

S. HRG. 113-340

**CRAFTING A SUCCESSFUL INCENTIVE AUCTION:
STAKEHOLDERS' PERSPECTIVES**

HEARING

BEFORE THE

**COMMITTEE ON COMMERCE,
SCIENCE, AND TRANSPORTATION
UNITED STATES SENATE**

ONE HUNDRED THIRTEENTH CONGRESS

FIRST SESSION

DECEMBER 10, 2013

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ONE HUNDRED THIRTEENTH CONGRESS

FIRST SESSION

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CRAFTING A SUCCESSFUL INCENTIVE AUCTION: STAKEHOLDERS' PERSPECTIVES

TUESDAY, DECEMBER 10, 2013

U.S. SENATE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Washington, DC.

The Committee met, pursuant to notice, at 2:39 p.m., in room SR-253, Russell Senate Office Building, Hon. Mark Pryor, presiding.

OPENING STATEMENT OF HON. MARK PRYOR, U.S. SENATOR FROM ARKANSAS

Senator PRYOR. I will go ahead and call the hearing to order. I want to thank everyone for being here. I especially want to thank our witnesses. I know it has been a snow day here in D.C. and some of you had to make arrangements. So thank you for being here.

And, you know, in early 2012, we passed bipartisan legislation, which originated in this committee, to make available a significant amount of new spectrum for commercial use and, at the same time, establishing and funding a public safety wireless broadband network.

Now, as part of that, the FCC has the authority to conduct voluntary incentive auctions of spectrum. The FCC is in the midst of setting up the rules for the first of these incentive auctions. And, also, the rules include protections to make sure that the auction does not unduly harm TV stations that are not interested in participating.

So I think the Congress rightly left many practical and technical decisions to the Federal Communications Commission, as the expert agency. Today the Committee will hear from the FCC and various stakeholders about what it will take to craft a successful incentive auction.

Now, designing one of these is immensely complicated, possibly the most complicated of these type of auctions ever designed by the FCC. They must get a sufficient number of broadcasters to participate in the reverse auction in order to have adequate spectrum to sell the forward auction.

In the forward auction, the FCC must balance competing interests with the need to raise enough money to cover the incentive payments and pay for the priorities set forth in the 2012 legislation, including FirstNet that I mentioned. And during the repackaging process, the FCC must meet its statutory duty to make "all reasonable efforts," quote/unquote, "all reasonable efforts" to protect

remaining TV stations' coverage areas while designing a practicable and workable band plan for mobile wireless services.

So, as you can tell, this is complicated.

And on the technical side, the FCC must also craft software and hardware to accomplish this first ever incentive auction. And, of course, we have learned in the last few weeks that software and hardware are important when it comes to these type of things, and they want to get it right.

But if the FCC is to get it right, it means innovative, new wireless services and more robust wireless networks to meet consumers' insatiable demands, a revitalized TV broadcast industry, and a new international precedent and standard for smart spectrum policy.

I know we have a large panel of witnesses today. It is very unusual for us to have seven. But if there is ever a topic that may require this many witnesses, I think this is it.

And this hearing is also very timely because on Friday FCC Chairman Tom Wheeler set a timeline to hold the voluntary broadcast TV incentive auction in the middle of 2015. I think that, in effect, is a six-month delay or so from what it was previously thought to be. So I encourage everyone here on the panel today, all the stakeholders who are watching or participating, to work constructively with the FCC to make this auction a success.

I look forward to hearing your testimony, but first I would like to recognize Senator Thune.

**STATEMENT OF HON. JOHN THUNE,
U.S. SENATOR FROM SOUTH DAKOTA**

Senator THUNE. Thank you, Mr. Chairman, for holding this hearing. And I want to thank our witnesses for being with us today.

American consumers are hungry for more mobile connectivity. The innovation economy is being driven by mobility, and spectrum is what fuels those wireless services. We must make it a priority to increase the availability of spectrum for commercial use, both licensed and unlicensed, as quickly as possible.

Last week, as Chairman Pryor mentioned, FCC Chairman Wheeler announced that the agency's timeline for the broadcast incentive auction has slipped from 2014 to mid-2015. It is important for the auction to be completed as soon as possible, but one lesson from the disastrous rollout of Healthcare.gov is that a short delay of this complicated effort may be justified.

Consumers will benefit from a speedy reallocation of spectrum for more valuable uses, but those households that continue to receive over-the-air TV broadcasts after the auctions must not be unduly disrupted during the channel-repacking process. Congress was clear about this in the Spectrum Act of 2012, and the technical details to make this work deserve an appropriate amount of time and deliberation.

As we all know, the mobile market is no longer focused on voice calls alone; it is increasingly about robust broadband Internet connectivity. During the Committee's recent broadband adoption hearing, we learned that one in eight online Americans now access the Internet solely through their mobile smartphones rather than subscribing to a fixed broadband service. With that in mind, I hope our witnesses will share their thoughts about what spectrum poli-

cies will make it more likely for wireless to develop as a substitute for and a competitor to wireline broadband.

Getting more spectrum into the marketplace for broadband via auction to the parties that will put it to highest use is ultimately the best way for Federal policymakers to encourage new services, spur competition, and benefit consumers.

In the incentive auction, I believe the FCC should let all interested participants freely compete against one another in the open market and should avoid putting its thumb on the scale, as we are apparently witnessing in connection with the Justice Department's settlement agreement in the American Airlines and U.S. Airways merger. The value of using spectrum auctions is that the free market is more effective at allocating spectrum than relying on the subjective opinions and predictions of government officials. American consumers should pick who wins in the marketplace, not the government.

And with the U.S. being the global leader in 4G LTE connectivity, this approach has clearly been very successful. By any measure, including usage, coverage, speed, and price, consumers have benefited enormously from market-driven spectrum auctions.

As the Commission moves forward, its primary focus needs to be on how to maximize participation in the upcoming incentive auction among both broadcasters and wireless bidders, not on how to limit their participation. I agree with our colleague Senator Schumer, who recently urged the Commission to avoid imposing auction rules that could discourage broadcasters from participating, could limit bidding by certain wireless carriers, and could ultimately reduce the amount of spectrum offered as well as the revenue that would be generated in return.

Mr. Chairman, I would ask for consent to submit for the record Senator Schumer's letter, along with two additional documents that echo his and my concerns.

Senator PRYOR. Without objection.

Senator THUNE. The first is an analysis by Dr. Leslie Marx, a Professor at Duke University and a former Chief Economist at the FCC. And the second document is a letter to the FCC from Larry Cohen, the President of the Communications Workers of America.

[The information referred to follows:]

UNITED STATES SENATE
Washington, DC, November 20, 2013

Hon. THOMAS WHEELER,
Chairman,
Federal Communications Commission,
Washington, DC.

Dear Chairman Wheeler:

As you assume the helm of the FCC, one of the most important tasks that lies before you is the structuring of the incentive auctions authorized by the Middle Class Tax Relief and Job Creation Act of 2012. I was a strong supporter of the provisions of the law that authorized these auctions, and I am deeply committed to ensuring their success.

The success of the incentive auctions is critical to our Nation in several ways. First and foremost, the auctions will generate the revenue needed to establish a national, interoperable public safety broadband network. The creation of this network is an unfulfilled recommendation of the 9/11 Commission; over a decade after that tragic day, we are finally on the precipice of establishing a system to prevent the

communications failures that hampered the evacuation and rescue operations of our heroic first responders.

Second, the auctions will help put back into the market spectrum that is currently not being used to its fullest potential. In an era of rapidly increasing demand for spectrum, ensuring that this limited resource is being used most efficiently and effectively is a high priority for businesses and consumers alike.

It is the responsibility of the Commission to structure the auction so that broadcasters will realize substantial benefit for choosing to put spectrum up for auction, broadcasters who will have to move to new channel assignments can be adequately compensated, and so that the auctions generate maximum revenue in order to adequately fund FirstNet.

That is why I urge you, in structuring these auctions, to maximize participation by broadcasters and bidders alike by avoiding limitations that could lower the potential return and disincentivize broadcasters from offering their spectrum for auction. While I understand that some have advocated for rules that would limit participation by certain wireless carriers, the effect of such rules would simply be to reduce the amount of spectrum offered for auction as well as the revenue that would be generated in return. Ultimately, then, the biggest loser would be FirstNet and the public safety network America needs to thrive in the 21st century.

I appreciate that this is a challenging issue, and look forward to working with the Commission to structure the most successful auction possible.

Sincerely,

CHARLES E. SCHUMER,
United States Senator.

COMMUNICATIONS WORKERS OF AMERICA,
Washington, DC, October 29, 2013

Hon. MIGNON CLYBURN,
Federal Communications Commission,
Washington, DC.

RE: EXPANDING THE ECONOMIC AND INNOVATION OPPORTUNITIES OF
SPECTRUM THROUGH INCENTIVE AUCTIONS, GN DOCKET NO. 12–268

Dear Chairwoman Clyburn and Commissioners:

The Federal Communications Commission (FCC) now has the critical mission of designing rules for an upcoming auction of valuable public airwaves that will help speed the continued nationwide deployment of high-speed mobile broadband service.

The FCC faces a most important near-term challenge as it attempts to make more airwaves available—at auction—to advance the deployment of and investment in high-speed mobile wireless communications. Getting the design of the upcoming auction right is critical. As the Commission has long recognized, high-speed wired and wireless networks are essential to job creation, economic growth, and improvements in education, health care, public safety, civic participation, and closing the digital divide.

The Communications Workers of America (“CWA”) represents 700,000 workers, including more than 40,000 in the wireless industry, whose families and communities depend on the success or failure of unionized wireless carriers. As such, CWA urges the Commission to construct an open and competitive auction in which every carrier and any other qualified bidder can participate equally on a level playing field.

Because an open competition is the best way to serve the public interest, CWA supports an auction that:

- Provides for continued investment, innovation, and job creation in the wireless industry
- Efficiently allocates additional spectrum for consumer wireless to support the speedy deployment of LTE networks and the continued expansion of other services
- Maximizes auction proceeds and provides full funding for the planned public safety network, FirstNet

T-Mobile and Sprint are now asking the FCC to establish different rules for different bidders, potentially slowing the spread of wireless and the investment and jobs that go with it. Yet, past FCC experience demonstrates that open auctions, in which bidders compete without restrictions, have generated the most revenue and assigned spectrum to the providers who will put it to work quickly and efficiently

for the American public. A recent economic analysis found that if spectrum limits had been put in place in the 2008 auction of 700 MHz spectrum it would have reduced auction revenue by 45 percent or almost \$9 billion.¹

As former Chairman Julius Genachowski has noted, such even-handed policies have created a wireless boom and enabled our country to recapture world leadership in wireless and mobile technology.² According to a recent White House report on broadband, wireless investment has climbed more than 40 percent to \$30 billion a year since 2009, and the top two wireless companies have combined to invest more than the top five oil companies and nearly four times more than the big three auto companies.³ As a whole, the wireless industry now supports 3.8 million jobs.⁴

The FCC should not favor one competitor over another. Each of the four national carriers have ample resources to bid aggressively for the spectrum they need without rules that tilt the playing field one way or the other. T-Mobile is strengthened by its recent combination with MetroPCS, the spectrum it acquired from AT&T and Verizon Wireless, and the \$3 billion cash penalty fee it received from AT&T. Sprint, now majority owned by the Japanese firm Softbank, received billions of new funds as part of that deal and, in combination with its affiliate Clearwire, controls more spectrum than any competitor.⁵ These companies are strong competitors.

We also are concerned that rules that limit participation by any bidder would reduce auction revenues and jeopardize funding for deployment of the Nation's public safety mobile broadband network (FirstNet). A recent independent study by Georgetown University found that bidding restrictions on Verizon and AT&T could reduce auction revenues by as much as \$12 billion and create a funding deficit for FirstNet.⁶ That result would make it harder and more dangerous for first responders to do their job and would expose the American people to needless risk.

A dedicated and interoperable nationwide broadband network will save lives by providing public safety personnel with the modern communication tools necessary to provide effective, speedy, and coordinated response in emergency situations. The network, first recommended a decade ago by the 9/11 Commission, is long overdue. Auction rules that limit funding should not be allowed to endanger first responders or the U.S. public they serve.

In addition to the revenue needed to fund the public safety network, the wireless auction must raise enough funds to pay broadcasters to give up their spectrum. Limitations on participation in the auction would reduce the funds available to pay the broadcasters. If not enough money is raised to meet the broadcasters' price, the spectrum goes unsold, and the auction fails.

Sprint and T-Mobile have suggested that the Commission should establish special rules for low-frequency spectrum, claiming that such spectrum is an essential input for wireless services due to its superior propagation. Because Sprint and T-Mobile failed to bid in the 700 MHz auction, and have chosen not to purchase low-frequency spectrum on the open market, they have little low frequency spectrum. Yet, both companies are competing aggressively with national 4G LTE networks that rely almost entirely on high-frequency spectrum. As recently explained by noted economists, low-and high-frequency spectrum are substitutes and wireless carriers do not require low-frequency spectrum in order to compete. Therefore, the Commission need not adopt special low-frequency spectrum aggregation rules.⁷

The U.S. Department of Justice (DOJ) has raised concerns that AT&T and Verizon might pursue a "foreclosure strategy" by purchasing and warehousing spectrum to keep it out of the hands of rivals.⁸ According to leading economists, such strategy is highly unlikely because it would require the acquisition of large amounts of expensive spectrum and depend on the ability of auction participants to "read the

¹Dr. Leslie Marx, "Economic Analysis of Proposals that Would Restrict Participation in the Incentive Auctions," Sept. 18, 2003.

²Julius Genachowski *Farewell Remarks*, March 22, 2013

³"*Four Years of Broadband Growth*," White House Office of Science and Technology Policy and the National Economic Council, June 2013

⁴"*50 Wireless Quick Facts*," CTIA, updated May 2013

⁵"*Sprint Set to Become 'Spectrum Powerhouse*," Computerworld, June 25, 2013

⁶"*The Economic Implications of Restricting Spectrum Purchases in the Incentive Auction*," Robert J. Shapiro, Douglas Holtz-Eakin, and Coleman Bazelon for the Georgetown University Center for Business & Public Policy, April 30, 2013

⁷Michael L. Katz, Philip A. Haile, Mark A. Israel, and Andres V. Lerner, "Comment on the Submission of the U.S. Department of Justice Regarding Auction Participation Restrictions," WT Docket No. 12-269, June 13, 2013

⁸U.S. Department of Justice, *Ex parte Submission, In the Matter of Policies Regarding Mobile Spectrum Holdings*, WT Docket No. 12-269, April, 2013.

minds” of other auction bidders.⁹ But more important, there is a far simpler and more effective method to block any foreclosure strategy: *the FCC should impose build-out requirements, complete with timetables and benchmarks, on any spectrum acquired at auction.*

As President Obama recently noted, wireless communications and the digital economy have been a bright spot in the U.S. economy. Continued expansion of wireless services and the resulting consumer benefits they enable should not be placed at risk from the spectrum shortage identified by the Commission in its National Broadband Report. Done correctly, the coming incentive auction is a vital part of the solution. CWA respectfully urges the Commission to support continued growth in U.S. wireless capabilities and the jobs that will be created by designing an open and competitive auction in which every bidder can compete without handicaps for the spectrum it needs.

Sincerely,

LARRY COHEN,
President.

Cc: Commissioner Jessica Rosenworcel
Commissioner Ajit Pai

THE FUQUA SCHOOL OF BUSINESS—DUKE UNIVERSITY
Durham, NC, December 5, 2013

Hon. JAY ROCKEFELLER,
Chairman,

Hon. JOHN THUNE,
Ranking Member,

Committee on Commerce, Science, and Transportation,
United States Senate,
Washington, DC.

Dear Chairman Rockefeller and Ranking Member Thune:

Thank you for the opportunity to contribute to this hearing on the FCC’s upcoming Incentive Auction. I am the Robert A. Bandeen Professor of Economics at Duke University and former Chief Economist at the FCC. I regularly research auctions, including spectrum auctions and incentive auctions. Verizon asked me to analyze proposed bidding restrictions in the upcoming incentive auction. I attach that report, “Economic Analysis of Proposals That Would Restrict Participation in the Incentive Auction,” which has been filed with the FCC.

