www.justice.gov/atr/public/guidelines/hmg-2010.html. It is computed “by summing the squares” of the market shares of each firm in the industry. Id.
53. See FCC’s Sixteenth Wireless Competition Report, supra note 20, at 3756–57. The U.S. Department of Justice and Federal Trade Commission consider an industry with an HHI of between 1500 to 2500 to be moderately concentrated and above 2500 to be highly concentrated. See U.S. DEP’T OF JUSTICE & FTC, supra note 44, § 5.3.
54. Concentration has increased as a consequence of the Verizon/SpectrumCo, AT&T/NextWave, AT&T/Alltel, T-Mobile/MetroPCS, Sprint/Clearwire, AT&T/Leap, and Verizon/Cincinnati Bell Wireless transactions.
55. A key design feature of LTE is to enable much more flexible assignment and use of spectrum resources. Jeanette Wannastrom, Carrier Aggregation Explained, 3GPP (June 2013), http://www.3gpp.org/technologies/keywords-acronyms/101-carrier-aggregation-explained. This design is useful both for dynamic assignment of spectrum resources to support heterogeneous application resource requirements and to allow operators to make use of heterogeneous spectrum resources (i.e., spectrum frequencies that may not be contiguous and may differ by geographic region). Id. Advanced forms of this design are sometimes referred to as “carrier aggregation.” Id.
with comparatively smaller market shares and less mature networks are often at a significant cost disadvantage relative to the largest operators. Such disadvantages are exacerbated when smaller operators cannot access spectrum in the same frequency bands, thereby preventing them from realizing the same economies of scale as the largest operators.

Not surprisingly, industry concentration varies sharply by geographic market and, as Exhibits 1 and 2 show below, it is highest in rural areas with low population densities. While most of the top mobile service markets in urban areas already have four or more facilities-based mobile service providers, rural consumers have fewer choices as market concentration is higher (see Exhibits 1 and 2 below).

Exhibit 1: Percentage of Road Miles Covered by Mobile Broadband Providers in Rural vs. Non-Rural Areas, Jan 2014


57. FCC’s Sixteenth Wireless Competition Report, supra note 20, at 3940–41 notes that:

[J]ust over 400,000 people in rural areas had no mobile wireless coverage, while approximately 58,000 in non-rural areas had no mobile wireless coverage as of October 2012. The percentage of the rural population covered by at least two providers remained flat at just over 96 percent from July 2010 to October 2012, and was lower than the 99.9 percent of the non-rural population covered by at least two providers. Further, 87 percent of the rural population was covered by at least three providers and 69 percent by at least four providers, compared to 99.5 percent and 98 percent, respectively, of the non-rural population.

58. FCC’s Seventeenth Wireless Competition Report, supra note 52, at *18.
2. Spectrum Concentration

Access to spectrum resources is a significant entry barrier to the wireless services industry. Control of spectrum resources is also highly concentrated, especially in the prime spectrum below 1 GHz. Although AT&T and Verizon are the dominant service providers nationally, with total combined market shares of approximately 65.2%, they hold a disproportionately large share of prime sub-1 GHz spectrum (73%).

The FCC recognizes that the spectrum below 1 GHz, which will be included in the Incentive Auction, has particularly attractive propagation characteristics for serving rural areas due to its long range and superior in-building penetration. To be competitive in rural markets, mobile service providers need access to this low-band, interoperable spectrum. The Incentive Auction will be especially important for the development of rural coverage because it will likely involve the last significant amount of critical

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Footnotes:
59. *FCC’s Sixteenth Wireless Competition Report*, supra note 20, at 3758. The highest population density (1,107 pop/sq. mi) occurs in EA 34 (Tampa-St. Petersburg-Clearwater, FL), and the lowest population density (1 pop/sq. mi) occurs in EA 171 (Anchorage, AK). *Id.* n.189.
60. *Id.* at 3752.
sub-1 GHz spectrum available to be reallocated to mobile broadband in the foreseeable future.

III. Right-Sizing Spectrum Licenses Requires Small Geographic Areas

Creating right-sized geographical license territories will ensure that the territories are sufficiently small enough to maximize the number of mobile service providers who can efficiently bid for and utilize them. While the FCC originally proposed to auction licenses based on the 176 EAs (later changed to 416 PEAs), competitive carriers have urged the FCC to consider smaller geographic license sizes, such as the 734 CMA-based territories. The choice of license size will have a significant impact not only on the auction process, but on future service quality, industry structure, and market competition as well. Benefits of using these smaller licenses include more unencumbered spectrum available for auction, increased auction participation and improved bidder incentives, mitigated volatility, and increased auction revenue, and better alignment for long-term spectrum efficiency.

A. More Unencumbered Spectrum Available for Auction

Repurposing the maximum amount of broadcast spectrum is a key goal of the Incentive Auction, and choosing license territories smaller than EAs will help to achieve this goal. The Incentive Auction faces two important challenges related to repurposing the maximum amount of spectrum. First, the risk that the incentives for broadcast licensees to participate in the Reverse Auction will vary by market, resulting in more spectrum being cleared in some markets than others. Second, following the Reverse Auction, the industry will experience technical challenges of repacking the cleared spectrum and mapping it to new license territories for sale in the Forward Auction.

Adopting small license territories for the Forward Auction would assist the FCC in addressing these challenges. Specifically, it would allow more flexibility in the repacking of remaining television broadcast spectrum for television broadcasters that decline to participate, encourage greater broadcaster participation in the Reverse Auction, and help to clear more spectrum in every geographic market. Additionally, adopting small license territories will allow the repurposed spectrum to be more easily mapped to higher-value, unencumbered licenses for sale in the Forward Auction.

63. In instances where this article refers specifically to the advantages of using CMAs, the conclusions are similarly applicable to other geographic territories smaller in size than EAs that might be considered for the Incentive Auction.
1. Facilitate Efficient Mapping of Broadcast Spectrum

Small license territories will allow the FCC to more efficiently map television broadcast spectrum into new territories to avoid unequal amounts of available spectrum across the country. While the FCC hopes to reclaim up to 120 MHz of the 294 MHz of spectrum allocated for television broadcast, it recognizes that nationwide clearing may not be possible for all frequencies. As the Incentive Auction NPRM indicates, some frequencies may not be available in all markets. Moreover, the spectrum of those broadcast licenses that will continue to operate after the auction must be repacked into license territories with adequate interference protection, which includes protection from the spectrum acquired in the Forward Auction. As broadband use increases, the FCC will likely persist in seeking to reallocate crowded spectrum bands across the broader radio frequency spectrum. In doing so, the FCC will face similar repacking and interference issues in other spectrum reallocation processes.