Congress and the FCC are counting on the “incentive auction” to accomplish two goals: (1) transfer a substantial amount of low-frequency spectrum from broadcasters to mobile wireless service providers who need the spectrum to give consumers the high-speed broadband they demand; and (2) thereby raise revenue for the U.S. Government and public safety. But the spectrum in this auction already is licensed to television broadcasters, and the auction rules do not compel them to transfer their spectrum. For this auction to work, the broadcasters must be induced to relinquish their spectrum. That inducement comes in the form of high bids from wireless carriers—if the broadcasters are offered enough money, they’ll move; if not, they won’t. Higher bids thus increase the amount of spectrum that can be transferred from broadcasters to mobile wireless providers.

As the economics literature and my own research have shown, the best way to maximize auction revenues is to have as many eligible bidders as possible. But some, including T-Mobile and Sprint, have urged the FCC to adopt rules that restrict Verizon and AT&T from bidding in the incentive auction. Should the FCC impose such restrictions, the overall bids for broadcast spectrum would be lower. As a result, less money would be raised for the government and public safety, and less scarce spectrum would be made available for use by wireless carriers, leading to either higher prices or lower quality, or both, for consumers. It is also possible that the entire auction would fail: the bids would be too low to induce broadcasters to sell their spectrum.

My report quantifies the likely effect of rules that restrict bidding by Verizon and AT&T. Using actual bidding data from two recent FCC auctions, I modeled the effect of such restrictions. I concluded that any restriction that materially reduces the

⁹Michael L. Katz, Philip A. Hail, Mark A. Israel, and Andres V. Lerner, Comment on the Submission of the U.S. Department of Justice Regarding Auction Participation Restrictions, Policies Regarding Mobile Spectrum Holdings, WT Docket No. 12–269, June 13, 2013.

demand that Verizon and AT&T bring to the Incentive Auction risks a substantial reduction in auction revenue and thus the amount of spectrum reallocated. If, for example, the FCC restricted Verizon and AT&T from bidding where they hold more than one-third of the low frequency spectrum, revenue would have been reduced by 15 percent and 40 percent in the auctions that I studied. Outright exclusion of AT&T and Verizon would have reduced revenues by 16 percent in one auction and 45 percent in the other.

I also simulated a two-sided incentive auction and showed that the risks created by imposing bidding restrictions are greater than in a traditional auction. Indeed, my model shows that bidding restrictions in a two-sided auction reduce both the maximum possible revenue and the maximum possible quantity of repurposed spectrum that can be achieved, thus jeopardizing *both* goals of the incentive auction.

Finally, it is not apparent to me why the government would put the success of this critical auction at risk based on the stated concerns of those who advocate for restrictions.

- First, it has been suggested that the low frequency broadcast spectrum has special characteristics that make it essential for wireless carriers to compete effectively. But contrary to what I would expect if T-Mobile and Sprint required low-frequency spectrum to compete effectively,¹ they did not participate at all in the most recent auction for low-frequency spectrum (the 700 MHz Auction), and have bought almost no low-frequency spectrum in private market transactions. Of the 2,096 low frequency spectrum transactions I examined from January 2007 to May 2013, T-Mobile and Sprint combined bought only one. And public statements by both T-Mobile and Sprint indicate their belief that their spectrum positions overall provide them a competitive advantage. Indeed, their highly advertised unlimited data plans suggest they have sufficient spectrum to handle volume increases.
- Second, even if there were some basis for a concern that Sprint or T-Mobile could be “foreclosed” from acquiring spectrum that is essential for them to compete, the FCC can prevent foreclosure using tools that do not create the risks that bidding restrictions create.
 - It can impose build-out requirements requiring companies that obtain licenses to deploy the spectrum promptly, thus making it uneconomic for a firm to “warehouse” spectrum it does not actually need.
 - It can (as it usually does) conduct an “anonymous” auction where no party knows who else is bidding on a particular license. That would make it virtually impossible for Verizon or AT&T to target a specific competitor because they would not know who they were bidding against.
 - And DOJ and the FCC can continue their existing practice of examining the auction results in particular markets and taking corrective action if competitive conditions warrant.

I thank you and the Committee for the opportunity to submit these materials and for your important work on this topic.

Sincerely,

LESLIE M. MARX, PH.D.

September 18, 2013

ECONOMIC ANALYSIS OF PROPOSALS THAT WOULD RESTRICT PARTICIPATION IN THE
INCENTIVE AUCTION

By Leslie M. Marx, Ph.D., Robert A. Bandeen Professor of Economics, Duke University and former Chief
Economist, Federal Communications Commission

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I. Executive summary

- (1) This report analyzes proposals to restrict Verizon’s and AT&T’s participation in the Federal Communication Commission’s (FCC’s) upcoming Incentive Auction. My key conclusions are:

Foreclosure

- Proposals to restrict the participation of Verizon and AT&T in the Incentive Auction do not address any real world problem. The assertion that some smaller wireless operators are at risk of being foreclosed from the spectrum necessary for them to compete is inconsistent with those firms’ own behavior, including their repeated decisions to forego opportunities to acquire low-frequency spectrum. Other evidence, including Sprint’s and T-Mobile’s marketing of unlimited

usage plans, further belies the assertion that those operators face capacity constraints that could be exploited through a foreclosure strategy.

- Even if (despite the evidence to the contrary) a strategy by Verizon and AT&T to attempt to foreclose rivals were rational, implementing it would be difficult. A foreclosure strategy is particularly difficult to implement in the context of the Incentive Auction because higher bids on the part of buyers result in a greater quantity of spectrum being made available from sellers, thus increasing the costs of foreclosure. In addition, in an auction with anonymous bidding, it would be difficult for AT&T and Verizon to know whether they are bidding against the foreclosure targets or against one another. Furthermore, even if a foreclosure strategy were feasible, Verizon and AT&T would each have an incentive to “free ride” on the other’s willingness to pay supra-competitive prices for spectrum.

Bidding Restrictions

- Based on the economics literature, empirical data from past FCC auctions, and a model of a two-sided auction mechanism, I conclude that restricting Verizon and AT&T in the Incentive Auction would put at risk its twin priorities of raising significant revenue and reallocating a substantial amount of spectrum from broadcast to mobile wireless services.
 - My simulations of past auctions show that, without Verizon and AT&T, revenue in the 700 MHz auction would have been 45 percent lower and revenue in the AWS-1 auction would have been 16 percent lower.
 - I also analyze bidding restrictions that would not fully exclude Verizon or AT&T, such as spectrum aggregation caps. The evidence indicates that any restriction that causes a material reduction in the participation of Verizon and AT&T risks a significant reduction in auction revenue and a failure of the auction.
 - Parties supporting auction restrictions speculate that they might actually increase revenue by ensuring that smaller firms are not discouraged from participating. But they support that conjecture only with hypothetical examples. Their theories are undermined by the empirical evidence, including the historical fact that smaller firms routinely compete successfully in auctions despite the unrestricted presence of larger bidders. Although Sprint’s and T-Mobile’s economists speculate that restricting larger bidders might encourage small bidders to participate more robustly, they do not assert that their own clients would choose not to participate because of the unrestricted presence of Verizon and AT&T.
 - I also analyze T-Mobile’s complex proposal to successively ease the proposed restrictions, after each round and on a market-by-market basis, if the restrictions cause the auction to fall short of an unspecified revenue target. That proposal would not avoid the revenue-suppressing effects of the auction restrictions. In addition, the added complexity and incentives created for strategic bidding threaten to distort auction outcomes.
- (2) Both the risks and costs of auction failure are further heightened by the overall complexity of the Incentive Auction and the significant difficulties associated with reallocating spectrum from broadcast to mobile wireless at a later date, if it is not reallocated as part of the Incentive Auction. Therefore, in the absence of evidence that anticompetitive foreclosure is likely (which has not been presented by any party), the FCC should avoid imposing restrictions on participation in the Incentive Auction. And if the FCC nevertheless believes that evidence of a foreclosure risk does exist, it can be addressed through other policies, such as build-out requirements, that do not present the same risk of auction failure.
 - Empirical evidence and economic theory contradict assertions that there is a risk of foreclosure if all bidders are permitted to participate fully in the Incentive Auction
 - (3) There is no basis for assertions that Sprint or T-Mobile has been foreclosed from acquiring low-frequency spectrum. The evidence points instead to a *choice* by Sprint and T-Mobile not to compete for low-frequency spectrum, rather than foreclosure from access to it. These carriers have not purchased it in the secondary market, where there were 2,153 licenses available since 2007: Sprint bought none and T-Mobile bought only one. And they did not purchase it in the FCC’s recent auction of low-frequency spectrum, the 700 MHz auction in 2008, despite the claimed need for the low-frequency spectrum on offer there. It is particularly notable that Sprint and T-Mobile, despite the claimed need for low-frequency spectrum in order to build out rural areas,

have acquired *no* such spectrum in rural markets despite numerous opportunities to do so.

- (4) Evidence on pricing plans is inconsistent with a finding that Verizon and AT&T have an incentive to “warehouse” spectrum in order to keep T-Mobile and Sprint capacity-constrained. Sprint and T-Mobile both tend to offer plans with unlimited data usage, and T-Mobile explicitly touts its network as being less congested than that of its competitors. By contrast, Verizon and AT&T tend to offer plans that require incremental payments for data use beyond a specified level. That pattern is the opposite of what would be expected under theoretical conditions where the smaller national competitors’ access to a key input is constrained.
- (5) Head-to-head competition between AT&T and Verizon where no other bidders were present accounted for more than \$4.2 billion in revenue during the 700 MHz auction. Those dollars would not have been spent by Verizon and AT&T if the purpose of their bidding had been simply to keep spectrum out of the hands of other operators.
- (6) Concerns that Verizon and AT&T might pursue a foreclosure strategy against Sprint and T-Mobile also ignore a number of key features of the market and the Incentive Auction. First, the FCC can directly address the issue using tools that would not create a risk of auction failure, such as imposing build-out requirements on licenses won in the Incentive Auction. Second, free-rider issues make foreclosure less likely because Verizon and AT&T would each prefer that the other incur the costs of such a strategy. Third, anonymous auction design makes a foreclosures strategy difficult and costly to implement. Fourth, a foreclosure strategy is particularly difficult to implement in the context of an incentive auction because higher bids on the part of buyers result in a greater quantity of spectrum being made available from sellers. Fifth, the market for mobile wireless services does not appear to be sufficiently concentrated to support the profitability of a foreclosure strategy.

I.B. The economics literature confirms that bidding restrictions are expected to reduce auction revenue

- (7) The theoretical literature concludes that excluding bidders reduces auction revenue. In addition, empirical evidence on the effects of bidding restrictions at U.S. Forest Service timber auctions shows that set-asides reduced auction revenue and the amount of timber sold. The literature also identifies key ways in which a two-sided auction differs from the more familiar one-sided auction. In particular, a two-sided auction can be more sensitive to the exclusion of buyers than a one-sided auction.
- (8) Thus, the literature indicates that regulators should expect reductions in revenue and the quantity transacted as a result of restrictions on bidders at the Incentive Auction. In addition, a reduction in the amount of spectrum transacted in the Incentive Auction means that less spectrum will be reallocated from broadcast use to mobile wireless services. This potentially has broader economic consequences given that there appears to be a consensus that the wireless industry as a whole is likely to suffer from a spectrum shortage as data usage continues to increase. Failure to promote the FCC’s goal in its National Broadband Plan to repurpose a substantial amount of spectrum for wireless operations could lead to higher prices for consumers, reduced quality of services, and stalled innovation.¹

I.C. Bidding restrictions in past FCC auctions would have substantially reduced revenue

- (9) I simulate the effects of bidding restrictions in two previous FCC auctions, Auction 66, the AWS spectrum auction, and Auction 73, the 700 MHz auction. The simulation results show that bidding restrictions at these past FCC auctions would have lowered revenues and prices and negatively affected efficiency. The results show that, in the absence of Verizon and AT&T, auction revenues would have been 16 percent lower in the FCC’s 2006 AWS spectrum auction and 45 percent lower in the 2008 700 MHz spectrum auction. In the AWS auction, T-Mobile would have benefited from a substantial subsidy if bidding restrictions had been imposed on Verizon and AT&T: in the simulation, the average price per MHz*Pop that T-Mobile pays for the licenses it wins falls by 18 percent.

¹See, *e.g.*, National Broadband Plan: Connecting America at p.xii.

- (10) I also analyze the impact of spectrum share caps that, as proposed by some parties, fall short of outright exclusion, and find revenue reductions of 15 percent in the AWS spectrum auction and of 41 percent in the 700 MHz auction. While the simulation of such caps in past auctions cannot be expected to provide precise estimates of the impact of such policies in the Incentive Auction, the empirical evidence indicates that any policy that leads to a significant reduction in the participation of Verizon and AT&T risks a significant negative revenue impact. The larger the reduction in participation, the larger will be the negative impact on revenue. As these simulations show, the loss of Verizon and AT&T as active competitors in the auction leads to substantial reductions in revenue.

I.D. Bidding restrictions in the Incentive Auction would risk auction failure

- (11) I simulate the effects of bidding restrictions in a two-sided auction using a theoretical model of buyer and seller behavior in a two-sided auction, one where sellers must be enticed to give up their assets by the magnitude of the buyers' bids. This model illustrates how the risk of auction failure is heightened where bidding restrictions are imposed in the context of a two-sided auction.
- (12) Bidding restrictions would reduce the maximum possible revenue and the maximum possible quantity of repurposed spectrum that can be achieved. In fact, the entire set of possible outcomes is shifted in the direction of lower revenue and a lower quantity of repurposed spectrum. If a minimum combination of revenue and quantity is required in order for the auction to succeed, then the elimination of two buyers could make that objective impossible to achieve, causing the auction to fail.
- (13) Moreover, it is my understanding that there may be a minimum amount of spectrum the FCC will need to clear in the reverse auction in order to offer spectrum in the forward auction that is attractive to a majority of wireless operators. Specifically, it is my understanding that in any market where less than 72 MHz of spectrum is available to be sold to wireless operators, it may be challenging or even impossible to configure a technically viable band plan featuring paired spectrum. To the extent that technical considerations dictate a quantity floor below which the Incentive Auction may not fall, the risk that auction restrictions would cause auction failure is increased.

II. Introduction and scope of submission

- (14) I have been asked by Verizon to evaluate the claim that Verizon (possibly in conjunction with AT&T) has an incentive and ability to foreclose Sprint and T-Mobile from gaining access to low-frequency spectrum through the FCC's upcoming Incentive Auction, which is meant to reallocate spectrum from broadcasters to providers of mobile wireless services.² In addition, I have been asked to analyze the likely effects of some of the proposals to limit Verizon's and AT&T's participation in the Incentive Auction.
- (15) A number of parties argue in submissions to the FCC that, because of purported concerns about foreclosure of Sprint, T-Mobile, or other wireless operators, the FCC should limit Verizon's and AT&T's participation in the Incentive Auction.³ However, the principal goals of the Incentive Auction are to reallocate spectrum to a higher-valued use and to raise revenue to fund other priorities. Therefore, limiting participation in the Incentive Auction by two buyers that have shown that they place a high value on spectrum puts the goals of the Incentive Auction at risk.

II.A. Relevant qualifications

- (16) I am the Robert A. Bandeen Professor of Economics at the Fuqua School of Business at Duke University. In addition, I am a Partner at the economic consulting firm Bates White, LLC. I received my PhD in Economics from

²For background on the FCC's Incentive Auction, see <http://www.fcc.gov/incentiveauctions>. For additional discussion, see Simon Loertscher, Leslie M. Marx, and Tom Wilkening (2013), "A Long Way Coming: Designing Centralized Markets with Privately Informed Buyers and Sellers," Working Paper, Duke University, available at <https://faculty.fuqua.duke.edu/~marx/bio/papers/incentiveauction.pdf>. An early proposal suggesting that the FCC put in place an incentive auction type of mechanism was put forward by Evan Kwerel and John Williams (2002), "A Proposal for a Rapid Transition to Market Allocation of Spectrum," OPP Working Paper No. 38, Federal Communications Commission.

³See, e.g., U.S. Department of Justice, "Ex Parte Submission of the United States Department of Justice," WT Docket No. 12-269, April 11, 2013 (DOJ ex parte).

Northwestern University. I served as Chief Economist for the FCC from August 2005 to August 2006 and served as a consultant to the Wireless Telecommunications Bureau of the FCC from August 2006 to August 2007. I have published numerous articles on various industry organization topics and on auction theory, and have recently focused on the economics of two-sided auctions. My CV is attached as Appendix A.

- (17) My opinions are based on my training and experience as an economist, including my experience working with the FCC, and my analysis of the available evidence and data.

II.B. Background and scope of analysis

- (18) In 1993, the U.S. Congress directed the FCC to design and implement auctions to assign spectrum licenses to providers of mobile wireless services. Although nothing like that had been done before, the first auction was held in 1994, and since then the FCC has held more than 80 auctions, issued more than 36,000 licenses, and raised more than \$50 billion for the United States Treasury.⁴
- (19) In 2012, the U.S. Congress directed the FCC to design and implement a new type of auction. The upcoming Incentive Auction will create a centralized market for the exchange of spectrum licenses in the 600 MHz frequency band from broadcasters to providers of mobile wireless services.
- (20) The authorizing legislation for the Incentive Auction states that, in order for any transactions to occur, the sale of licenses to providers of wireless services must raise funds sufficient to cover: (i) the accepted bids of the television broadcasters, (ii) the FCC's out-of-pocket costs of conducting the auction, and (iii) the expected reimbursement costs of broadcasters and certain other parties associated with the license reassignments occurring as part of the auction.⁵ The legislation authorizing incentive auctions does not explicitly require the FCC to raise any additional revenue, but it does state that any additional revenue shall be transferred to the Public Safety Trust Fund for various enumerated purposes.⁶ Statements by members of Congress and FCC Commissioners indicate that the auction is expected to generate sufficient revenue to fund the FirstNet public safety network.⁷
- (21) At the same time, the Department of Justice (DOJ) and various parties to the *Spectrum Holdings* and *Incentive Auctions* proceedings have expressed concerns about allowing AT&T and Verizon to acquire spectrum licenses at the Incentive Auction.⁸ DOJ expressed particular concerns that Verizon and AT&T might acquire the low-frequency spectrum in rural areas only to hamper the ability of other carriers to compete in those markets. DOJ argues that low-frequency spectrum is particularly important for providing coverage in rural areas and Sprint and T-Mobile have "virtually none."⁹
- (22) Assistant Attorney General Bill Baer later clarified in testimony to the Senate Judiciary Committee that the DOJ's submission was designed to "urge the FCC. . .to take a look. . .at whether or not the playing field is already tilted in favor of big guys who may or may not—we were not making a fac-

⁴Congressional Hearing on "Keeping the New Broadband Spectrum Law on Track" (U.S. House Energy and Commerce Committee, 12 Dec. 2012), statement of FCC Commissioner Jessica Rosenworcel.

⁵Public Law 112–96, Section 6403(c)(2)(B), <http://www.gpo.gov/fdsys/pkg/PLAW-112publ96/pdf/PLAW-112publ96.pdf>.

⁶See § 6403(d)(4)(A).

⁷In Congressional Hearings on "Keeping the New Broadband Spectrum Law on Track" (U.S. House Energy and Commerce Committee, 12 Dec. 2012), FCC Commissioner Ajit Pai argued that if the incentive auction did not yield any net revenues, "That would mean no money for the First Responder Network Authority (FirstNet) to build out a nationwide, interoperable public safety broadband network; no money for state and local first responders; no money for public safety research; no money for deficit reduction; and no money for next-generation 911 implementation. Most of the problem stems from the structure of the proposed auction. The only closing condition set forth in the NPRM is that the revenues from the forward auction must cover the costs of the reverse auction." In the question-and-answer portion of the hearing, the FCC Commissioners were asked, "Should the Commission ensure that the auction raises \$7b [for a nationwide interoperable public safety network]?" The responses were: "Pai: Yes, we should focus on maximizing revenue. Rosenworcel: Yes, absolutely. Clyburn: Absolutely. McDowell: Yes. Genachowski: Yes."

⁸DOJ ex parte.

⁹DOJ ex parte at p.14.

tual judgment—. . . [be] using what they already have and use that as a factor in deciding what rules to set in the auction.”¹⁰

- (23) Nonetheless, DOJ states that, “The Commission’s policies, particularly regarding auction of new low-frequency spectrum, can potentially improve the competitive landscape by preventing the leading carriers from foreclosing their rivals from access to low-frequency spectrum.”¹¹ It goes on to say, “[f]or instance, rules that ensure that the two smaller nationwide carriers are not foreclosed from access to more spectrum, and particularly low-frequency spectrum, could benefit consumers. Auction rules of this nature would ensure the smaller nationwide networks, which currently lack substantial low-frequency spectrum, would have an opportunity to acquire it.”¹²
- (24) In addition, in reply comments to the FCC on the design of the Incentive Auction, other commenters suggest the imposition of rules that would restrict the acquisition of additional spectrum by certain firms.¹³
- (25) As I show in this report, there is substantial conflict between the desire to raise revenue and reallocate spectrum through the Incentive Auction and the proposals to restrict the ability of Verizon and AT&T to compete in the auction. Such restrictions would potentially overcomplicate an already complex auction and put at risk achieving the dual goals of raising revenue and reallocation of spectrum. In addition, I show that historical bidding behavior indicates that restrictions on Verizon and AT&T are unlikely to substantially affect the allocation of licenses in rural areas, which appeared to be the key concern of DOJ.

III. There is no evidence that Sprint and T-Mobile have been foreclosed from access to low-frequency spectrum

- (26) Throughout this submission, I define low-frequency spectrum as spectrum that is at a frequency below one GHz.¹⁴ Data on the availability of low-frequency spectrum—both at auction and on the secondary market—are relevant for two reasons. First, to the extent that there are significant opportunities for wireless operators to acquire low-band spectrum through vehicles other than the Incentive Auction, such firms have the ability to bypass any theoretical “foreclosure” by Verizon and AT&T. Second, assertions that Sprint’s and T-Mobile’s ability to compete are reduced if they are not guaranteed access to low-frequency spectrum in the Incentive Auction can be tested against the conduct of these carriers in pursuing recent opportunities to acquire such spectrum.
- (27) I conclude, based on the empirical evidence, that the existence of a liquid market for low-frequency spectrum undercuts the assertion that there is a risk that AT&T and Verizon could foreclose rivals from such spectrum by buying up all available spectrum. I also conclude that the behavior of Sprint and T-Mobile, who have consistently failed to purchase low-frequency spectrum even when given numerous recent opportunities to do so, undercuts the assertion that either of those firms is at risk of being “foreclosed” from an input that is crucial to their ability to compete.

¹⁰Senate Judiciary Hearing, April 16, 2013, available at <http://www.judiciary.senate.gov/resources/webcasts/index.cfm>.

¹¹DOJ ex parte at p.14.

¹²DOJ ex parte at p.23.

¹³As reported in the communications trade press, “[a]mong the areas of continuing disagreement is whether the FCC should impose a cap on the ability of Verizon Wireless and AT&T to buy spectrum in the auction.” (“Sharp Disagreements Remain on Incentive Auction Rules,” *Communications Daily*, March 15, 2013) See, for example, the comments by T-Mobile: “One of the strongest deterrents to widespread participation in the 600 MHz auction is the prospect that bidding will be pointless if the Nation’s two largest carriers—each of which has a market capitalization roughly ten times that of its next largest competitor—are given an unfettered ability to acquire all of the spectrum offered. Most commenters, therefore, support imposing a cap on spectrum acquisitions. . . .” (Reply Comments of T-Mobile USA, Inc., GN Docket No. 12–268, March 12, 2013, pp.iv–v, available at <http://apps.fcc.gov/ecfs/document/view?id=7022130363>, accessed March 20, 2013) Other examples include the reply comments of the Competitive Carriers Association and Cellular South, Inc. in the same docket.

¹⁴This is a common definition of “low frequency” in this context as noted in the DOJ ex parte at p.12.

III.A. Sprint and T-Mobile were not foreclosed from acquiring spectrum in the 700 MHz and AWS spectrum auctions

III.A.1. 700 MHz Auction

- (28) The 2008 700 MHz auction was a large, relatively recent auction where the FCC auctioned 80 MHz of low-frequency (700 MHz) spectrum. It concluded in March 2008. Licenses sold in the 700 MHz auction can be used for mobile wireless services, including voice and mobile broadband, among other things.
- (29) Neither T-Mobile nor Sprint participated in the 700 MHz auction. By contrast, Verizon and AT&T, along with 99 other entities, actively participated. That 99 other entities participated is evidence that Verizon's and AT&T's participation in that auction did not discourage other interested buyers from bidding in the auction.
- (30) It is useful to focus on the 700 MHz B-block licenses because these licenses cover areas the size of Cellular Market Areas (CMA) and thus can be easily defined as rural or non-rural.¹⁵ As reported in Figure 1, the majority of rural CMA-level licenses (72 percent in terms of numbers of licenses and 62 percent in terms of MHz*POPs¹⁶) were won by entities other than Verizon and AT&T.¹⁷ Thus, DOJ's concern that Verizon and AT&T may foreclose other buyers of the low-frequency spectrum in rural areas is misplaced.

Figure 1 Number of B-block licenses won by top bidders in rural and non-rural CMAs in 700 MHz Auction

Bidder	Non-Rural		Rural	
	Licenses	MHz*POPs	Licenses	MHz*POPs
AT&T	150	1,881	77	229
Verizon	34	489	43	66
Qualcomm	1	2	2	3
Frontier (Dish)	0	0	0	0
T-Mobile (chose not to participate)	0	0	0	0
SpectrumCo (Sprint; chose not to participate)	0	0	0	0
Other	118	261	303	485
Total	303	2,634	425	783

Source: Calculations based on the FCC data and documentation.

III.A.2. AWS spectrum auction

- (31) In order to further evaluate claims that Sprint and T-Mobile have been foreclosed from acquiring spectrum suitable to expand coverage in rural areas, I analyze data from the 2006 AWS spectrum auction. The AWS spectrum auction, referred to as the "AWS-1 Auction," was another large, relatively recent auction. It concluded in September 2006. Licenses sold in the AWS-1 spectrum auction can be used for mobile wireless services, including voice and mobile broadband. In this section, I focus on the AWS-1 A-block licenses, which are 20 MHz licenses defined over the 734 CMAs. It is useful for the purposes of this section to focus on the A-block licenses because CMA-sized areas can more easily be defined as either rural or non-rural.
- (32) Figure 2 reports the number and MHz*POPs of A-block licenses won by bidder broken down by rural and non-rural CMAs. The vast majority of these rural licenses (96 percent in terms of numbers of licenses and 95 percent in terms of MHz*POPs) were won by an entity other than Verizon, AT&T, T-Mobile, or Sprint. This suggests that Sprint and T-Mobile had an opportunity

¹⁵ In fact, the FCC identifies certain CMAs as rural areas.

¹⁶ The term "MHz-POPs" is defined as the product of the number of megahertz associated with a license and the population of the license's service area, both of which affect the value of a license. Because trades can involve licenses of different sizes, both in terms of MHz and population coverage, an examination of the MHz*POP associated with trades provides additional information.

¹⁷ 72 percent is calculated by dividing the number of rural licenses won by participants other than Verizon and AT&T (305) by the total number of rural licenses (425). Similarly 62 percent is calculated by dividing 488 by 783.

to acquire additional spectrum that would have expanded their rural coverage, but chose not to, even though Verizon and AT&T were not actively bidding on these licenses themselves either to acquire the spectrum or to keep it out of the hands of Sprint and T-Mobile.

Figure 2 Number of A-block licenses won by top bidders in rural and non-rural CMAs in AWS spectrum auction

Bidder	Non-Rural		Rural	
	Licenses	MHz*POPs	Licenses	MHz*POPs
T-Mobile	83	1,827	10	47
Cricket	38	715	35	136
AT&T	20	769	1	10
Verizon	2	11	5	10
SpectrumCo (Sprint)	0	0	0	0
Other	160	1,063	358	1,065
Total	303	4,384	409	1,268

Source: Calculations based on the FCC data and documentation.

III.B. Evidence from secondary market transactions shows that Sprint and T-Mobile have not been foreclosed

- (33) The availability of low-frequency spectrum on the secondary market would make it difficult for Verizon and AT&T to implement a successful foreclosure strategy at the Incentive Auction. AT&T and Verizon cannot prevent other providers from purchasing low-frequency (or any other) spectrum on the secondary market, unless they stand ready to purchase all or most of the available supply—and the evidence shows that they have not.
- (34) In addition, past secondary market transactions suggest that Sprint and T-Mobile have not been particularly interested in acquiring low-frequency spectrum—a fact that undercuts the assertion that they are at risk of being foreclosed.
- (35) Verizon gave me data, taken from the publicly available sources, on all of the assignment and transfer applications that the FCC received from January 8, 2007, to January 30, 2013. These transactions were consummated between February 16, 2007, and May 10, 2013. I use these data to investigate whether the empirical evidence supports the claim that Sprint, T-Mobile, or other wireless operators have not had opportunities to substantially increase their holdings of low-frequency spectrum.
- (36) The secondary market transactions data contain 5,153 spectrum trades.¹⁸ Eighty-eight percent of these transactions (4,510 out of 5,153) involved the transfer of the whole license. In the remaining 12 percent of transactions, the license was partitioned or disaggregated. When only one part of a license is transferred, the database does not report the fraction of the total licensed spectrum that was traded.
- (37) Figure 3 reports the number of whole and partial license transactions and the MHz*POPs million¹⁹ transacted as a part of whole license transfers. Because only 12 percent of transactions involved the partial assignment of a license and because the data do not specify the size of the partial assignment, I exclude these transactions from my analysis of secondary market transactions.

¹⁸I excluded 23 internal trades between two entities both under Verizon's control (2) or AT&T's control (21).

¹⁹Because trades can involve licenses of different sizes, both in terms of MHz and population coverage, an examination of the MHz*POP associated with trades provides additional information.

Figure 3 Secondary market transactions by band, January 2007–May 2013

Band	Counts of trades			MHz*POP (millions) traded, whole license trades only
	Whole license	Partial assignment	Total	
Cellular	1,110	1	1,111	6,360
Lower 700 MHz	984	56	1,040	7,091
Upper 700 MHz	2	0	2	16
<i>sub-total: below 1 GHz</i>	<i>2,096</i>	<i>57</i>	<i>2,153</i>	<i>13,466</i>
PCS	1,547	334	1,881	41,476
AWS	804	249	1,053	17,684
WCS	63	3	66	7,171
<i>subtotal: above 1 GHz</i>	<i>2,414</i>	<i>586</i>	<i>3,000</i>	<i>66,331</i>
Total	4,510	643	5,153	79,797

Source: Calculations based on FCC data and documentation.