The FCC allocated television broadcasting licenses on the basis of 210 Designated Market Areas (“DMAs”). Following the Reverse Auction, the industry will face a complex process of repacking channels and mapping the freed spectrum from DMAs to new mobile license territories. The amount of unencumbered spectrum the FCC will clear following the repacking of the remaining broadcasters will vary significantly based on the number of broadcasters agreeing to sell their spectrum licenses in the Reverse Auction.

Licensing schemes following a small-territory approach—such as CMA-based licensing—would significantly increase the number of markets that would have 85 MHz of spectrum (or more), based on repacking alone. Currently, many EAs with less than 85 MHz of total spectrum are likely to have areas within them with 85 MHz or more available. Thus, many of these areas could be carved into separate smaller licensed


65. Incentive Auction NPRM, supra note 3, at 12,419 & 12,545 app. C at 7.

66. The FCC refers to these territories as TMAs (Television Market Areas). FCC Areas, supra note 34. The Neilson Company coined the term “DMA,” which refers to the same areas. Stuart Sweet, What Is a Designated Market Area (DMA)?, THE SOLID SIGNAL BLOG (Apr. 20, 2014), http://forums.solidsignal.com/content.php/3068-What-is-a-designated-market-area-%28DMA-%29 DMA. DMA is the standard reference term; TMAs are rarely used outside of FCC regulatory filings. See generally id.

territories with at least 85 MHz available for mobile broadband as opposed to leaving the entire EA with less than 85 MHz. Using a large EA-based territory approach would increase the overall area that is encumbered (and thus not usable) by interference protection zones for remaining television broadcasters. From this perspective, small licensed territories are a more efficient mapping strategy. Likewise, the EA-based territory model does not eliminate the challenges of remapping. Consequently, the case for using relatively larger geographic license areas cannot be made citing technical mapping concerns, partly due to the resulting less efficient mapping strategy.

2. **Reduce Encumbered Spectrum in Border Areas**

Smaller license territories would allow the FCC to minimize license territories where spectrum is unusable due to interference across national borders. Specifically, the use of small territories facilitates spectrum interference coordination with users in Canada and Mexico. Smaller CMA-based license territories would allow the FCC to limit the spectrum resources and markets (i.e., population, or “POPs”) that might have areas within a license territory where the FCC restricts the use of the spectrum to address border interference coordination issues. In addressing license boundary issues, the smaller the license territories, the more focused, flexible, and granular the options will be, because small territories allow areas encumbered by interference to be mapped into fewer encumbered territories, leaving more unencumbered territories.

**B. Increased Auction Participation and Improved Bidder Incentives**

Adopting small license territories may promote auction participation in all markets, but especially in the rural markets where the participation of additional operators is most important due to lower levels of competition. Increasing the efficiency of bidding also lowers operators’ resource constraints and increases incentives for bidders to build out their territories.

Fundamentally, the smaller the license territory, the lower the expected price per license because there are fewer people or “POPs,” meaning fewer potential subscribers in each territory. The decrease in price per license will increase the number of interested bidders who can afford the licenses and associated costs. Additionally, the smaller the license territory, the easier it is for a provider to optimize its service coverage area, which is particularly important for rural carriers who do not provide service throughout entire EAs. With EAs, or other large license areas, the chance

68. See Exhibits 1 and 2 supra Part II.C.1, for information related to relative competition in rural versus urban areas.
that a carrier will use licensed spectrum inefficiently increases. Instead of bidding for spectrum in targeted areas more closely matching their needs, they may need to bid for larger territories that include significant areas they do not need, or even want.

Requiring operators to buy more spectrum than needed imposes an unnecessary cost on market participants. To the extent that larger territories reduce participants, competition suffers, which, in turn, increases consumer costs and reduces innovation. Small, targeted territory sizing will lower the barriers to entry in the market, and allow more entities to participate. Economists generally believe greater participation in auctions enhances auction efficiency. 69 Furthermore, participants confronted with only inefficiently large license territories are likely to lower their bids to compensate for the inefficiently high capital costs, and build out expenses and regulatory costs associated with buying and holding the surplus spectrum assets. The net effect will thereby depress auction proceeds.

Some carriers only have a choice to bid for large spectrum license packages, and the added cost may dissuade them from participating; 70 or, if they do participate, they are less likely to offer successful bids. Even if they successfully participate, they will have fewer resources available to deploy services using the spectrum. In either case, the efficiency of the auction process—and its goal of deploying spectrum to those who will put it to the best use—inevitably suffers.

Unfortunately, a number of wireless operators have already indicated to the FCC that they will not participate in the Incentive Auction if licenses are allocated based on EAs (see Exhibit 3 below).


70. According to Dr. Kovacs commenting on the 700 MHz auction:

[one of the keys to the success of the small bidders was the availability of spectrum that covered areas that matched their needs. They did not have to pay for licenses that were too big for them to fund, either in terms of initial license cost or ultimate build-out cost.

**Exhibit 3: Carriers Indicating They Will Not Participate in an EA Auction**

<table>
<thead>
<tr>
<th>Carrier</th>
<th>Source: Competitive Carriers Association</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic Seawinds Communications, LLC</td>
<td></td>
</tr>
<tr>
<td>Appalachian Wireless (East Kentucky Network LLC)</td>
<td></td>
</tr>
<tr>
<td>Bluegrass Cellular</td>
<td></td>
</tr>
<tr>
<td>Carolina West Wireless</td>
<td></td>
</tr>
<tr>
<td>Cellcom</td>
<td></td>
</tr>
<tr>
<td>Cellular One (MTPCS, LLC)</td>
<td></td>
</tr>
<tr>
<td>Chat Mobility</td>
<td></td>
</tr>
<tr>
<td>Northwest Missouri Cellular Limited Partnership</td>
<td></td>
</tr>
<tr>
<td>Plateau Telecommunications</td>
<td></td>
</tr>
<tr>
<td>Public Service Wireless Services, Inc.</td>
<td></td>
</tr>
<tr>
<td>Sandhill Communications</td>
<td></td>
</tr>
<tr>
<td>Vtel Wireless</td>
<td></td>
</tr>
</tbody>
</table>

In addition to the carriers listed above, other carriers and investors that participated in previous EA auctions have exited the mobile operator market or have been acquired. A partial list of these participants is shown in Exhibit 4 below.