III.B.1. Sprint and T-Mobile buy and sell spectrum in the secondary market

- (38) By looking at all transactions, not just low-frequency transactions, I establish that Sprint and T-Mobile actively participated in the secondary market, engaging in approximately the same number of buy transactions as sell transactions. That active participation suggests that Sprint and T-Mobile were able to acquire useful spectrum through this channel, but as I show below, they did not take advantage of the secondary market to acquire low-frequency spectrum. Figure 18 in Appendix B reports the number of transactions by buyer and seller.
- (39) As shown in Figure 4 below, the evidence in terms of MHz*POPs traded (based on the 4,510 trades involving whole licenses) shows that both Sprint and T-Mobile were net buyers of spectrum in secondary market transactions, including purchases of spectrum from Verizon and AT&T. Furthermore, the data show that Sprint and T-Mobile could have purchased an additional 24,233 million MHz*POPs that spectrum holders other than Verizon and AT&T put up for sale. (These 24,233 million MHz*POPs correspond roughly to an 80 MHz license covering the entire United States.) Figure 4 shows that T-Mobile was able to increase its spectrum holdings substantially through secondary market transactions and that it could have purchased about six times more from sellers other than Verizon and AT&T than it decided to buy. (T-Mobile purchased 4,180 million MHz*POPs from “Other” sellers, but 24,233 million MHz*POPs sold by those other sellers were purchased by “Other” buyers.) The fact that Sprint only purchased 304 out of 24,233 million MHz*POPs from “Other” sellers suggests that although the secondary market was relatively active across most commercial spectrum bands, Sprint failed to take advantage of opportunity to acquire spectrum. The evidence from these secondary market transactions does not support claims that Sprint and T-Mobile have been anticompetitively foreclosed from acquiring spectrum.

Figure 4 MHz*POPs traded, all bands, January 2007–May 2013 (whole licenses only)

MHz*POP (millions) traded		Buyer					Total
		Verizon	ATT	T-Mobile	Sprint	Other	
Seller	Verizon		2,609	593	47	415	3,664
	ATT	629		1,297	4	431	2,360
	T-Mobile	1,914	1,169		20	343	3,447
	Sprint			22			22
	Other	19,298	22,289	4,180	304	24,233	70,303
	Total	21,841	26,068	6,092	375	25,422	79,797
<i>buy/sell ratio</i>		5.96	11.04	1.77	16.82	0.36	

Source: Calculations based on FCC data and documentation.

III.B.2. Neither T-Mobile nor Sprint has chosen to acquire low-frequency spectrum in the secondary market despite significant opportunities to do so

- (40) Since January 2007, there have been 2,153 transactions of low-frequency spectrum. T-Mobile bought one license and Sprint did not buy any.²⁰ Although Verizon and AT&T have been active buyers of low-frequency spectrum, a significant proportion of the spectrum transacted did not involve Verizon or AT&T and thus could not have been subject to foreclosure by Verizon and AT&T.
- (41) In particular, focusing on the 2,096 low-frequency transactions that involved the transfer of a whole license, Figure 5 shows that—at a minimum—Sprint or T-Mobile could have been the buyer in 729 transactions when the buyer and seller were firms other than Verizon or AT&T. Figure 6 reports the quantities of low-frequency spectrum transacted in MHz*POPs rather than in numbers of transactions. Approximately thirty percent of the MHz*POPs of low-frequency spectrum transacted (3,691 million out of 12,832 million) were sold and purchased by a firm other than Verizon or AT&T and thus could not have been subject to foreclosure by Verizon or AT&T; this is roughly the same MHz*POPs as a 12 MHz license covering the entire United States. This evidence supports the conclusion that Sprint and T-Mobile have had opportunities to purchase low-frequency spectrum but have chosen not to.

Figure 5 Number of transactions of low-frequency whole licenses, January 2007–May 2013

Counts of trades		Buyer					Total
		Verizon	ATT	T-Mobile	Sprint	Other	
Seller	Verizon	n/a	81	0	0	79	160
	AT&T	4	n/a	0	0	1	5
	Other	450	751	1	0	729	1,931
	Total	454	832	1	0	809	2,096

Source: Calculations based on FCC data and documentation.

²⁰T-Mobile bought a 25 MHz Cellular A license from SunCom Wireless Holdings covering CMA 629 (South Carolina 5—Georgetown) where about 375,000 people currently reside. This was a part of T-Mobile's acquisition of SunCom Wireless Holdings, Inc. that was announced in September 2007 and consummated in February 2008. In addition to one 25 MHz Cellular A license, T-Mobile also received 27 PCS licenses as part of the acquisition.

Figure 6 MHz*POPs of low-frequency spectrum transacted from January 2007 to May 2013 (whole licenses only)

MHz*POP (millions) traded		Buyer					Total
		Verizon	ATT	T-Mobile	Sprint	Other	
Seller	Verizon	n/a	207	0	0	402	609
	AT&T	23	n/a	0	0	2	25
	Other	2,726	6,406	9	0	3,691	12,832
	Total	2,749	6,613	9	0	4,095	13,466

Source: Calculations based on FCC data and documentation.

- (42) Verizon offered for sale all of its licenses in two blocks of the Lower 700 MHz band in 2013. This spectrum could have provided significant coverage in low-frequency spectrum for T-Mobile or Sprint, but neither company bought any of these licenses. The CFO of Deutsche Telekom said, “We are not interested in 700 megahertz spectrum at this time [. . .] [T]his spectrum is nothing which would be attractive for us.”²¹

III.B.3. Sprint and T-Mobile have failed to act on opportunities to purchase low-frequency spectrum in rural areas

- (43) In the previous section, I show that there were opportunities for firms to purchase low-frequency spectrum on the secondary market, but that Sprint and T-Mobile did not take advantage of those opportunities. The evidence shows that they passed up these opportunities even in rural areas. This is noteworthy because DOJ has indicated a particular concern about potential foreclosure in rural markets, where low-frequency spectrum can facilitate deployment of wireless service with fewer cell sites because of its ability to propagate signals further.
- (44) The 2007–2013 data show that there were significant opportunities to purchase low-frequency spectrum in rural areas, which the FCC defines as areas where population density is currently below 100 inhabitants per square mile.²² According to the transactions data, Sprint and T-Mobile made *no* purchases of low-frequency spectrum in rural areas.
- (45) Figure 7 and Figure 8 below report transactions of low-frequency spectrum in rural areas. A significant proportion of the transactions involves neither Verizon nor AT&T as either the buyer or seller and thus could not have been subject to anticompetitive foreclosure by either. Yet of these 469 low-frequency licenses sold in rural areas, Sprint and T-Mobile bought none.

Figure 7 Number of transactions of low-frequency rural licenses traded, January 2007–May 2013 (whole licenses only)

Counts of trades		Buyer					Total
		Verizon	ATT	Sprint	T-Mobile	Other	
Seller	Verizon	n/a	74	0	0	53	127
	ATT	1	n/a	0	0	1	2
	Other	311	374	0	0	469	1,154
	Total	312	448	0	0	523	1,283

Source: Calculations based on FCC data and documentation.

²¹ Q1 2012 Investor call (May 10, 2012).

²² “We establish a baseline definition of ‘rural area’ as those counties (or equivalent) with a population density of 100 persons per square mile or less, based upon the most recently available Census data.” *Facilitating the Provision of Spectrum-Based Services to Rural Areas and Promoting Opportunities for Rural Telephone Companies to Provide Spectrum-Based Services*, Report and Order, 19 FCC Rcd 19078, at ¶¶ 11, 79 (2004).

Figure 8 Rural MHz*POPs of low-frequency spectrum transacted January 2007–May 2013 (whole licenses only)

MHz*POP (millions) traded		Buyer					Total
		Verizon	ATT	Sprint	T-Mobile	Other	
Seller	Verizon	n/a	176	0	0	171	347
	ATT	3	n/a	0	0	2	5
	Other	1,092	1,603	0	0	1,537	4,232
	Total	1,095	1,778	0	0	1,710	4,583

Source: Calculations based on FCC data and documentation.

- (46) There may be limitations to secondary market opportunities, and engaging in a sequence of small secondary market transactions may not be attractive for a carrier because of the risk that the carrier may be unable to purchase sufficient licenses at attractive prices to support its business plan. But T-Mobile's and Sprint's failures to make any meaningful attempts to acquire low-frequency spectrum, particularly rural low-frequency spectrum, suggest that they have chosen to target other bands of spectrum, not that they have been foreclosed. And the active secondary market for spectrum, including for rural low-frequency spectrum, would make it difficult for Verizon and AT&T to successfully execute a foreclosure strategy in the future.

III.C. Evidence from pricing plans suggests a pattern of capacity constraints that makes foreclosure unlikely

- (47) DOJ states that, “[a]bsent compelling evidence that the largest incumbent carriers are already using their existing spectrum licenses efficiently and their networks are still capacity-constrained, the Department would normally expect the highest use value for new spectrum that is in the public interest to come from rivals to the leading firms that could effectively make use of additional spectrum to expand capacity, improve coverage, or introduce new services in an effort to challenge the dominant firms.”²³
- (48) This report does not address the extent to which mobile wireless service providers are capacity constrained. That question has been separately addressed by economists and industry analysts. For example, Allan Shampine submitted a declaration on behalf of Verizon in which he calculated the customers per MHz*POP of various wireless operators and concluded that Verizon and AT&T use their spectrum more intensively than other operators, including T-Mobile and Sprint.²⁴ And a recent market research report by Deutsche Bank labels Sprint the “new spectrum powerhouse” and emphasizes that Sprint has “more bandwidth available for LTE than all of its national competitors combined.”²⁵ Similarly, Macquarie Capital recently commented that Sprint and T-Mobile have a “strong spectrum and network capacity position” and that Verizon and AT&T “will need to purchase additional spectrum” within the next two years.²⁶
- (49) Additional economic evidence speaking to the issue can be found in a review of pricing plans offered by the four national providers. On the one hand, if a wireless carrier is relatively unconstrained in terms of its network capacity, one would expect that it would offer pricing plans that allow for customers to use large amounts of data or even offer plans with unlimited data usage. On the other hand, one would expect carriers that are more capacity constrained to offer plans that encourage customers to conserve on network capacity.
- (50) Statements by the FCC and industry analysts support the economic logic that wireless operators' pricing plans can be expected to reflect their relative

²³ DOJ ex parte at p.12.

²⁴ Declaration of Allan L. Shampine, In the Matter of Policies Regarding Mobile Spectrum Holdings, Docket No. 12–269 (Nov. 26, 2012), at 18–19, available at <http://apps.fcc.gov/ecfs/document/view?id=7022067975>.

²⁵ See Brett Feldman et al., Deutsche Bank Market Reports Research, *Sprint Nextel Corp. The New Spectrum Powerhouse; Restating Coverage at Buy at 1*, available at <http://apps.fcc.gov/ecfs/document/view?id=7520931274>.

²⁶ July 29, 2013 Macquarie Capital report, “US Telecom Services: Spectrum and network capacity vs. traffic demand for the Big 4 wireless carriers.”

capacity constraints. For example, in the Fifteenth Annual CMRS Competition Report, the FCC stated: “In late 2009 [. . .] the chief executive of AT&T’s wireless operations hinted that the company would eventually shift from unlimited data pricing to charging subscribers based on the amount of data used in order to encourage high-usage customers to curb demand for network capacity and improve the operator’s ability to manage its network. Analysts have long anticipated the introduction of usage-based wireless data pricing, arguing that a departure from the unlimited data pricing model is only a matter of time. In June 2010, AT&T became the first national operator to move from unlimited data pricing to usage-based tiered data pricing for smartphones.”²⁷ In the Sixteenth CMRS Competition Report, the FCC confirmed that more wireless carriers facing capacity constraints are shifting to usage-based data plans: “the Fifteenth Report [. . .] had focused on the industry’s shift from unlimited data pricing to tiered, usage-based data pricing for smartphones. As discussed in the Fifteenth Report, this shift was a response to the effects of increased bandwidth consumption by smartphone users on network utilization and capacity constraints.” The report also stated that Sprint has an “unlimited data pricing [. . .] and T-Mobile reintroduced an unlimited smartphone data pricing option.”²⁸

- (51) Figure 9 compares the individual post-paid plans of Verizon, AT&T, T-Mobile, and Sprint. During the first half of 2013, Sprint and T-Mobile offered service plans to their customers that allow those customers to increase their data use in an unlimited way at zero incremental cost to those customers. Sprint offered an unlimited data plan at \$110 per month, and T-Mobile offered an unlimited data plan at \$90 per month during the first quarter and \$70 per month during the second quarter, for an average price of \$80 per month. This type of pricing is consistent with a lack of binding capacity constraints. If network capacity were a problem for T-Mobile and Sprint, I would have expected to see pricing plans that encourage customers to conserve on network usage. In fact, a recent T-Mobile advertisement portrays AT&T’s network as overcrowded but T-Mobile’s network as having ample capacity.²⁹ Similarly, Sprint recently announced that customers who choose the “New Unlimited, My Way Plan” starting at \$80 per month would receive the “Sprint Unlimited Guarantee,” an offering that allows the customers “to lock-in unlimited talk, text and data not for just the next two years, but for life.”³⁰

Figure 9 Comparison of individual 2013 (Jan–Jun) post-paid plans including unlimited anytime minutes and unlimited text messaging—monthly charge (\$) and corresponding included data usage (GigaBytes)

	Sprint	T-Mobile	Verizon	AT&T
Data usage	Unlimited	Unlimited	4GB	4GB
Average 2013 price (\$ per month)	110	80	110	110

Source: Verizon.

- (52) In contrast, Verizon and AT&T have commonly offered service plans that cap the amount of data that is available to customers at zero incremental cost.

²⁷ See In the Matter of Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993 Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile Services, WT Docket No. 10–133 (2011) (“Fifteenth CMRS Competition Report”), at ¶¶ 87–88.

²⁸ The FCC also reported that “[t]he same network management issues motivating the ongoing shift from unlimited data pricing to tiered smartphone data plans in the postpaid segment—namely, the impact of higher bandwidth consumption by smartphone users on network utilization and capacity constraints—are also beginning to induce changes in the pricing and service terms and conditions of high-end prepaid plans for users of smartphone data.” ¶¶ 167; see In the Matter of Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993 Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile Services, WT Docket No. 11–186, released March 21, 2013 (“Sixteenth CMRS Competition Report”).

²⁹ See, e.g., PhoneArena.com, “T-Mobile ad attacks AT&T for having slow pipes,” available at http://www.phonearena.com/news/T-Mobile-ad-attacks-AT-T-for-having-slow-pipes_id42743, site accessed July 4, 2013; T-Mobile “Pipes” Apple iPhone 5 Commercial, available at <http://www.youtube.com/watch?v=h2Sc6fGz9o>, site accessed July 4, 2013.

³⁰ See, e.g., “Sprint Launches Unlimited Guarantee and New Unlimited, My Way Plan,” available at http://newsroom.sprint.com/news-releases/sprint-launches-unlimited-guarantee-and-new-unlimited-my-way-plan.htm?view_id=2933, site accessed July 23, 2013.

Most recently, both Verizon and AT&T offered plans that allow for 4 GB of data usage at \$110 per month. Plans that limit the data usage that is available at no incremental cost are consistent with the kind of pricing that I would expect from a wireless carrier that is capacity constrained relative to carriers offering unlimited plans.

- (53) Therefore, the pricing behavior of the four national wireless operators is not consistent with the assertion that Verizon and AT&T are purchasing spectrum they do not need for their operations in order to ensure that their competitors remain capacity constrained.

IV. Verizon and AT&T are unlikely to have the incentive or ability to foreclose Sprint and T-Mobile in the Incentive Auction

- (54) In its submission, DOJ expresses concern that Verizon and AT&T will engage in a form of predatory bidding that will drive up the price of spectrum in the Incentive Auction to such an extent as to deny Sprint and T-Mobile the ability to acquire low-frequency spectrum in rural areas, which DOJ claims is needed to improve network coverage. But the DOJ paper includes no data or other evidence to support its concern, and DOJ subsequently clarified that it has not made any judgment about what the FCC will find when it undertakes the factual analysis needed to evaluate the concerns.³¹
- (55) Verizon and AT&T could have an incentive to purchase spectrum with the intent of withholding it from the market and thus decreasing supply in order to raise or maintain price levels only if smaller rivals are already constrained in terms of spectrum and Verizon and AT&T are not. However, the pricing plan evidence that I present in section III.C suggests that the opposite is true.
- (56) If margins are high and either Verizon or AT&T faces spectrum-capacity constraints in the coming years, then purchased spectrum will most likely be deployed in order to expand output at the high margins rather than withheld from the market. Furthermore, if smaller rivals are already unconstrained by their spectrum holdings, then withholding additional spectrum from them is unlikely to have any effect, while at the same time being costly to the larger wireless carriers. Therefore, if, as the evidence suggests, Verizon and AT&T are capacity-constrained relative to their smaller rivals, Verizon and AT&T would have no incentive to foreclose by purchasing spectrum to keep it out of the hands of their rivals.
- (57) Additionally, DOJ suggests that its concerns about low frequency spectrum may extend beyond rural markets if carriers require that spectrum to “offer[] coverage across a broad service area.” (DOJ *ex parte* at 14). But Sprint already has low frequency spectrum in the 800 MHz band, which it is using for its LTE deployment.³² And T-Mobile’s senior management has made clear that any coverage constraints it may face can be remedied with the acquisition of a small amount of low-band spectrum: according to an analyst at Jefferies who recently met with T-Mobile’s leadership, T-Mobile believes it only needs a 5x5 block of low frequency spectrum to improve its coverage “dramatically.”³³ This suggests that Verizon and AT&T would have to buy up almost all of the low frequency spectrum at the 600 MHz auction to succeed in a foreclosure strategy targeting DOJ’s potential non-rural concerns.
- (58) In the remainder of this section, I first address a much more direct remedy at the FCC’s disposal that, unlike bidder participation restrictions, does not risk the success of the Incentive Auction. Then, I discuss some additional reasons why foreclosure by bidding up the price of spectrum in the Incentive Auction is unlikely to be an effective or profitable strategy for Verizon and AT&T: (1) Given the high costs associated with foreclosure and the uncertain benefit, both Verizon and AT&T would have an incentive to free ride on the efforts of the other to bid up the cost of spectrum. (2) Anonymous auction design would make the implementation of a foreclosure strategy difficult and costly. (3) The supply of spectrum is likely to increase as Verizon and AT&T bid up the price, increasing the cost of implementing a foreclosure strategy (4) The market does not appear to be sufficiently concentrated to make the

³¹Senate Judiciary Hearing, April 16, 2013, available at <http://www.judiciary.senate.gov/resources/webcasts/index.cfm>.

³²See Sprint Q2 2013 Earnings Call (July 30, 013).

³³August 28, 2013 Jefferies report, “T-Mobile USA”. (“ . . . T-Mobile believes that its coverage would improve dramatically with just a small (5x5) channel of low band spectrum.”).

foreclosure strategy profitable enough to justify the costs to Verizon and AT&T.

IV.A. As a policy tool to prevent foreclosure, build-out requirements have significant advantages over bidding restrictions

- (59) If, despite the evidence to the contrary, the FCC believes that foreclosure by purchasing spectrum with the intent of withholding it from use is likely, then a more direct and less risky remedy is available to the FCC.
- (60) The FCC can defeat a foreclosure strategy simply by imposing build-out requirements for licenses purchased at the Incentive Auction. DOJ notes in its ex parte submission that bidders may consider both use value and foreclosure value of spectrum when bidding. But bidders must also consider holding costs of any spectrum won, which offsets the perceived value. Holding costs of spectrum are increased by the extent to which the FCC requires that holders of spectrum pursue the build out of capacity in order to make use of acquired spectrum. Thus, the FCC has a tool at its disposal by which it can directly reduce the likelihood that firms will find it profitable to withhold spectrum from the market through a warehousing strategy.
- (61) The imposition of a build-out requirement does not have to cause the significant risks and distortions that bidding restrictions do. Suppose that, as the evidence suggests, neither Verizon or AT&T (or anyone else) has any intention of purchasing spectrum in the Incentive Auction to withhold it from the market. Then a properly designed build-out requirement would only minimally impact bidding behavior, if at all. In such a case, however, bidding restrictions would unnecessarily put at risk the goals of the Incentive Auction and interfere with the efficient allocation of spectrum. Therefore, build-out requirements will tend to be a much more efficient means of deterring foreclosure than bidding restrictions.
- (62) In addition, because increases in the supply of spectrum reduce the profitability of a foreclosure strategy, the FCC can address foreclosure concerns by taking steps to accelerate the reallocation of spectrum, such as that currently assigned to the Federal Government, to use for commercial mobile wireless services.
- (63) Moreover, if DOJ is concerned about foreclosure in rural areas, it could examine the results of the auction and bring challenges if it uncovers anti-competitive conduct. For the reasons described in this report, I think it is unlikely that Verizon and AT&T would have an incentive to engage in foreclosure, but DOJ could easily determine whether AT&T and Verizon had purchased all or almost all of the relevant spectrum in the auction at prices significantly in excess of expectations, and then DOJ could investigate whether that was in pursuit of foreclosure. DOJ could use such a post-auction review to challenge foreclosure instead of a prophylactic rule restricting bidding by Verizon and AT&T.
- (64) Because the FCC could impose build-out requirements and the DOJ could examine bidding behavior post-auction in rural areas, policy tools exist for addressing foreclosure concerns that avoid the undesirable effects of bidding restrictions.

IV.B. Incentives to free ride imply that there is unlikely to be a unilateral incentive for significant foreclosure by either Verizon or AT&T

- (65) Free rider concerns suggest that a foreclosure strategy may be difficult for AT&T and Verizon to implement. DOJ's theory involves Verizon and AT&T both being willing to warehouse all or almost all the rural spectrum up for auction to prevent Sprint and T-Mobile from gaining access to that spectrum. That means that a significant portion of the foreclosure costs borne by Verizon or AT&T will benefit the other firm.
- (66) The effect of this will be to greatly reduce Verizon's and AT&T's unilateral incentives (if any) to foreclose well below the incentive that a single large firm would have. A single large firm would internalize all of the additional profits from the foreclosure strategy. When benefits are shared, however, each firm sharing the benefits would prefer to free ride on the other's efforts, leading to significantly less foreclosure than would have occurred if the benefits were not shared.

IV.C. Anonymous auction design makes foreclosure less likely

- (67) The FCC can make auction design choices that reduce concerns related to foreclosure. In past auctions, the FCC has used anonymous bidding procedures in order to limit the scope for strategic bidding. By using anonymous bidding in the Incentive Auction, the FCC can prevent bidders from knowing the identity of rivals for a particular license, making a foreclosure strategy more difficult and costly to implement.
- (68) In the context of an auction with anonymous bidding, it would not be possible for Verizon or AT&T to know when one of them (as opposed to one of the firms supposedly a target of their foreclosure strategy) has won a license. The result is that Verizon and AT&T would not know when to stop bidding. Notably, as discussed in Section VI.C below, in the 700 MHz Auction, Verizon and AT&T competed head-to-head with one another for spectrum in various markets, even after all other participants had stopped bidding. In fact, that head-to-head competition between Verizon and AT&T contributed to more than \$4.2 billion in additional revenues that would not have been received if AT&T and Verizon had stopped bidding as soon as one of them was guaranteed to acquire the license. None of the parties asserting that there is foreclosure risk has put forth a theory explaining how foreclosure could take place in the context of anonymous bidding and direct competition between Verizon and AT&T.

IV.D. Uncertainty about the level and elasticity of supply in an incentive auction makes a foreclosure strategy difficult to implement

- (69) A foreclosure strategy is particularly difficult to implement in the context of an incentive auction because higher bids on the part of buyers result in greater quantity being made available from sellers.
- (70) In an incentive auction, unlike other auctions the FCC has run, there is significant uncertainty regarding the ultimate supply of spectrum to the market. The nature of the Incentive Auction involves broadcasters making decisions about the price at which they are willing to supply spectrum to the market. It will be difficult for participants to predict before the auction how much will be supplied at a given price level. A company seeking to implement a foreclosure strategy that involves bidding up the price of spectrum so as to purchase that spectrum in order to withhold it from the market already faces uncertainty over how high it will have to bid in order to keep spectrum away from rival bidders. An incentive auction introduces additional uncertainty associated with how much spectrum will have to be purchased at inflated bids. This uncertainty makes planning and implementing this foreclosure strategy difficult and costly.
- (71) The extent to which higher prices stimulate sellers to offer more spectrum for sale is reflected in the elasticity of supply. If supply is highly elastic, then a small increase in price results in a large increase in the quantity of spectrum supplied. To analyze the effects of supply elasticity, auction theorists consider the set of equilibria of an auction, where an equilibrium is a specification of bidding strategies, one for each bidder, that are mutual best responses. These equilibria provide predictions on likely outcomes for the auction. The theory for one-sided auctions suggests that the elasticity of supply and uncertainty regarding that elasticity affects the set of equilibria in these auctions, with greater uncertainty and more elastic supply eliminating certain equilibria that may be undesirable from the perspective of the auction designer.³⁴ It seems likely that uncertainty regarding the elasticity of supply in the Incentive Auction would further inhibit attempts by bidders to coordinate on a foreclosure strategy. For example, if bidders are unsure about the elasticity of supply, they may be unsure about whether coordination on foreclosure strategies can be supported as an equilibrium, or if their beliefs about the elasticity of supply differ, they may disagree regarding foreclosure strategies.

³⁴See Paul Milgrom (2004), *Putting Auction Theory to Work*, Cambridge University Press, Chapter 7.2, showing that when bidders at a multi-unit auction face elastic supply rather than inelastic supply, some low-revenue equilibria may be eliminated.

IV.E. The market for wireless services is unlikely sufficiently concentrated to make foreclosure profitable

- (72) In all models of competition that I am aware of, the effects of foreclosing a rival diminish as the number of firms already effectively competing in the market increases. For example, a monopolist that is able to foreclose an entrant in order to remain a monopolist rather than sharing a duopoly profit will find that foreclosing that rival is significantly more profitable than foreclosing a rival that, had it been able to enter, would have become the third competitor rather than the second. Similarly, foreclosure of a fourth rival is significantly less profitable than foreclosing the third.
- (73) For example, consider a market consisting of symmetric firms competing by setting quantities facing inverse demand equal to $p = 100 - q$, where p is the market price and q is the total quantity supplied to the market. This is an example of a model of Cournot competition.³⁵ Assuming that firms produce at zero cost, the equilibrium price is equal to $100/(n + 1)$, where n is the number of symmetric firms in the market. Equilibrium profit of each firm is equal to $(100/n + 1)^2$. The aggregate value to the remaining firms of foreclosing one potential entrant decreases as the number of firms in the market increases. Specifically, if there are two potential competitors but one is foreclosed, the value of foreclosure is approximately 1,389.³⁶ If there are three potential competitors but one is foreclosed, the joint value of foreclosing the third firm for the two other firms is approximately 972.³⁷ If there are four potential competitors but one is foreclosed, the joint value of foreclosing the fourth firm for the three other firms is 675.³⁸
- (74) The current market structure for mobile wireless services in the United States involves a significant number of national and regional competitors of various sizes and strengths. The potential foreclosure that is described by DOJ does not involve the complete foreclosure of a rival by a monopolist but rather is marginal in nature. It involves (theoretically) foreclosing rivals' access to a small subset of the available input when there are already many small, medium, and large-sized rivals and therefore the value of that foreclosure and its effect would likely be small.
- (75) In addition, the costs of a successful foreclosure strategy are likely to be large because it would require a firm to purchase licenses for large amounts of spectrum and then to fulfill any build-out requirements associated with those licenses.
- (76) In sum, in the Incentive Auction, bidders likely will not know whom they are bidding against, making a targeted foreclosure strategy difficult or impossible to implement. In addition, a firm will not know whether a higher bid will have the effect of increasing the total amount of spectrum available in the market. This uncertainty, together with the limited benefits and high costs of a foreclosure strategy, suggests that firms will not have the incentive to engage in such a strategy.

V. Effects of bidding restrictions in the economics literature

V.A. Papers on auction design suggest that bidding restrictions are likely to reduce revenue and efficiency

- (77) Economic theory supports the intuitive conclusion that a seller should be able to raise more money when running an auction that does not exclude any bidder than an auction that excludes even a single bidder. Bulow and Klemperer (1996) prove a theorem that shows that, when the auctioneer's goal is to raise the highest amount of money possible, "an auction with $N + 1$ bidders beats any standard mechanism for selling to N bidders."³⁹
- (78) The authors show that this conclusion requires only that the bidders are "serious," that is, they value the object for sale more than the seller, and holds true under fairly general conditions. In particular, the conclusion that there

³⁵See, e.g., Jean Tirole (1989), *The Theory of Industrial Organization*, Cambridge, MA: MIT Press, Section 5.4.

³⁶The profit of a monopolist is 2500, whereas the profit of a duopolist is approximately 1111, where $2500 - 1111 = 1389$.

³⁷With three firms, each firm has profit 625, but with two each has profit 1111, and $2(1111) - 2(625) = 972$.

³⁸With four firms, each firm has profit 400. Using the prior result, $3(625) - 3(400) = 675$.

³⁹Jeremy Bulow and Paul Klemperer (1996), "Auctions Versus Negotiations," *The American Economic Review*, Vol. 86, No. 1, pp. 180-194.

is nothing as valuable to a seller as attracting one extra bona fide bidder to a competitive auction holds true both under “private values” conditions, “common value” conditions, and anything in-between. In a “private value” scenario, each bidder knows how much she values the object for sale; this information is private to herself and would not affect the values of other bidders if that information were revealed to them. In contrast, in a “common value” scenario, the value of the object for sale is the same for all bidders, but it is unknown at the time of the auction (*e.g.*, the amount of oil that can be extracted after winning an oil lease auction).

- (79) This result suggests that a seller should generally focus on maximizing the number of bidders. In the authors’ own words: “A simple competitive auction with $N + 1$ bidders will yield a seller more expected revenue than she could expect to earn by fully exploiting her monopoly selling position against N bidders.”⁴⁰
- (80) Combining theoretical and empirical analysis, Brannman, Klein, and Weiss (1987) show that having more bidders results in higher winning bids both in theory and in the data in a range of different auction settings, including underwriters’ spreads on tax-exempt general obligation bonds and on tax-exempt revenue bonds, U.S. Department of Interior offshore oil lease auctions, and oral ascending and sealed-bid auctions of National Forest Service timber in the Pacific Northwest.⁴¹

V.B. Assertions that bidding restrictions might not suppress revenue are based on unrealistic hypothetical scenarios

- (81) In his March 12, 2013, declaration on behalf of T-Mobile,⁴² Prof. Jonathan B. Baker posits the following theoretical exception to the typical revenue result expected when bidding restrictions are imposed: “Given the non-trivial fixed costs of auction participation, a firm expecting to be outbid could readily be deterred from participating in the auction in the first place. If auction participation is thin as a result of this dynamic, the large incumbent firms that are in principle willing to pay to obtain foreclosure benefits may enjoy these benefits without bidding up the auction price to a level that pays for those benefits fully, leaving the public with a less competitive wireless sector and the government with lower revenues than could be obtained.” Similarly, in their paper on behalf of Sprint, economists Dr. Stanley M. Besen, Dr. Serge X. Moresi, and Prof. Steven C. Salop state that: “*Economic theory* has shown that unrestricted auctions *can* discourage some potential bidders and lead to the result that auction revenues fall far short of expectations.”⁴³
- (82) However, both T-Mobile’s and Sprint’s economists limit themselves to hypothetical examples illustrating how the typical outcome—a reduction in revenue—might not occur (under their theories) if certain theoretical conditions are met. They present no evidence that the conditions that they claim might lead to a revenue-enhancing outcome are present in the context of the Incentive Auction or any other spectrum auction in the United States.

⁴⁰ See also Vijay Krishna (2002), *Auction Theory*, New York: Academic Press. More nuanced effects are possible in models with participation costs and investments. For example, in Flavio M. Menezes and Paulo K. Monteiro (2000), “Auctions with endogenous participation,” *Review of Economic Design* 5, 71–89, the authors distinguish between the number of bidders who pay the participation costs required to *actually* participate in an auction and the number of bidders who could *potentially* participate in an auction. The auctioneer’s expected revenue always increases in the number of bidders who actually participate in an auction, but they show that an increase in the number of bidders who could potentially participate could in theory cause the auctioneer’s expected revenue to decrease, although they conclude that not much can be said in general about the likelihood of this effect. In Richard J. Gilbert and Paul Klemperer (2000), “An Equilibrium Theory of Rationing,” *RAND Journal of Economics* 31(1), 1–21, the authors consider a model in which the seller sets its pricing policy and then each of two buyers must make an initial sunk investment that determines probabilistically whether its value is positive or zero. In this case, the seller’s prices must provide incentives for investment and the seller may prefer to commit to sell to only one buyer in order to promote investment.