**Exhibit 4: Bidders in Previous EA Auctions that Exited or Were Acquired**

<table>
<thead>
<tr>
<th>Carrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>18th Street Spectrum, LLC</td>
</tr>
<tr>
<td>Alltel Corporation</td>
</tr>
<tr>
<td>American Cellular Corporation</td>
</tr>
<tr>
<td>AWS Wireless Inc.</td>
</tr>
<tr>
<td>Broadband Wireless Unlimited, LLC</td>
</tr>
<tr>
<td>CenturyTel</td>
</tr>
<tr>
<td>Clearwire</td>
</tr>
<tr>
<td>Comporium Wireless, LLC</td>
</tr>
<tr>
<td>Cox Wireless</td>
</tr>
<tr>
<td>Cricket</td>
</tr>
<tr>
<td>Leap Wireless</td>
</tr>
<tr>
<td>MetroPCS</td>
</tr>
<tr>
<td>PCS Partners, L.P.</td>
</tr>
<tr>
<td>Qualcomm</td>
</tr>
<tr>
<td>Red Rock Spectrum Holdings</td>
</tr>
<tr>
<td>SpectrumCo</td>
</tr>
<tr>
<td>Toba Inlet PCS</td>
</tr>
<tr>
<td>VentureTel 700, Inc.</td>
</tr>
<tr>
<td>Wireless Communications Venture</td>
</tr>
</tbody>
</table>

Source: Competitive Carriers Association

Finally, the harm of imposing excessive spectrum costs on small bidders impacts all bidders and, ultimately, consumers. Specifically, the failure to assign spectrum efficiently will harm the consumers where the spectrum is less likely to be built out. This effect will reduce their choices and ultimately create an artificial spectrum scarcity as other operators may have been willing to bid for a build-out of that area if it had been available in a small, targeted area.

The added costs and time associated with re-assigning the spectrum via secondary markets or subleases will, as the following paragraphs explain, distort investment in complementary assets, such as radio network infrastructure. It will also increase the cost and delay the delivery of broadband to underserved communities.
1. **Promote Participation Among Small Operators**

One pitfall of adopting larger territories is that it will likely disadvantage rural and regional operators with smaller service coverage areas. The FCC has recognized that small license territories facilitate participation from new entrants and from small carriers—rural and non-rural—in spectrum auctions.\(^2\) For many small operators, an EA-sized license is much larger than needed.\(^3\) EA-based licenses contain both rural and urban areas. For example, if a carrier wants spectrum to serve Carroll, New Hampshire, it must bid for spectrum in EA 3—which includes Boston, Massachusetts; Providence, Rhode Island; and Windham, Vermont. The expected cost of acquiring an EA may be financially impossible or impractical for smaller operators.

Recent auction results suggest that small carriers have a strong interest in bidding for spectrum in rural areas. Exhibits 5 and 6 show data from the 700 MHz and AWS auctions, respectively.

### Exhibit 5: Winning Bidders for B-Block CMAs in 700 MHz Auction\(^4\)

<table>
<thead>
<tr>
<th>Bidder</th>
<th>Non-Rural Licenses</th>
<th>MHz*POPs</th>
<th>Rural Licenses</th>
<th>MHz*POPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT&amp;T</td>
<td>150</td>
<td>1881</td>
<td>77</td>
<td>229</td>
</tr>
<tr>
<td>Verizon</td>
<td>34</td>
<td>489</td>
<td>43</td>
<td>66</td>
</tr>
<tr>
<td>Qualcomm</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Frontier (Dish)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>T-Mobile (chose not to participate)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SpectrumCo (Sprint; chose not to participate)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>118</td>
<td>261</td>
<td>303</td>
<td>485</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>303</strong></td>
<td><strong>2,634</strong></td>
<td><strong>425</strong></td>
<td><strong>783</strong></td>
</tr>
</tbody>
</table>

Source: Calculations based on the FCC data and documentation.

---

72. Service Rules for Advanced Wireless Services in the 1.7 GHz & 2.1 GHz Bands, 18 FCC Rec. 25,162, 25,176 (2003) [hereinafter *AWS-1 R&O*] (“By being smaller, [CMAs] provide entry opportunities for smaller carriers, new entrants, and rural telephone companies. Their inclusion in our band plan will foster service to rural areas and tribal lands and thereby bring the benefits of advanced services to these areas.”).

73. For some operators, and particularly for rural operators, one EA may not cover their entire service area, but two EAs would provide a larger area than necessary. See Letter from Patrick D. Riordan, President & CEO, New-Cell, Inc. d/b/a Cellcom, to Marlene H. Dortch, Sec’y, FCC, Comments of Cellcom (Aug. 5, 2013), available at http://apps.fcc.gov/ecfs/document/view?id=7520936251; see also text accompanying supra note 72.

Exhibit 6: Winning Bidders for AWS Auction

<table>
<thead>
<tr>
<th>Bidder</th>
<th>Non-Rural</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Licenses</td>
<td>MHz*POPs</td>
</tr>
<tr>
<td>T-Mobile</td>
<td>83</td>
<td>1827</td>
</tr>
<tr>
<td>Cricket</td>
<td>38</td>
<td>715</td>
</tr>
<tr>
<td>AT&amp;T</td>
<td>20</td>
<td>769</td>
</tr>
<tr>
<td>Verizon</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>SpectrumCo (Sprint)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>160</td>
<td>1063</td>
</tr>
<tr>
<td>Total</td>
<td>303</td>
<td>4384</td>
</tr>
</tbody>
</table>

Source: Calculations based on the FCC data and documentation.

During auctions that included CMAs, small operators acquired 41% of the total MHz-POP licenses and 82% of the rural MHz-POP licenses. This result is far in excess of their roughly 10% market share. Had these auctions not included CMAs, many of these small operators would likely have been excluded. Reduced participation by small carriers would further exacerbate the concentration of spectrum resources under the control of the largest operators.

2. Promote Efficient Participation of Large Operators

Large operators generally prefer larger spectrum license areas. Indeed, the largest national operators might be happiest with national licenses, which would shut out smaller operators and new entrants, reduce participation in the auctions, and reduce competition in wireless services. If licenses are available in smaller territory sizes, however, a national operator still has the opportunity to aggregate bids on smaller license territories to create number of licenses that are together comparable to a national license. Due to the low cost of computerized bidding, transaction costs of aggregating smaller license territories are likely to be minimal.

75. Id at 10.
76. The smaller operators include everyone but the big four (AT&T, Verizon, Sprint, and T-Mobile). The smaller operators captured 3730 out of the total 9060 MHz-POPs (41%) and 1689 out of the rural 2051 MHz-POPs (82%) auctioned in the 700 MHz and AWS auctions. See Exhibits 5 and 6 supra Part III.B.1.
77. This conclusion is evidenced by the carriers who have publically indicated that they will not participate in the Broadcast Inventive Auction if it is held on the basis of EA-sized license territories evidences this. See Exhibit 3 supra Part III.B.
78. Deborah D. McAdams, Wireless Interest Spar at Senate Spectrum Hearing, TVT. [June 4, 2013], http://www.tvtechnology.com/article/wireless-interests-spar-at-senate-spectrum-hearing/219691 (quoting Dr. George Ford as arguing that “if you want to maximize auction revenues, you should sell one license”).
compared to the high cost of acquiring large blocks of spectrum, which often cost tens of millions of dollars. Thus, the use of smaller license territories is unlikely to reduce the participation of large operators in the auction. When confronting the increased competition for spectrum from small and rural operators, the large operators may be incentivized to bid more aggressively.

Additionally, large operators target the most densely populated portions of any large license territory, which normally eschews rural areas. In this scenario, the operator would purchase licenses covering both rural and urban areas in order to acquire the spectrum in the densely populated portions of the EAs. Accordingly, using small geographic license areas that separate rural areas from densely populated areas will not dissuade large operators from bidding. Using small areas will increase total revenue by allowing small carriers motivated to serve rural areas to target its bidding where the highest return on investment is expected.

As noted in Section II.C.2 above, the two largest national operators, AT&T and Verizon, already have significant low-band spectrum resources nationwide. Any spectrum they acquire in the Incentive Auction will complement their current low-band spectrum resources. With the new and more flexible wireless broadband technology (e.g., 4G LTE-based networks), it is less important that large operators acquire the same amount of spectrum and the same frequencies in all geographic market areas.

Thus, right-sizing spectrum licenses should help all bidders avoid excess spectrum costs. Large operators would be able to pinpoint spectrum additions in urban areas for their capacity and propagation requirements, or rural areas for their coverage requirements.79

3. *Promote Efficient Build-Out*

As shown in this section above, the use of EAs will reduce the ability of small carriers to participate in auctions with large carriers who are likely to dominate an EA-based auction. In instances where smaller carriers are able to participate, using EAs will, at a minimum, force the small carriers to bid on larger territories than they are able to serve efficiently.

In comparison, small operators or new entrants who make winning bids in auctions based on smaller license territories will have incentives to accelerate their investment in complementary network infrastructure. This is because small license territories better target operators’ desired service areas. Faster investment would accelerate the opportunity to realize economies of scale, scope, and profits from the use of more focused

79. See *AWS-1 R&O*, supra note 72, at 25,176–77 (“These local service areas will be optimal for incumbent operators who may need spectrum capacity only in limited areas.”).
spectrum acquisitions. Moreover, if these small operators already serve a particular area, their incremental costs will be lower for expanding coverage to adjacent, under-served areas relative to an operator without local infrastructure investments already in place.

4. Reduce Financing and Other Resource Constraints

Better alignment between spectrum territories and operator business models will result in fewer resources devoted to excess spectrum assets. More resources will be available to bid for the spectrum that a specific operator actually desires. In turn, operators will have more resources to make complementary investments—such as building out license territories—required to realize the value from spectrum assets. Even if an operator plans to use the secondary markets to reduce the excess supply of licensed spectrum, this option results in additional costs and risks that increase the cost of capital.

For an estimate of the magnitude of such additional resource demands of large license territories, consider that an EA-sized territory is four to five times larger than a CMA-sized territory and roughly twice the size of a PEA-sized territory. Assuming a build-out cost of $2,000 per square mile, it would cost about $10 million to build a network for a CMA territory as compared to $40 million for an EA territory, or $20 million for a PEA territory. For an operator whose service area is significantly smaller than an EA, the additional costs come from either the capital costs of leaving a large chunk of newly acquired spectrum fallow, incurring the costs of selling the licenses for the excess spectrum, or greatly expanding network infrastructure investments, and entering markets where it does not have existing relationships or spectrum holdings in other frequency bands. For small operators, scaling their business plans accordingly is relatively more burdensome and they are more likely to confront financing and other

80. These estimates are conservative, but are based on an estimate for constructing a nationwide public safety network in the 700 MHz spectrum of $7 billion. Since the U.S. has 3.8 million square miles, corresponding to a build-out cost of $1842 per square mile, or approximately $2000 per square mile. There are 734 CMAs, each being 5177 square miles (approximately 5000 square miles); 176 EAs, each being 21,591 square miles (approximately 20,000 square miles); and 416 PEAs, each being 9134 square miles (approximately 9000 square miles). Earlier this article cited estimates of build-out costs that ranged from $1 to $5 per $1 spent on spectrum acquisition. See State of Wireless Communications: Hearing Before the Subcomm. on Comm'n's, Techn. and the Internet of the S. Comm. On Commerce, Sci. and Transp., 113th Cong. 16–17 (2013) (written testimony of George S. Ford, PhD, Chief Economist, Phoenix Ctr. for Advanced Legal & Econ. Pub. Policy Studies), available at http://wirelessbroadbandcoalition.org/wp-content/uploads/2013/05/Dr.-George-Ford-Testimonyl.pdf. On the lower end of the scale, other economists have assumed as a first-order approximation that spectrum prices and build out costs are comparable. See Coleman Bazelon & Giulia Mchenry, Spectrum Value, 37 TELECOMMS. POL’Y 737 § 4.3 (2013). This projection is comparable with the lower estimate.
resource constraints (e.g., skilled personnel) than large operators. 81 The largest operators can access deeper wells of financial and personnel resources, which typically results in significantly higher margins. 82 Hence, it is reasonable to expect that the costs of dealing with wrong-sized spectrum territories would disproportionately harm small operators. In turn, this would reduce their ability to compete in rural markets that, as shown in Part II.C.1, are already the most underserved.

Secondary markets are not a cost-free solution to these issues. Before an operator can resell a portion of its license, it must first finance and acquire the entire license (i.e., they can’t resell a license until they own it). It may take years to sell an area within a larger territory, particularly in areas where there are few participants. During this period, capital costs accrue, build-out deadlines advance, and the operator faces the market risk of the value of spectrum falling. As the publicly available financial statements of the major wireless carriers show, customer payments are, by and large, their only source of revenue. Accordingly, wireless customers will ultimately bear these costs. Clearly, buying a license territory that is more closely aligned with operators’ needs in the first place is preferable.

C. Mitigate Volatility and Increase Auction Revenue

Promoting competition for spectrum in the Incentive Auction will, in turn, promote the efficient reallocation of spectrum, as well as competition in the wireless industry. This offers the best prospect for promoting economic growth, technological innovation, and consumer welfare, which are the ultimate goals of the auction process. Given the pressing need for additional commercial spectrum for wireless broadband along with the high value of 600 MHz broadband spectrum, the Incentive Auctions could achieve gross proceeds on the order of $45 billion. 83 The enhanced competition from using a small license size offers the best prospects for maximizing auction revenue while also meeting the auction’s other policy goals, including increased competition.

1. Increase Auction Revenues

With respect to auction revenue, the most likely outcome of selecting a smaller license territory size is greater auction proceeds. Part III.A of this article explained why adopting smaller territory sizes maximizes the

81. See JOE PEEK, U.S. SMALL BUS. ASS’N, OFFICE OF ADVOCACY, THE IMPACT OF CREDIT AVAILABILITY ON SMALL BUSINESS EXPORTERS (2013), available at http://www.sba.gov/sites/default/files/files/rs404tot(3).pdf (explaining that smaller firms are more likely to have more limited financing options and consequently confront higher capital costs).
82. See FCC’s Sixteenth Wireless Competition Report, supra note 20, at 3704.
83. See GREENHILL REPORT, supra note 28, at 2.
amount of unencumbered spectrum from the auctions. Smaller territory sizes create better opportunities for all bidders to right-size their bids. This outcome encourages participation and alleviates the need to reduce bids to compensate for the costs of acquiring wrong-sized licenses. Taken together, these effects ensure that the highest value bidders participate in each market and that the winning bid goes to the operator best able to realize value from the acquired resources. Thus, an auction based on small areas allows all bidders the opportunity to bid for the spectrum they need and to devote the maximum amount of resources to acquiring spectrum.