⁴¹ Lance Brannman, J. Douglass Klein and Leonard W. Weiss (1987), “The Price Effects of Increased Competition in Auction Markets,” *Review of Economics and Statistics* 69(1), pp. 24–32.

⁴² Jonathan B. Baker, “Spectrum Auction Rules That Foster Mobile Wireless Competition,” paper submitted on behalf of T-Mobile, *In the Matter of Policies Regarding Mobile Spectrum Holdings*, WT Docket No. 12–269.

⁴³ Stanley M. Besen, Serge X. Moresi, & Steven C. Salop, *Why Restricting Participation in Spectrum Auctions Can Increase Bidder Participation, Increase Auction Revenues, and Increase Competition in Wireless Markets*, Mar. 12, 2013 (filed with Sprint’s reply comments in Docket No. 12–268), p. 3, emphasis added.

- (83) For example, neither Dr. Baker nor Sprint's economists provide evidence that in the Incentive Auction smaller bidders will face "non-trivial fixed costs" to participate, or that such costs would cause them to be discouraged from participating if larger bidders are permitted to participate without restrictions.
- (84) The data indicate that the hypothetical conditions posited by T-Mobile's and Sprint's economists do not appear to be present. For example, in the AWS auction, it was known that Verizon, AT&T, and T-Mobile would participate without restrictions, yet 168 qualified bidders registered for the auction and 104 bidders won licenses during the auction.⁴⁴ One of those bidders was T-Mobile, which won more licenses and spent more money than either Verizon or AT&T. Similarly, in the 700 MHz auction, there were 214 qualified bidders, of which 101 won licenses. Neither T-Mobile's nor Sprint's economists explain how the substantial number of active participants in those past auctions is consistent with their apparent assumption that "non-trivial fixed costs" of auction participation may deter smaller bidders from participating in future U.S. spectrum license auctions.
- (85) Sprint's and T-Mobile's economists do not appear to assert that their clients are among the "smaller" firms that may be deterred from participating in auctions if there are not restrictions on Verizon and AT&T. Given those companies' substantial financial resources and their proven historical ability to acquire spectrum when they seek to acquire it, there does not appear to be a basis to conclude that the presence of "non-trivial fixed costs" for participating in the Incentive Auction would discourage their participation. Indeed, even if they provided factual support for their conjecture that *smaller* firms may be deterred by the presence of unrestricted *larger* firms (and they do not), Sprint and T-Mobile do not explain why their own presence would not similarly deter smaller rivals from participating.

V.C. Empirical evidence from timber auctions further undermines the revenue theory advanced by Sprint and T-Mobile

- (86) U.S. Forest Service timber auctions are an apposite and instructive real-world test for Sprint's and T-Mobile's conjecture about likely outcomes when smaller bidders face non-trivial fixed costs to participate in auctions. When the U.S. Forest Service sells the rights to harvest timber in a given area ("tract") by auction, it allows would-be participants to survey the tract to gather information about the value of the timber to be harvested. The evaluations of the idiosyncratic features of each tract are typically done through on-foot surveys of each tract by experienced experts known as "cruisers."⁴⁵ These surveys represent a non-trivial fixed cost of auction participation for small loggers who may consider participating in the auction in competition with large mills.⁴⁶ The U.S. Forest Service sets a fraction of harvesting contracts aside for small firms, thus providing the FCC with what economists call a "natural experiment" about the effects of bidder participation restrictions in a non-trivial context—timber sales were about \$1.5 billion per year in the early 1980s (although now they are about 1/10 of that amount).⁴⁷
- (87) Athey, Coey, and Levin (2013) estimate that, far from increasing revenue, set-asides reduced revenue from U.S. Forest Service auctions by 5 percent between 1982 and 1989 (around that time, timber sales were slightly less than

⁴⁴ See http://wireless.fcc.gov/auctions/default.htm?job=auction_summary&id=66.

⁴⁵ As stated in Baldwin, Marshall, and Richard (1997) "Bidder Collusion at Forest Service Timber Sales" *Journal of Political Economy*, 105: 657–699 at page 666, "Certain other facts regarding Forest Service sales are relevant to our study. . . . Second, old-growth timber is highly heterogeneous. Bidders invest significant resources in assessing its value through 'cruises.' Cruises are analogous to geological reports for offshore oil tract sales."

⁴⁶ Athey, Levin, and Seira (2011) "Comparing Open and Sealed-Bid Auctions: Evidence from Timber Auctions," *Quarterly Journal of Economics*, 126: 207–257, state that "the costs of surveying a tract can run to several thousand dollars" and estimate the median survey cost to be about \$3,000 in the Northern forests and about \$5,000 in the California forests. The authors also report that the median expected profit from winning an auction is roughly \$45,000 gross of surveying costs. For smaller bidders who tend to win half or a quarter of the auctions that are won by a median sized bidder, expected profit would tend to be 50 to 25 percent of \$45,000 or \$22,500 to \$11,500. Therefore, survey costs for such small bidders would represent a relatively large percentage of the overall expected profit from bidding in an auction.

⁴⁷ See historical summary and graph of Forest Service cut and sold data, available at http://www.fs.fed.us/forestmanagement/documents/sold-harvest/documents/1905-2012_Natl_Summary_Graph.pdf.

\$1 billion per year) and reduced auction efficiency by 17 percent.⁴⁸ Brannman and Froeb (2000) estimate that, between 1974 and 1989, eliminating the set-aside program would have increased auction revenues by 15 percent. In that period, the U.S. Forest Service timber auction revenues were slightly more than \$1 billion per year.⁴⁹

- (88) Thus, set-asides failed to increase auction revenue and the amounts traded in timber auctions, even though a theoretical argument could be made for large bidders having an advantage over smaller ones in those auctions. It is thus unreasonable to expect that set-asides primarily benefitting large bidders, such as Sprint and T-Mobile, would increase auction revenue (and auction efficiency as well) in the Incentive Auction.

VI. Simulating the effects of bidding restrictions in past spectrum auctions suggests large negative effects on revenue

- (89) In this section, I describe my simulation analysis and results of the impact of bidding restrictions if they had been imposed on the FCC's AWS spectrum auction (Auction 66) and 700 MHz auction (Auction 73). These are two large, relatively recent auctions in which Verizon and AT&T participated. Sprint and T-Mobile participated in the AWS spectrum auction, making that auction of interest for examining how bidding restrictions on Verizon and AT&T might affect those firms. The 700 MHz auction involved low-frequency spectrum, similar to the Incentive Auction. Thus, these two auctions provide useful test cases for the effects of bidding restrictions.
- (90) I simulate the effects of a number of different bidding restrictions, all of which would have a significant effect on the licenses that Verizon and AT&T would be able to bid on in the Incentive Auction:
- a. outright exclusion of AT&T and Verizon from the auction;
 - b. a 33 percent cap on low-frequency (below 1 GHz) spectrum holdings, applied pre-auction by market, such that a carrier would be excluded from bidding at auction in any market where its pre-auction spectrum holdings exceed 1/3 of the low-frequency spectrum in that market;
 - c. a 33 percent cap on low-frequency spectrum holdings applied post-auction by market, assuming that both AT&T and Verizon purchase 20 MHz of spectrum at auction.⁵⁰
- (91) The range of restrictions that I model is designed generally to cover the types of restrictions being proposed that would limit participation by AT&T and Verizon in the Incentive Auction. Differences between past auctions and the Incentive Auction, such as different license sizes (both spectrally and geographically) and different amounts of auctioned spectrum, make it difficult to model precisely some of the specific proposals that have been presented. For example, I understand that Sprint and T-Mobile have proposed that if AT&T or Verizon would be completely excluded from bidding in a particular market under their proposed 1/3 cap on low-frequency spectrum holdings, a "safety valve" may be appropriate under which they could bid on a small amount of spectrum (*e.g.*, 10 MHz or 1/6 of the to-be-auctioned spectrum). Although precise modeling of the effects of such a policy is challenging, based

⁴⁸Susan Athey, Dominic Coey, and Jonathan Levin, (2013), "Set-Asides and Subsidies in Auctions," *American Economic Journal: Microeconomic*, 5(1): 1–27. The authors find that set-asides did increase small firms' participation, but argue that bidding subsidies targeted at small firms would have increased small firms' profits and the U.S. Forest Service revenues with a much more limited "efficiency" cost in terms of reduced quantity harvested.

⁴⁹Lance Brannman and Luke M. Froeb, (2000) "Mergers, Cartels, Set-Asides, and Bidding Preferences in Asymmetric Oral Auctions," *Review of Economics and Statistics*, 82(2): 283–290. These authors concur with the Athey, Coey and Levin (2013) conclusion that a policy of granting bidding preference to targeted bidders is superior to set-asides.

⁵⁰One of the problems with Sprint's and T-Mobile's proposals is that it is not clear what amount of to-be-auctioned spectrum would be included in the denominator for purposes of determining a bidder's share of low-frequency spectrum. Given that the quantity of supply is unknown prior to the Incentive Auction, how a spectrum aggregation cap affects a participant's ability to bid in a particular market depends on how much additional spectrum is cleared in the auction, which is an unknown variable in the context of the Incentive Auction. That constitutes a significant uncertainty regarding how the cap would be applied. In the post-auction share cap exclusion scenarios, I assume that a total of 70 MHz is reallocated in the Incentive Auction. In other words, I assume the denominator used to calculate the firm's share includes the presently-available low-frequency spectrum plus 70 MHz of to-be-auctioned spectrum. That is consistent with T-Mobile's proposal that the FCC adopt a band plan featuring 35x35 MHz of paired spectrum.

on my findings regarding the effects of restrictions that fall short of outright exclusion, it is clear that any measure that materially reduces the demand that AT&T and Verizon bring to the Incentive Auction risks a material reduction in auction revenue.

- (92) Currently, both Verizon's and AT&T's individual shares of low-frequency spectrum are at least 33 percent in many of the 172 Economic Areas (EAs) into which the United States was divided by the Bureau of Economic Analysis of the U.S. Department of Commerce at the time of the first FCC auctions.⁵¹ Any Incentive Auction participation rule that prevents a carrier from participating in the bidding if its pre-auction low-frequency spectrum holdings are above the 33 percent threshold would be equivalent to excluding AT&T and Verizon, as reported in Figure 10. The calculations are based on 134 MHz of available low-frequency spectrum.

Figure 10 The effect of spectrum aggregation caps on Verizon's and AT&T's ability to bid in the Incentive Auction

POPs in EAs* where carrier could not bid when exclusion condition is:	Verizon		AT&T		Excluded population as a % of total U.S. population
	Verizon	AT&T	Verizon	AT&T	
Pre-auction low-frequency* holdings \geq 33%	267,527,458	229,194,228	85%	73%	
Post-auction low-frequency holdings \geq 33% under a total of 70 MHz being re-allocated and named carrier seeking two 5x5 licenses	171,723,755	221,109,342	55%	71%	

* U.S. EAs only, that is, excluding Puerto Rico (EA #173), U.S. territories (EAs #174–175) and Gulf of Mexico EA (#176). Note: assumes Verizon's current Lower 700 MHz block B holdings are assigned to AT&T and Grain, pursuant to transfer applications recently approved by the FCC.

Source: Calculations based on current spectrum holdings data provided by Verizon.

- (93) Figure 10 also reports how extensive the restraint on Verizon and AT&T would be under apparently less stringent participation rules based on post-auction low-frequency holdings. For illustrative purposes, I assume that the Incentive Auction would reallocate 70 MHz of spectrum. I then report the population in EAs where Verizon or AT&T could not win 20 MHz of spectrum because that additional spectrum would bring them above the 33 percent threshold (that is, above 68 MHz).⁵² Figure 10 highlights how limits, seemingly less stringent than outright exclusion, would still have the effect of preventing Verizon from procuring spectrum to serve over half of the U.S. population.

VI.A. Procedure

- (94) For each auction under consideration, I identify the following data:

1. The complete set of bid amounts and net bid amounts (the actual paid amount including the bidding credit) submitted by each participant in every round for each license offered in that auction.
2. Information on whether particular bids were withdrawn or dropped and the tie-breaking random numbers associated with each bid.

⁵¹In 2004 the Bureau of Economic Analysis redefined its EAs, increasing their number from 172 to 179. See <http://www.bea.gov/SCB/PDF/2004/11November/1104Econ-Areas.pdf>. For the purposes of the AWS and 700 MHz Auctions, there were 176 EAs (see the band plans in Appendix B).

⁵²If Verizon and AT&T theoretically sought to acquire only a single 5x5 license, the proposed cap would exclude Verizon from markets representing 50 percent of the population and AT&T would be excluded from markets representing 30 percent. Although historical purchasing patterns suggest that Verizon might not be interested in making a 5x5 MHz purchase, I simulated this scenario and found that it would have led to revenue reductions in both of the auctions. Even assuming that those smaller licenses would have substantial value by themselves (a questionable assumption given the fixed costs Verizon and AT&T would incur deploying spectrum in a new band class), my analysis indicates revenue reductions of up to 25 percent under the simulation methodology described below. That reduction likely understates the revenue effect because I did not attempt to account for the lower levels of demand (*i.e.*, only a 5x5 license instead of the amount actually acquired in the past auction) that AT&T and Verizon would have brought to the auction under this assumption.

3. Information on whether any of the bidders raised their own bid even though they did not need to do so to remain the highest bidder and the provisional winner in a particular round.
- (95) To determine the ranking of bidders, I first look at the bidders' round-specific highest bids. If there are ties, those are resolved by using the tie-breaking random numbers assigned by the FCC.
- (96) In my AWS spectrum auction and 700 MHz auction simulations, in order to simulate the effects of bidder participation restrictions, I assume that all bids in the auctions remain as they were submitted, but I remove the bids of AT&T and Verizon as appropriate for the particular restriction scenario. For example, consider the effect of the exclusion of Verizon in the bidding over a particular license. As demonstrated in Figure 11, Verizon wins license AW-REA001-F in round 16 and pays \$1,335 million (highlighted in yellow). The provisional winning bid for each round (shown in bold) is defined as the round-specific highest bid (as in round 9). If there are ties, I use the tie-breaking random numbers assigned by the FCC to determine the provisional winning bid (as in rounds 10 or 12). Now assume that Verizon is not permitted to bid. The second-highest bidder, in this case T-Mobile, wins and pays an amount that exceeds the bid submitted by the third-highest bidder or equals the bid of the third-highest bidder but has a higher tie-breaking random number. In this example, T-Mobile pays \$644 million (highlighted in green), a bid that exceeds Dolan's \$537 million submitted in round 10. I refer to this as the "As bid" method. I make adjustments for reserve prices, the absence of other bidders, and ties.

Figure 11 AWS spectrum auction simulation example (license AW-REA001-F)

Round	Bidder	Actual Bids		"As Bid" simulation	
		Bid (\$ millions)	Random number	Bid (\$ millions)	Random number
9	Verizon	248	0.16		
	Denali	248	0.65	248	0.65
	Dolan	273	0.40	273	0.40
	SpectrumCo (Sprint)	447	0.87	447	0.87
	Wireless DBS LLC	248	0.56	248	0.56
10	Verizon	537	0.21		
	Dolan	537	0.32	537	0.32
12	Verizon	644	0.66		
	T-Mobile	644	0.15	644	0.15
13	T-Mobile	773	0.27	773	0.27
14	Verizon	927	0.12		
15	T-Mobile	1,113	0.74	1,113	0.74
16	Verizon	1,335	0.68		

Source: FCC documentation.

Note: The provisional winning bids for each round are in bold. The original win is highlighted in yellow and the simulated win is in green.