Furthermore, using small areas may reduce the volatility of prospective auction proceeds, further enhancing auction efficiency. The increased participation and improved flexibility in expanding the supply of unencumbered spectrum should garner more participation in both the Reverse and Forward Auctions. While it may not be feasible to predict the winning bids in particular markets, the added assurance of broad participation should reduce auction revenue volatility. For example, broad participation—which ensures that high bidders are not foreclosed—will help reduce the risk of a low bidding scenario that may fail to meet reserve requirements and result in less spectrum being cleared. To the extent that smaller areas help reduce the risks and costs of participation, they will also help reduce revenue volatility.

Further, it is possible that an auction based on large territories could provide incumbents with the opportunity to prevent new wireless competitors from entering the market by acquiring a disproportionate share of scarce spectrum (i.e., economic foreclosure). However, in the lead up to Google’s bid for the Upper 700 MHz C Block, auction experts and game theorists advised Google that the net effect of foreclosure can be a reduction in bids in opposition to incumbents.\textsuperscript{84} This reduction leads to an “incumbent dilution discount” through which:

\begin{quote}
the resulting price [of licenses] will not reflect the fair market value that otherwise would have been reached. The dilution of competitive bidders means the final price will be lower than otherwise would be the case. Recent studies have confirmed that this is a pervasive aspect of the FCC auction environment.\textsuperscript{85}
\end{quote}


In contrast, choosing the smaller territory sizes like CMAs would render such foreclosure strategies less likely and ultimately contribute to the FCC’s core mission of promoting competition and longterm efficiency in the markets for wireless services.

2. Past Auctions Demonstrate the Value of Smaller Territories

Experience from prior FCC auctions supports the conclusion that auctions based on CMAs lead to greater aggregate revenue. Dr. Scott Wallsten recently analyzed 69,000 spectrum sales, including those from every FCC spectrum auction since 1996, and his analysis on auction size is summarized in Exhibit 7 below:

Exhibit 7: Relationship of License Sales Price to Population Size Covered

![Exhibit 7: Relationship of License Sales Price to Population Size Covered](chart.png)

Source: Wallsten, Scott, Is There Really a Spectrum Crisis? 86

Dr. Wallsten notes that “[w]hile the precise order of value by region differs by specification, regardless of specification the analysis reveals a clear negative correlation between the size of the region specified by the license and the revealed private value of the license.” 87 This observation

87. Id. at 21.
follows from his hypothesis that “[s]maller geographic definitions allow bidders to more selectively bid on areas they value.”

The results of the 700 MHz auction provide support for Dr. Wallston’s hypothesis. In the 700 MHz auction (FCC Auction number 73), the FCC used a variety of license sizes to allocate the spectrum: EAs for the A Block and E Block, CMAs for the B Block, REAGs for the C Block and a nationwide license for the D Block. In this case, the CMA sold for $2.68 per MHz-POP, followed by the EA Blocks A ($1.16 per MHz-POP) and E ($0.74 per MHz-POP), and the REAGs C Block ($0.76 per MHz-POP). The national license in the D Block only fetched $0.17 per MHz-POP, which was less than the FCC’s minimum reserve price, so the D Block license was not awarded.

D. Better Alignment for Long-Term Spectrum Efficiency

Smaller territory sizes—including CMAs—are better aligned with the long-term direction of efficient spectrum management that more narrowly tailors spectrum capacity by time and geography. In addition to acquiring spectrum, wireless operators are relying on densification of cell sites and expansion of small cell deployment to handle increasing traffic loads on their networks. The goal of spectrum management reform is not just to achieve a one-time repurposing of spectrum from low value legacy use to the highest value use. Rather, the goal is also to transition into a spectrum management regime that is robust and flexible enough to respond to future needs to repurpose spectrum when even higher value uses come along.

While it may not be possible to forecast which future market opportunities will grow fastest, it is widely accepted that growth in wireless data services will drive increased demand for wireless spectrum. Meeting this demand and redirecting spectrum resources to keep pace with shifting industry structures, wireless innovation, and market needs will require spectrum management systems to be more efficient, dynamic, and flexible.

1. Promote Evolution of More Efficient Secondary Markets

An important feature of auctions is their ability to assign spectrum to its highest value uses. To ensure this, spectrum licenses should be tradable on secondary markets. Enabling liquid, efficient secondary markets for

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88. Id. at 22.
90. Id.
92. FCC’s Sixteenth Wireless Competition Report, supra note 20, at 3706–07.
spectrum licenses will lower entry and exit barriers for new and smaller operators consistent with the universal service and competition goals of the FCC.

The FCC is aware of the importance of the secondary markets for competition. It notes that “[t]he Commission’s secondary market policies allow existing licensees to obtain additional spectrum capacity and expand their coverage areas to better meet the needs of their customers, while also providing new entrants with additional opportunities to access the spectrum so that they can compete.” Smaller license territories, such as CMAs, are more consistent with granular spectrum management, dynamic secondary markets, and other advanced spectrum sharing that are part of the long term direction of communications technology and the FCC. Initial smaller license territories facilitate the division and sale of spectrum into smaller pieces. Secondary markets often require smaller license territories much more so than large license territories because operators often use them to “fill in” additional coverage areas (to existing market areas) or add capacity in areas of particularly high demand.

CMAs are also consistent with the FCC’s current regulatory review processes. For example, the FCC reviews secondary market transactions on a CMA basis. An initial license allocation on this same basis would likely simplify later data collection efforts needed to review secondary market transactions. As secondary markets become more developed, the issue of having spectrum already divided into smaller territories is likely to become increasingly important. Data being available on the basis of smaller territories should facilitate smaller and more targeted spectrum exchanges, as well as the FCC’s review of secondary market transactions.

2. Smaller Territories Are Consistent with the Future of Wireless

Despite being a key part of the solution, the allocation of new spectrum alone cannot accommodate the growth in wireless services and the implicit demand for spectrum resources. The industry will need technical innovations and denser cell architectures to meet the growing demand for wireless services of all types. More spectrally efficient wireless technologies permit transmission of more bits per Hz, and enable a more
granular and dynamic assignment of spectrum resources. Further, denser cell architectures enable spatial reuse of frequencies.

In addition to expanding access to available spectrum, these technical and architectural refinements also enable more dynamic, capable, and efficient service provisioning.96 The need to economize on power consumption of consumer hardware devices also encourages moving to denser, smaller cell sizes, which is increasingly important as mobile broadband data rates increase.97 To the extent cell sites cover smaller areas, it is logical for territories to be smaller so that carriers can obtain licenses for smaller areas where they specifically need to increase capacity or extend service.

Additionally, modern wireless system architecture is well suited for smaller license territories. LTE is designed to provide more flexible, dynamic, and increasingly seamless assignment of spectrum resources to applications on a granular basis (with respect to frequency, space, and time).98 These enhanced capabilities allow tighter geographic targeting and adjustment, and are more naturally matched to smaller license territories.

3. Lower Frequency 600 MHz Spectrum Is Especially Well-Suited for Rural Broadband and In-Building Penetration

The 600 MHz spectrum, with its longer range than higher frequency spectrum, is particularly well-suited for deploying mobile service infrastructure in less dense areas where using smaller cell sites to provide coverage would be significantly more expensive.99 According to the FCC, “[s]pectrum below 1 GHz is considered most suitable for establishing base network coverage, especially for wide area and in-building coverage . . .”100 In addition to being especially applicable for service in rural areas, the 600 MHz spectrum is also very valuable for providing service in urban areas. Its non-line-of-sight propagation characteristics make it valuable for expanding in-building coverage and augmenting capacity in urban markets.

100. See FCC’s Sixteenth Wireless Competition Report, supra note 20, at 3704.
Using more granular license areas would allow the 600 MHz spectrum to go to its highest value uses in each of these markets. Because small operators disproportionately address rural markets,\textsuperscript{101} enabling economically viable participation from such operators will facilitate meeting universal service goals while augmenting competition. Additionally, smaller license territories will enable urban operators to provide better service in congested urban markets where wireless operators are experiencing the most rapid traffic growth.\textsuperscript{102}

4. \textit{No Pairing Issues with Other Frequencies}

In contrast to other bands, pairing issues do not support a preference for larger EAs over a size like CMAs in the 600 MHz auction. The FCC’s Notice for Proposed Rulemaking on the AWS-3 auction noted that it is logical to use EAs because the AWS-3 spectrum is expected to be paired with other spectrum that were licensed on the basis of EAs.\textsuperscript{103} Similarly, in the recent \textit{H-Block Report and Order}, the FCC considered EA-based licensing logical because adjacent bands were also allocated this way.\textsuperscript{104} This is not the case, however, with the Incentive Auction spectrum. With the Incentive Auction, the FCC will start with a clean slate in the 600 MHz band once the television broadcasters are cleared. The choice of license territories will not be encumbered by prior decisions. If anything, the argument for license territories that facilitates pairing cuts in favor of CMAs given that the adjacent 700 MHz band is licensed with a variety of license sizes—including CMAs—and the 850 MHz band is licensed on a CMA basis.


\textsuperscript{103} \textit{See Amendment of the Commission’s Rules with Regard to Commercial Operations in the 1695-1710 MHz, 1755-1780 MHz, & 2155-2180 MHz Bands, 28 FCC Rcd. 11,479, 11,526 (2013) (discussing that AWS-1 and AWS-4 spectrum is expected to be paired with the AWS-3 spectrum, but the FCC used a variety of license sizes when auctioning AWS-1).}

\textsuperscript{104} \textit{H-Block R&O, supra note 45, at 9500.}
IV. Addressing Concerns of Using Smaller License Territory Sizes

In the preceding parts, this article explained how the choice of small license territories (such as CMAs) offers the best prospects for realizing the goals of the Incentive Auctions. This part addresses concerns that might be raised suggesting that EAs, or another large territory size, would be preferable and explains why we believe these concerns are misplaced.

A. Smaller Territories Will Not Prevent Acquisition of Nationwide Spectrum

Larger carriers have suggested that small auction territories could make it more difficult for them to develop national networks and therefore leave holes in their networks.\(^\text{105}\) Even if one accepts this argument, it may best be viewed as an argument in favor of auctioning a portion of the spectrum as national licenses, but does not offer a compelling justification for choosing large EAs over smaller license territory sizes entirely. The rest of this part of the article explains why the choice of small license sizes, instead of EAs, would not negatively affect the efforts of larger operators to right-size their spectrum acquisitions, including spectrum for national coverage, when considering the total market costs.

1. Carriers Can Bid More

The Incentive Auction’s bidding process will most likely be automated.\(^\text{106}\) Thus, nothing prevents a carrier who wants spectrum for a larger coverage area (potentially even nationwide) from being the highest bidder in every CMA the carrier wants to cover.\(^\text{107}\)

As explained above, choosing a small license territory size will facilitate wider participation and likely yield higher auction proceeds. Some of this result may be due to bid prices being higher for some licenses than would have been the case if EAs were chosen, thereby discriminating against some bidders. To the extent that is the case, the winning bidder may have to pay more to acquire certain collections of spectrum licenses in


\(^{107}\) For example, AT&T’s was able to acquire a near-nationwide footprint with CMAs in the Lower 700 B Block spectrum. FCC, FCC 700 MHZ BAND AUCTION RESULTS (Mar. 19, 2008) [hereinafter 700 MHZ BAND AUCTION RESULTS], available at https://apps.fcc.gov/edocs_public/attachmatch/DA-08-595A2.pdf.
a CMA auction than they would in an EA auction. Of course, it is understandable that an operator would prefer bids to be lower rather than higher. But an auction design that motivates larger operators to pay more for spectrum, while not reducing competition, is a beneficial outcome from the FCC’s perspective. On the other hand, an auction design that promotes large operators’ ability to pay less than they are willing would essentially be a subsidy. Such a subsidy would not be in the public interest.

2. **No Need to Subsidize Carriers That Do Not Want to Bid for All Markets**

In suggesting that CMAs’ bidding might result in spectrum holes in its national coverage, Verizon suggests that it may fail to be the winning bidder for all of the CMAs it wants in a CMA-based auction. The implication here is that Verizon is unwilling to pay the value of the spectrum when competitive carriers have strong incentives to acquire small territories. While it is understandable that Verizon and others may want to confront less competition in the auctions and pay less for the spectrum they acquire, this objective is not in the public interest. Large license areas would direct spectrum away from its most efficient use and subsidize the acquisition of spectrum by one of the national providers that, many might argue, already has an excess share of the prime sub-1 GHz spectrum.

A more subtle argument relates to the potential risk for hold-up, assuming that Verizon would be the most efficient licensee for the spectrum at issue. According to the hold-up argument, a speculator might recognize Verizon’s desire to acquire a national footprint of spectrum and would be willing to outbid Verizon for a CMA. Having acquired the CMA, the speculator could then hold up Verizon for surplus rents. This argument is not convincing for several reasons.