- (97) As another example, if Verizon were the second-highest bidder and so determined the price paid by the winner, then, when excluding Verizon, I assume that the same bidder wins but pays only the bid amount that would have been just enough to outbid the third-highest bidder, again adjusting appropriately for reserve prices. For instance, as demonstrated in Figure 12, AT&T wins license WY-CMA167-B in round 26 and pays \$3.17 million (highlighted in yellow). If Verizon and AT&T are not permitted to bid, the second highest bidder, in this case MetroPCS, becomes a winner. MetroPCS pays \$1.66 million if I use the "As bid" method (highlighted in blue) because in round 21 MetroPCS has to overbid Verizon's \$1.51 million submitted in round 20. But if Verizon and AT&T are unable to bid, MetroPCS only needs to overbid Alltel, which submitted \$0.96 million in round 12. Hence, it is enough to bid only \$1.15 million submitted in round 13 by AT&T (highlighted in green). I refer to this as the "Minimum required bid" method and use it in the analysis that follows. This method is preferable to the "As bid" approach because it uses a more accurate model of bidding behavior. In particular, bidders

would rationally bid only as much as it is necessary to overbid the preceding highest bid.

Figure 12 700 MHz auction simulation example (license WY-CMA167-B)

Round	Bidder	Actual Bids		"As Bid" vs. "Minimum required bid" simulation	
		Bid (\$ millions)	Random number	Bid (\$ millions)	Random number
12	Alltel	0.96	0.51	0.96	0.51
	AT&T	0.96	0.09		
13	AT&T	1.15	0.73	1.15	0.73
	Verizon	1.15	0.59		
18	Verizon	1.28	0.07		
19	AT&T	1.38	0.53		
20	Verizon	1.51	0.88		
21	AT&T	1.66	0.81	1.66	0.80
	MetroPCS	1.66	0.80		
22	Verizon	1.88	0.66	1.88	0.27
	MetroPCS	1.88	0.27		
23	AT&T	2.15	0.04	2.15	0.64
	MetroPCS	2.15	0.64		
24	AT&T	2.47	0.58		
	Verizon	2.47	0.31		
25	Verizon	2.84	0.56		
26	AT&T	3.17	0.36		

Source: FCC documentation.

Note: The provisional winning bids for each round are shown in bold. MetroPCS wins and pays \$1.66 million under the "As Bid" simulation method (highlighted in blue) and only \$1.15 million under the "Minimum required bid" method (green).

- (98) This methodology does not provide a perfect measure of the effects of excluding bidders, but it has the advantage of relying on the bids actually submitted at the auction to estimate effects. On the one hand, it will understate the revenue loss from excluding Verizon and AT&T in the following types of cases. Suppose bidder A would like to purchase one of two different licenses, which it views as substitutes, and that in the auction it wins one license and finishes as the second-highest bidder on the other, losing to Verizon. When I reevaluate the bids without Verizon, my methodology will predict that bidder A wins both licenses, when bidder A, who wants only one of the two licenses, might not have bid in such a way as to win both (even though prices are lower in the absence of Verizon). On the other hand, this methodology could theoretically overstate the revenue loss from excluding bidders if the absence of bidders such as Verizon and AT&T causes bidders to win licenses they would not have otherwise, and the acquisition of these licenses increases their value for other licenses due to complementarities, causing them to bid more aggressively on those other licenses. In addition, my methodology could theoretically overstate the revenue loss from exclusion if, for example, knowledge of the exclusion of certain bidders prior to the auction induces additional entry into the auction (in expectation of lower prices) thus increasing the competitiveness of the auction. However, I am not aware of any reason to expect that either the understatement or overstatement effect that is possible in my methodology would dominate.⁵³
- (99) This approach allows a detailed examination on a license-by-license basis of the potential impact of excluding specific bidders in specific markets that I believe is informative as to the likely effects of restrictions on bidder participation. In the absence of Verizon and AT&T, I expect that the bidding of other auction participants would have been largely similar (especially given the anonymous bidding format of 700 MHz Auction). Thus, I view the simulation results as informative as to the revenue reductions that one might

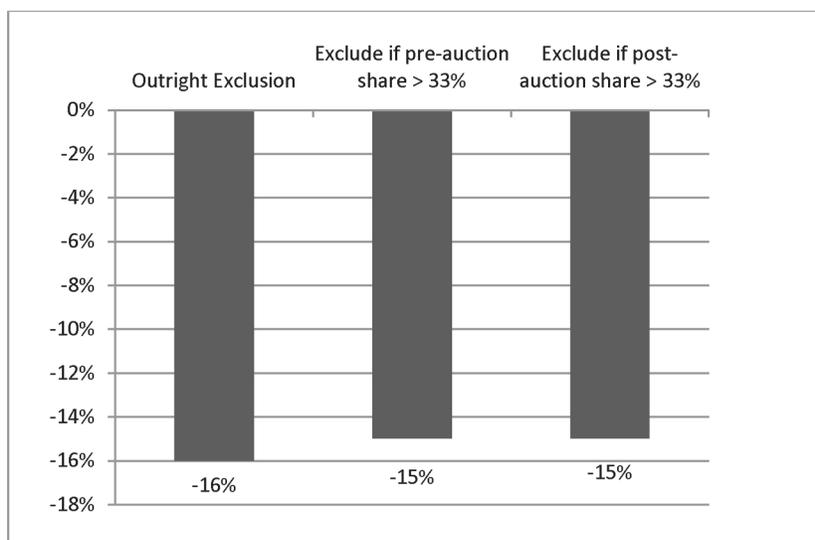
⁵³ As discussed in Section V.C above, the empirical evidence appears to undercut the suggestion by some parties that bidding restrictions on Verizon and AT&T might increase revenue by encouraging the participation of other bidders.

expect to observe as a result of restrictions on the ability of Verizon and AT&T to participate.

VI.B. Results—Auction 66—AWS spectrum auction

- (100) In this section I describe simulation results for the AWS auction. Appendix C describes the band plan for this auction.
- (101) As previously described, I considered three scenarios: outright exclusion of AT&T and Verizon, a pre-auction 33 percent share cap applied to AT&T and Verizon, and a post-auction 33 percent share cap assuming purchase of 20 MHz in the market applied to AT&T and Verizon. Simulating the effects of these exclusion scenarios results in a 15 percent to 16 percent reduction in revenue.

Figure 13 Summary of simulated revenue reductions in the AWS spectrum auction



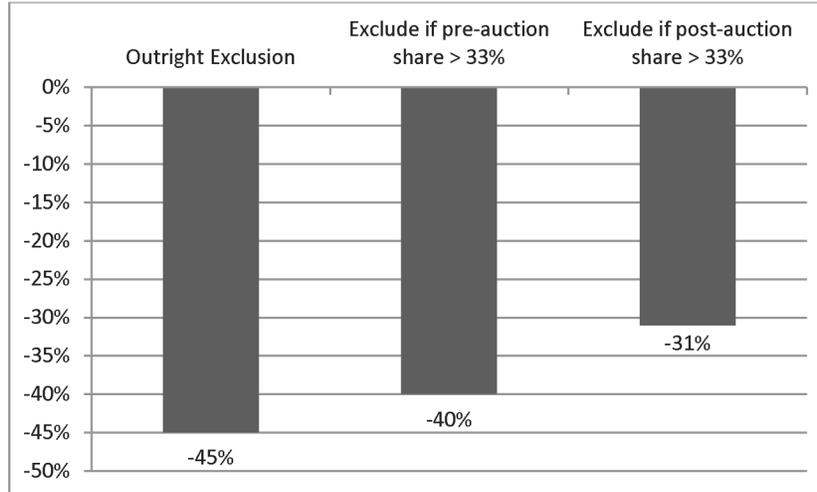
Source: Calculations based on the FCC data and documentation.

- (102) As Figure 13 reports for the three scenarios, the simulation estimates a revenue drop of between 15 and 16 percent. This implies that a pre-or post-auction share cap of 33 percent would have had almost the same effect as outright exclusion of Verizon and AT&T in the AWS auction.
- (103) I simulated the changes in the average price paid by top bidders as a result of the exclusion of Verizon and AT&T. T-Mobile enjoys the largest decrease in the average price per MHz*POP as a result of the exclusion—18 percent. SpectrumCo (Sprint) enjoyed a 6 percent decrease in the average price it paid per MHz*POP.
- (104) Also, I calculated the results of a hypothetical version of the AWS auction in which all of the licenses were auctioned on a CMA basis. This provides a robustness check and offers a way to reduce effects related to the presence of small numbers of large licenses. The results, which are set forth in Appendix D, are similar to the results of the simulation of the actual auction.

VI.C. Results—Auction 73—700 MHz auction

- (105) I ran a similar simulation in the 700 MHz auction. This auction involved six categories of licenses referred to as Blocks A through F. Appendix C describes the band plan for this auction.
- (106) I simulate 700 MHz auction results under the same restriction scenarios as in the AWS spectrum auction simulations. Figure 14 summarizes my results.

Figure 14 Summary of simulated revenue reductions in the 700 MHz auction



Source: Calculations based on the FCC data and documentation.

- (107) In this auction, the revenue drop is even more dramatic. This is likely because of the particularly intense competition between Verizon and AT&T during that auction. In the 700 MHz Auction, AT&T and Verizon often competed against each other when bidding for 12 MHz of Block B CMA-level licenses. AT&T won 227 CMA-level licenses and paid \$6,637 million. Verizon won 77 CMA-level licenses and paid \$2,052 million.
- (108) If, hypothetically, AT&T and Verizon had not bid against each other in the auction,⁵⁴ my analysis of the auction data suggests that they would still have won all 304 CMA-level licenses, but would have paid only \$4,453 million instead of \$8,689 million. Thus, absent competition between AT&T and Verizon, 700 MHz auction total revenues would be \$14,722 million instead of \$18,958 million—22 percent lower. That result confirms that restrictions on Verizon and AT&T in the Incentive Auction would limit not just the participation of two significant buyers, but two significant buyers who have historically competed aggressively against one another, to the benefit of auction revenues.
- (109) The fact that head-to-head competition between Verizon and AT&T was robust also contradicts the suggestion that Verizon and AT&T were pursuing a foreclosure strategy: they collectively paid over four and a half billion dollars *more* for their spectrum than they would have had to if their goal had been to keep the spectrum out of the hands of competitors.

VII. Bidding restrictions in a simulated incentive auction

- (110) In addition to the revenue simulations described above, I also simulate the effects of restricting the participation in the Incentive Auction using a theoretical model of a two-sided auction.⁵⁵ Although the model does not capture

⁵⁴There is no basis to expect, and no party appears to assert otherwise, that Verizon and AT&T would risk violating both the FCC's bidder collusion rules and the antitrust laws by agreeing to not bid against one another.

⁵⁵Our model is based on the two-sided auction mechanism of Simon Loertscher and Claudio Mezzetti (2013), "A Dominant Strategy Double Auction with Multi-Unit Traders," Working Paper, University of Melbourne, available at <http://www.simonloertscher.net/data/downloads/12120/LM-DoubAuc3.pdf>. This paper introduces a double auction mechanism in which buyers and sellers with multi-unit demand and supply have a dominant strategy to bid truthfully. The mechanism produces nonnegative revenue for the auctioneer and traders never regret participating (ex-post individual rationality is satisfied). In this Loertscher-Mezzetti double auction, the short side of the market trades at a single price, while the long side trades at prices deter-

Continued

all the complexity of the Incentive Auction, it does model the important interaction between supply and demand in a two-sided auction.

- (111) The interaction between supply and demand in a two-sided auction makes the problem of designing an incentive auction fundamentally different from the problem of designing a standard auction. The auctioneer does not know how much buyers are willing to pay nor how much sellers would require in order to be willing to sell. The auction mechanism must elicit this information from buyers and sellers, determine the quantities to be exchanged, and determine the amounts to be charged to buyers and paid to sellers, retaining the difference between the total amount received from buyers and the total amount paid to sellers as revenue to the auctioneer. Key ways in which a two-sided incentive auction differs from the standard one-sided auction include:⁵⁶
- (1) *Fully efficient two-sided mechanisms do not generate positive revenue.* In a two-sided market, in order to guarantee that goods are reallocated to their highest-value use—in the case at hand, making sure that this one-time opportunity to reallocate broadcast spectrum to higher-value wireless services does not go to waste—the market designer must be willing to take a loss in order to induce both sides of the market to reveal their true valuation of the object. In the Incentive Auction, as previously noted, Congress and the FCC seek to generate positive revenue, so a fully efficient mechanism is not an option.
 - (2) *The revenue-efficiency trade-off is steeper in an incentive auction.* In order to maximize revenue, the market designer must give up more in terms of the market’s ability to allocate licenses to the highest valuing users than in a standard auction. Parties involved need to appreciate the negative efficiency consequences of demands for revenue on the Incentive Auction.
 - (3) *The exclusion of strong buyers can have more severe consequences in an incentive auction.* An incentive auction can be more sensitive to the exclusion of a strong buyer than a standard auction. The effect is more pronounced the stronger is the strong buyer and less pronounced as the number of other buyers increases. In addition, in the Incentive Auction, a reduction in the amount of spectrum transacted has broader implications because it means that less spectrum will be reallocated from broadcast use to mobile wireless services and could potentially affect the repacking of the remaining broadcast licenses.
- (112) The simple two-sided auction model that I present in this section illustrates the trade-offs that the auctioneer faces and how the exclusion of bidders negatively affects the outcomes that the auctioneer may expect to realize. The auctioneer’s two conflicting goals are auction revenue maximization on one hand and efficiency maximization on the other (*i.e.*, the goal of facilitating all transactions for which the buyer values the good more than the seller).
- (113) If the auctioneer knows how much each seller and each buyer values the goods for sale, the auctioneer can achieve both goals by allowing all the trades where the buyer values the good more than the seller, and then requiring that each trading pair surrender the (positive) difference between their two values. However, in real world situations, the auctioneer will not know how much each seller and each buyer values the goods for sale, and therefore the auctioneer needs to design a mechanism to induce them to reveal such private information through their bids. In order to earn revenue, the auctioneer necessarily must reduce the number of trades below the efficient level. The distortion in the number of transactions may be large if the auctioneer seeks to maximize its revenue from the two-sided auction at the expense of efficiency.
- (114) In what follows, I show how market conditions, including the number of potential traders and their uncertain valuations from the auctioneer’s point of view, give rise to a range of possible outcomes. These outcomes reflect the

mined by the well-known in the economics literature Vickrey-Clarke-Groves (VCG) mechanism (with a reserve price).

⁵⁶The discussion in this paragraph is based on Simon Loertscher, Leslie M. Marx, and Tom Wilkening (2013), “A Long Way Coming: Designing Centralized Markets with Privately Informed Buyers and Sellers,” Working Paper, Duke University, available at <https://faculty.fuqua.duke.edu/~marx/bio/papers/incentiveauction.pdf>.

inherent trade-off in two-sided markets between auctioneer revenue and the efficiency of the auction. The outcome implemented by an auctioneer will depend on the auctioneer's preferences between the two conflicting goals. I show that the exclusion of bidders can substantially worsen the range of outcomes available to the auctioneer.

VII.A. Procedure

- (115) I calculate a relatively simple example to illustrate the trade-off between auctioneer revenue and efficiency and the effect of bidder exclusion. Given that this model is purely illustrative and not meant to be a quantitative prediction of the effects of exclusion, I do not attempt to calibrate it to expected parameter values. In my set-up, 10 potential sellers each holding 1 unit of a homogenous good face 5 potential buyers, each interested in purchasing up to 4 units.
- (116) The auctioneer does not know how much the potential sellers value the units that they own. The auctioneer only knows that the value for any given seller is between \$0 and \$1 and that values between \$0 and \$1 are equally likely. Thus, I assume that the auctioneer expects that, on average, an individual seller values her unit at \$0.50, but the auctioneer knows that among the 10 sellers some sellers will randomly draw values much less than \$0.50 (and hence, relatively more willing to sell) and some sellers will randomly draw values much more than \$0.50 (hence, relatively less willing to sell). In particular, the auctioneer expects that, if it could see the valuations and line them up from lowest to highest, there would be a range of seller values spread between \$0 and \$1.⁵⁷
- (117) Similarly, the auctioneer does not know how much potential buyers are willing to pay for each of the 4 units each buyer is interested in. The auctioneer only knows that the value any given buyer places on a unit is between \$0 and \$1, but I assume that values greater than \$0.50 are relatively more likely so that the auctioneer expects that, on average, an individual buyer will value an individual unit at \$0.75.⁵⁸
- (118) To illustrate the trade-off between auction revenue and auction efficiency, I consider the outcomes the auctioneer can expect to achieve if it runs a two-sided auction mechanism based on the work of Loertscher and Mezzetti (2013). We can view the mechanism as a two-sided version of a multi-unit Vickrey auction with a reserve price,⁵⁹ which is a multi-unit extension of a second-price auction, in which bidders submit bids and the high bidder wins but pays only the amount of the second-highest bid. In Appendix E, I provide the technical details behind the illustrative simulations results presented in this section.