First, the risk of such “hold-up” problems is a challenge for all auction designs, not just auctions for small license territories. Second, the increased competitiveness in a small license territory auction, along with other design characteristics being contemplated (e.g., bidding in the Forward Auction for amounts of spectrum instead of specific frequencies or appropriate build-out requirements), more strongly addresses the risk of hold-up compared to using large license territories. Third, the presumption that large carriers are especially vulnerable to hold up in this context is not credible because the largest carriers are in the strongest bargaining position and have the deepest resources (spectrum, network, and financial) to counter extortion attempts by would-be speculators. Finally, the greater compatibility between smaller CMAs and more liquid secondary markets

108. *See Verizon Comments, supra* note 107, at 49.
makes it more likely that future holes in national operator networks might be filled by acquiring spectrum after the auction.

3. **Existing Spectrum Holdings Compensate for Spectrum Holes**

Carriers do not need nationwide coverage in any given frequency or even spectrum band. They do, however, need a portfolio of spectrum in various bands to service a variety of circumstances. Newer multiband handsets and 4G LTE network technology make it feasible to operate national services while switching frequencies using heterogeneous spectrum holdings.\(^{109}\) Moreover, given their significant spectrum holdings below 1 GHz, the two largest carriers have the ability to shift customers to other bands. Finally, it is worth noting that not even the national operators have facilities offering ubiquitous coverage\(^ {110}\) and, hence, rely on roaming agreements to provide service in coverage gap areas.

4. **Aggregation of Smaller License Sizes Would Not Involve Significant Transaction Costs**

Larger operators with large coverage areas may argue that even if the frequencies do not change, there will be additional licensing-related transaction costs associated with having a larger number of smaller licenses relative to having fewer EAs. For example, Verizon points to the FCC’s discussion of the transaction costs that may be involved in aggregating large swaths of spectrum as a reason for using larger territory sizes.\(^ {111}\) The computing and management tools associated with managing complex portfolios of spectrum resources in more dynamic spectrum markets have advanced significantly during the previous decade.\(^ {112}\) During this time computer technology has evolved and auctions have become the most common method for spectrum allocation globally. Furthermore, the future of spectrum management points toward small cells. With the increased emphasis on higher data rates and usage, cell sites will become increasingly

\(^{109}\) See generally GESSNER ET AL., supra note 100.


\(^{111}\) See Verizon Comments, supra note 107, at 62 n.134 (citing Service Rules for the 746-764 & 776-794 MHz Bands, and Revisions to Part 27 of the Commission’s Rules, 15 FCC Rcd. 476, 501 (2000) (“[W]hen areas are inefficiently small, the costs of aggregation during or after the auction in terms of delay and transaction costs may harm both service providers and customers alike.”).

\(^{112}\) See Ying Loong Lee et al., Recent Advances in Radio Resource Management for Heterogeneous LTE/LTE-A Networks, 16 COMM’N SURVEYS AND TUTORIAL, IEEE 2142 (2014).
dense over time. Additionally, secondary market trading, while dominated by the two largest carriers, is more advanced today. The combination of better spectrum management tools, the increased need to transact spectrum more dynamically (in time and space), and the trends toward smaller cell sites suggest that any such transaction costs are likely significantly lower today and ought to continue decreasing in the future. Indeed, the smaller license territories may actually contribute to lowering transaction costs.

B. Smaller Territories Will Not Significantly Increase Auction Administrative Costs

Another concern is that more licenses being auctioned will result in higher administrative auction costs and, subsequently, in managing the larger number of small license territories. The authors do not believe any such increase in costs would be sufficient to outweigh the benefits of using small license territory sizes.

Given its past use of both large and small license territories, the FCC clearly has the expertise to handle an auction with many licenses. In fact, the FCC successfully managed auctions within 493 BTA regions in the mid 1990s. Since then, the expertise of the FCC and the industry in auctions has advanced significantly. Industry and regulators have developed analytical tools and software to support increasingly complex auction frameworks, including combinatorial clock auctions. Therefore, auctions based on smaller territories today will likely be simpler to manage than the BTA auctions in the mid 1990s. Moreover, the FCC is proposing an auction of the 3.5 GHz band Priority Access licenses based on Census tracts. More than 74,000 Census tracts exist in the United States. The FCC’s apparent confidence in managing a Census tract territory auction is a
further testament to its ability to manage auctions of many small territories on a nationwide basis, and indicates the general trend toward more granular management of spectrum resources.

The auctions in the mid 1990s took place when participants and their advisors had substantially less cumulative experience. Presumably, the software tools for preparing bids and managing the auction have, along with technology in general and due to twenty years of experience with spectrum auctions, significantly advanced during this period. With today’s software-assisted auctions and spectrum management, the number of territories auctioned is unlikely to significantly impact costs. To alleviate any lingering concerns about burdens of complexity, the FCC could consider adding additional time between rounds to allow bidders to assess their positions. Prior experience of successful auctions based on smaller CMA territories demonstrates that the number of territories does not impose an excessive burden on bidders.121

Auctioning a larger number of licenses might add to license-related paperwork, but these costs should be trivial. However, even assuming that administrative costs would increase as a result of choosing smaller license areas, it would be inappropriate to view this cost as solely attributable to the Incentive Auction. The trend in wireless technology and spectrum management policy is toward narrowly tailored spectrum resource management. Thus, any transaction costs associated with such a move will be incurred in any case. This granular type of management will enable more dynamic resource allocation in time, space, and frequency, thereby greatly expanding the capacity of scarce spectrum. Increasingly fine articulation of spectrum contours and license areas will support more efficient secondary market transactions, interference management, and future efforts to repurpose spectrum to higher-value uses.


121. 700 MHZ BAND AUCTION RESULTS, supra note 109 (including 700 MHz B Block auctioned in FCC Auction number 73 in 2008, where AT&T was able to acquire a near nationwide footprint).

122. See generally PCAST REPORT, supra note 21.
C. Roaming and Interoperability Costs Will Not Increase Significantly

Another concern associated with using small license territories is the potential for increased roaming costs. Such a problem exists when a customer is more likely to cross the smaller territory boundaries than the boundary of an EA, or larger license territory.

Within a territory—whether it is a CMA, EA, or some other area—a spectrum license would operate in a particular frequency. But across CMA boundaries (i.e., in another CMA), the same frequency may not be available or may be licensed to different operators. Licensing on the basis of CMAs may enable the clearing of more unencumbered spectrum. In that context, the fact that more roaming may occur and that it will then incur additional roaming costs should hardly be regarded as a problem. This is because the customer who roams to the new spectrum made available by the use of smaller territories, would be taking advantage of additional spectrum resources that would not have even been available if larger license territories were used. The proliferation of multiband handsets and the likelihood that all handsets working on the Incentive Auction spectrum work on all of it should facilitate this outcome. Accordingly, the fact that the same frequency may be allocated to different operators in different areas, and that users may need to change frequencies more often, is an inconsequential issue.

This issue highlights another implicit concern that the auctions raise. Specifically, the wireless costs may increase because of a loss of scale or scope economies in equipment (network and handset), as operators may need to support operations across multiple frequencies. While that is true, it is the explicit goal of spectrum auctions, including the Incentive Auction, to make new frequencies available for higher value wireless services. The ability to deploy an asset for a higher value use, however, should not be viewed as an added cost.

There are certainly global scale and scope economies to be realized when the market for equipment that operates in a particular frequency is larger. Opportunities to take advantage of such scale and scope economies, however, require enormous scale and scope. They do not

124. The FCC has mandated that handset operating on any part of the Incentive Auction spectrum frequency band operate across the entire band. Incentive Auction R&O, supra note 6, at 6866.
126. Id.
arise at the level of the individual operator, or at the level of CMA versus EA-sized markets. Instead, these issues arise in the context of global or national markets. 127 With respect to network equipment and handsets, the markets are global. Likewise, network design, planning, outside plant construction, and infrastructure services are readily available to operators of all sizes from an ecosystem of service providers with national scale. 128 For example, the most significant outside plant cost is associated with the siting, construction, and management of cell towers. Even the largest operators have significantly outsourced those activities by relying on national tower leasing companies. 129 Thus, any additional costs realized by the wireless ecosystem as a consequence of operating in a larger range of frequencies is not attributable to the choice of smaller territories instead of larger ones.

This leaves the second concern about whether the choice of smaller license territories might increase roaming cost. This concern arises where two different operators own the same frequency in adjacent territories. In this context, the question would arise as to how the customer should roam. Should the customer be handed off to the operator with the license in the adjacent CMA? Should the customer be moved to another frequency controlled by the customer’s original operator (or by that operator’s regular roaming partner)? In both cases, there may be incremental roaming charges. In the latter case, the customer would require a multi-band handset that supports the various frequencies to be used for roaming. While there might be additional roaming expenses, it is unclear whether they should be viewed as a problem for the following three reasons illustrated below.

1. **Multiband Radios Are Already the Norm in Mobile Devices**

   Multiband radios are already the norm in mobile devices, and the expectation is that support for multiband radios will increase and is needed to take advantage of the diverse spectrum resources that will become increasingly available. 130 Indeed, the Incentive Auction will significantly

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127. *Id.*
128. Large public companies, such as American Tower Corporation and Crown Castle International, provide tower services; and large equipment companies, including Acatel-Lucent, Cisco Systems and Ericsson, also provide consulting systems integration services to the industry. See *Exhibitor List Index, SUPER MOBILITY WEEK*, http://www.exhibits.supermobilityweek.com/2014/public/ExhibitorList.aspx?pagemenu=1 (last visited Apr. 11, 2015) (providing insight into the extent of the industry ecosystem).
expand the range of frequencies that will be used for wireless broadband and other services. Moreover, the transition to LTE, wireless innovation, and the emerging ecosystem of mixed network roaming (e.g., Wi-Fi offload) are expanding technical, business, and consumer options for enabling low-cost roaming and multi-frequency support for wireless data. Finally, 600 MHz interoperability is likely to significantly increase roaming opportunities.

2. Not All Radios Need to Roam

Not all radios need to roam because not all uses of the Incentive Auction spectrum will support high-speed or national mobile roaming services. The mobile broadband licenses allow their holders a great deal of flexibility over the services they may offer. For example, some of the spectrum may be used for backhaul, fixed wireless broadband, or other services that have yet to be determined.

3. Multimode Handsets Are Desirable

If one considers the typical national mobile broadband service, it is desirable that such handsets be multimode to encourage interoperability and enhance competition. Operators who wish to offer less capable handsets (possibly to support legacy, niche, or low-cost customers) always have the option of acquiring a national license to a particular frequency band. As this article explains further below, choosing a small license size does not preclude this choice, but it does provide access to additional

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spectrum resources to allow the operator to shift uses (non-mobile or frequency agile) to free up scarce national frequencies.

In summary, small areas will not likely increase roaming costs and will more likely expand the tool set for addressing a world where multi-frequency, multi-network wireless communication will be the norm.

D. Post-Auction Adjustments Are Easier with Smaller Territories

Advocates of large license territories argue that after-market transactions can address any of the issues that may arise from failing to adopt smaller license territories. Many of these arguments apply equally well to explain why choosing small territory sizes should not pose a problem for advocates of large license territories.

The proponents of large license territories argue that licensees whose original bids are wrong-sized can engage in post-auction spectrum leasing or secondary market trading to right-size their spectrum acquisitions. To the extent this argument is true, it would help ameliorate the damage from wrong-sizing the license territories to be auctioned. However, right-sizing the licenses at the start would be a better choice than taking those risks and incurring the resulting costs in the first place.

The risks and costs of too small versus too large auction territories are likely to be asymmetric. With small licenses, everyone has a symmetric opportunity to acquire the spectrum in each territory, as foreclosure risks are minimized. With large licenses, there is the chance that post-auction secondary markets might not be sufficiently liquid to enable smaller entrants or rural operators to acquire spectrum resources to make post-auction right-sizing adjustments to their spectrum holdings. Small providers (and even large providers seeking to fill spectrum holes) would be dependent on EA-licensees to partition those territories to make appropriately sized territory (i.e., smaller) spectrum available to them. Small territory licenses may be sold or aggregated more easily in order to match spectrum buyers and sellers with heterogeneous supply and demand.

Furthermore, secondary spectrum markets are still emerging and offer an inadequate alternative for smaller operators to acquire spectrum resources. The more limited option to lease spectrum from operators with excess resources reduces the effectiveness of the potential competition


135. See Verizon Comments, supra note 107, at 46 (“The Commission should then rely on the secondary market to sort out discrepancies between EAs, rather than on competitive bidding via Commission auction.”).

136. See Mayo & Wallsten, supra note 117, at 61.
smaller operators might offer. Finally, the surplus generated from secondary market trading would accrue to private interests instead of being captured in the auction proceeds.

V. Conclusion

The case for using smaller license territories for the FCC spectrum auctions, including the Forward Auction portion of the Broadcast Incentive Auction, is compelling. Smaller license territories support specific goals of the Incentive Auction outlined in the Spectrum Act and promote efficient spectrum use. They will give smaller carriers, particularly rural-based carriers, the opportunity to compete for the spectrum resources they need. In turn, this outcome will further the development of a more competitive mobile broadband market, greater innovation, improved rural coverage, and greater auction proceeds. Smaller license territories also dovetail with the longterm U.S. spectrum policy towards more efficient and dynamic spectrum markets. Computerized auction processes will minimize additional administrative costs. The opponents’ only concern is that, with more bidders, the largest wireless companies may have to pay more to get the large blocks of the spectrum they seek. But such an outcome is more desirable from a public policy perspective this is a good outcome.
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