VII.B. Results

- (119) A two-sided auction can be designed to emphasize revenue or to emphasize efficiency through the selection of auction design parameters. In the model I use, a design that provides relatively high payments to sellers encourages them to supply more units, which tends to increase efficiency but reduce expected auctioneer revenue. A design that provides relatively low payments to sellers not only lowers the price paid to sellers but also reduces the number of units supplied, which increases competition among the buyers and thus increases the average price buyers pay and the expected revenue to the auctioneer. Therefore, depending on the auction design, the auctioneer can emphasize revenue, efficiency, or balance the two.
- (120) That trade-off in my model is depicted in Figure 15. (See Appendix E for the details underlying this illustration.) Expected auctioneer revenue is on the vertical axis, and the expected number of units reallocated or traded is represented on the horizontal axis, where a larger number of units reallocated implies that the auction is more efficient. The curves in Figure 15 are

⁵⁷I assume that sellers draw values randomly from the uniform distribution over the unit interval.

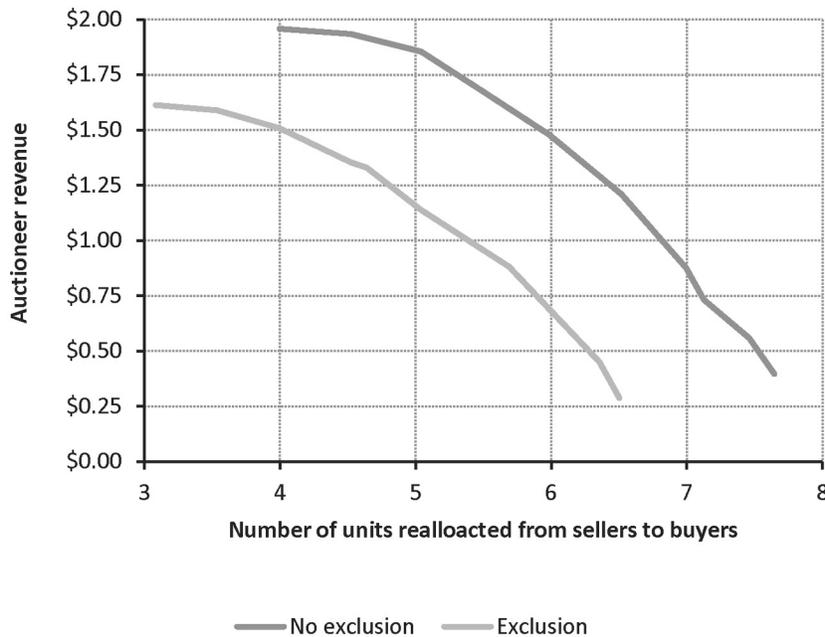
⁵⁸More formally, I assumed that each buyer's value for a given unit is a random variable with support [0, 1] and cumulative distribution $F(x) = x^3$.

⁵⁹See Vickrey, William (1961), "Counterspeculation, Auctions, and Competitive Sealed Tenders," *Journal of Finance*, 16: 8–37. This mechanism is sometimes referred to as a Vickrey-Clarke-Groves auction, as Clarke and Groves independently reached similar conclusions, see Clarke, E.H. (1971), "Multipart Pricing of Public Goods," *Public Choice*, XI, 17–33, Groves, Theodore (1973), "Incentives in Teams," *Econometrica*, 41: 617–31.

downward sloping, which indicates that auction designs that produce greater expected revenue also produce a lower expected number of trades.

- (121) The blue line in Figure 15 shows the combinations of average revenue and numbers of trades that are feasible without exclusion. That is, without exclusion, if the auction is designed to maximize revenue, the auctioneer can expect to earn nearly \$2 with an average of 4 units changing hands. If instead the auction is designed to maximize efficiency, the auctioneer will expect to earn less than \$0.50 with an average of approximately 7.5 units changing hands. The blue curve between these two extremes represents all of the intermediate combinations of expected revenue and number of trades that are achievable depending on the auction design parameters chosen.⁶⁰ Similarly, the green curve depicts the combinations that are achievable if two of the five identical buyers are excluded.

Figure 15 Expected number of trades and auction revenues in a simple two-sided auction



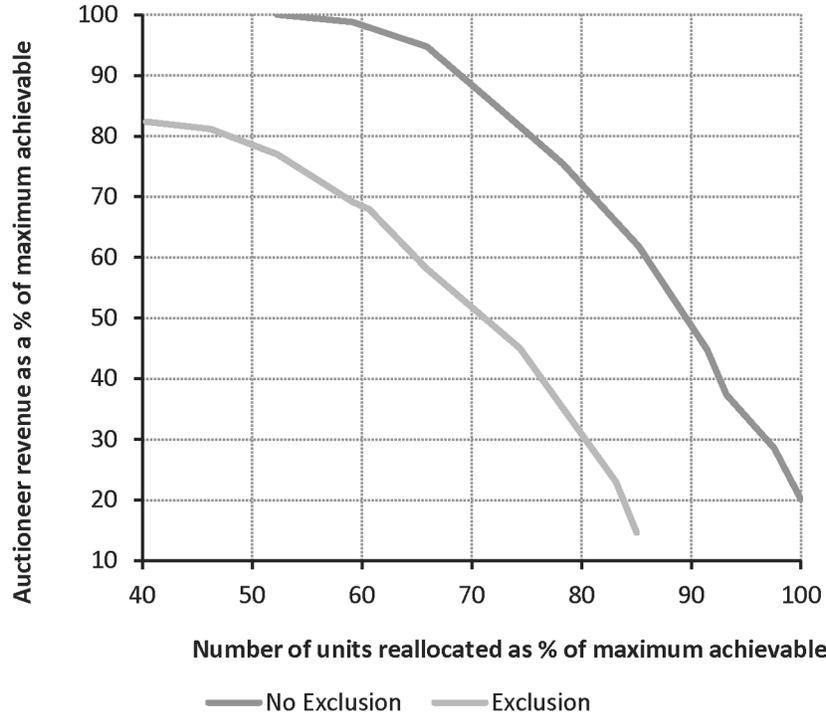
Source: Calculations.

VII.B.1. Exclusion of bidders in a two-sided mechanism worsens the choices available to an auctioneer

- (122) In my illustrative model, the number of units traded are not calibrated to real-world values, so I redraw Figure 15 to express the *shift inward of the auction outcomes under exclusion* as a percentage of the maximum number of trades achievable under no exclusion—the point representing approximately 7.5 units in Figure 15 corresponds to 100 units in Figure 16 below. Similarly, because auction revenues in the model are not calibrated to real-world values, I redraw the figure so that approximately \$2.00 in auctioneer revenues in Figure 15 corresponds to 100 in Figure 16.

⁶⁰These combinations of revenue and numbers of trades are achievable in an expected sense. The values of the buyers and sellers are random in the model. Therefore, for a given reserve price the number of trades and revenue will depend on the actual values drawn. The combinations of revenue and numbers of trades are the mean outcomes when values are redrawn and auction rerun many times.

Figure 16 Impact of exclusion in a simple two-sided auction (max trades under no exclusion=100; max auctioneer revenue under no exclusion=100)



Source: Calculations.

(123) As shown in Figure 16, exclusion reduces the maximum auctioneer revenue by just under 20 percent. (You can see this in the figure by noting that the maximum revenue value for the green line is just over 80.) Exclusion also reduces the efficiency-maximizing number of trades by approximately 15 percent. (The maximum number of trades for the green line is approximately 85.) An auctioneer aiming to find a compromise solution between these two conflicting targets stands to lose more than 20 percent on auction revenue and more than 15 percent on efficiency from exclusion. (The green line is more than 20 percent below the blue line, except close to the point of maximum revenue where it is slightly less than 20 percent below, and the green line is more than 15 percent to the left of the blue line.)

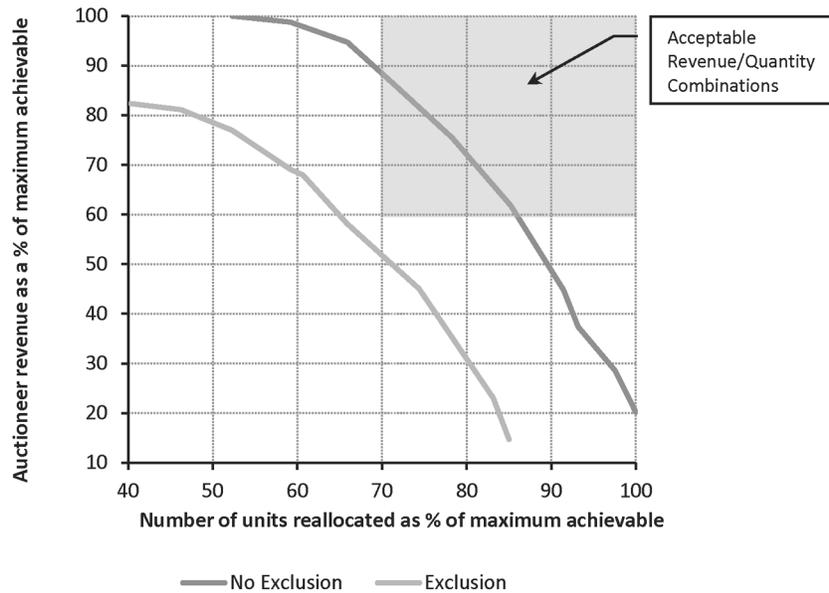
(124) The set of revenue levels and numbers of transactions that can be achieved in a two-sided mechanism shifts down and to the left (towards lower revenue levels and fewer trades) when buyers are excluded. Bidding restrictions mean that the maximum possible revenue is reduced and the maximum number of transactions that can be achieved is reduced. Furthermore, the feasible set of revenue levels and numbers of transactions is worsened from the perspective of the auctioneer.

VII.B.2. Exclusion of bidders in a two-sided mechanism can cause revenue and transaction goals to be unattainable

(125) As described above (see para. (20)), the Incentive Auction must raise a minimum level of revenue in order to succeed in reallocating licenses from broadcast TV to mobile wireless services. In addition, although not required by the authorizing legislation, it is clear that the Incentive Auction is being relied upon to fund the First Responder Network Authority (FirstNet) (see fn. 7).

- (126) Furthermore, the National Broadband Plan calls for the FCC to take steps to reallocate 120 MHz from the broadcast TV bands as part of the goal of making an additional 300 megahertz between 225 MHz and 3.7 GHz available for mobile use by 2015. As described in the National Broadband Plan, “Incentive auctions can be especially useful where fragmentation of spectrum licenses makes it difficult for private parties to aggregate spectrum in marketable quantities.”⁶¹
- (127) If minimum thresholds of revenue and quantity transacted are required for the auction to succeed, then the elimination of two buyers can make achieving those thresholds impossible, causing the auction to fail. This case is illustrated in Figure 17, which assumes that auction success requires at least 70 percent of the maximum number of trades and 60 percent of the maximum revenue achievable under unrestricted competition. The blue-shaded box represents the range of outcomes that satisfy both requirements for auction success. As Figure 17 shows, exclusion results in failure to satisfy either requirement.

Figure 17 Exclusion may cause the illustrative two-sided auction to fail



Source: Calculations.

- (128) My understanding is that there are substantial technical challenges associated with configuring a band plan that makes a reasonable amount of paired spectrum available to wireless operators. Specifically, I understand that no party has presented a band plan designed to repurpose paired spectrum if the amount of cleared spectrum is less than 72 MHz in numerous markets because that is the minimum amount needed to configure a 25x25 MHz band plan. Given the potentially drastic result of an outcome where that minimum clearing threshold is not met, imposing restrictions that would materially suppress the quantity of spectrum repurposed would present a particularly acute risk of outright auction failure.
- (129) Therefore, bidding restrictions on buyers at the Incentive Auction have the potential to create an environment in which the goals for the Incentive Auction of revenue generation and spectrum reallocation cannot be achieved. In this sense, bidding restrictions can cause the Incentive Auction to fail.

⁶¹ National Broadband Plan, Section 5.3, <http://www.broadband.gov/>.

VII.C. *Proposals for a contingent auction would distort the auction process and potentially contribute to auction failure*

- (130) T-Mobile recently proposed that the FCC apply strict bidding restrictions to Verizon and AT&T, but if certain revenue goals are not met, then the restrictions would be relaxed and the auction rerun, and so on, relaxing the restrictions repeatedly until revenue goals are met.⁶² That proposal would increase the complexity of an already complex Incentive Auction and would increase the risk of auction failure. Rerunning auctions can cause a number of problems from increased risk of coordinated bidding to distorted bidding incentives in an effort to game the system, which in complicated auctions can be difficult to predict and therefore avoid. In addition, even if such a mechanism theoretically allows the auction to achieve a revenue target, bidding restrictions will still decrease the amount of reallocated spectrum. Perhaps the most fundamental problem with the T-Mobile proposal is that it subverts the benefits of a two-sided auction as a means of determining the efficient allocation. The proposal would use a revenue target determined outside of the auction context to determine the amount of spectrum to be reallocated, but there is no way such a revenue target can reasonably be expected to achieve an efficient reallocation. If the auction were to meet the arbitrary set of revenue targets with restrictions on Verizon and AT&T, it is likely that the auction would have reallocated additional spectrum and/or raised more revenue had there been no restrictions.
- (131) It has been shown in the economics literature that contingent re-auctions are generally neither efficient nor optimal for the seller.⁶³ Strategic bidding in the 700 MHz auction as a result of the contingent re-auction format has been documented in the economics literature.⁶⁴ In order to avoid incentives for strategic bidding in the proposed auction format, detailed and potentially complex and restrictive activity rules would have to be put in place. However, such complicated restrictions would likely reduce the efficiency of the auction and would themselves create additional harmful effects.
- (132) One such harmful effect is illustrated by T-Mobile's attempt to address potential strategic bidding incentives by imposing an "activity rule" under which restrictions would be relaxed *only* in markets where the restricted bidders are actively bidding. That rule creates an exposure risk because it may require restricted bidders to bid on licenses that in and of themselves are of little value in order to retain and expand their eligibility to bid on the licenses they actually want. Take the example of a restricted bidder whose business plan calls for a 10x10 MHz license in a particular market and who places little value on a single 5x5 license. If the bidder only has "headroom" under the cap to bid on a single 5x5 MHz licenses, under T-Mobile's proposal it would need to bid on a license that has little value by itself in order to have a chance of acquiring the license it does want. A firm in that position may choose not to bid on the smaller license because of the risk that it wins it without the ability also to acquire the complementary licenses that are needed for its business plan. That exposure problem is further complicated and exacerbated by the fact that, under the cap, firms will have different levels of headroom in different markets, which introduces an additional layer of complexity for firms interested in acquiring footprint-wide licenses of particular sizes.
- (133) T-Mobile's proposal would also compromise the ability of restricted bidders to move their demand between geographic markets based on price feedback received during the auction. Consider a firm that is interested in acquiring a license in either Milwaukee or Kansas City, but not in both markets. Under a normal auction, that bidder could first seek to acquire a license in Kansas City and see how the bidding proceeds there, and then it may choose to shift its demand to Milwaukee if the Kansas City license becomes too expensive. Auction designs that support the ability of bidders to move demand between markets have been promoted by the FCC. But under the proposal, that strategy would be prohibited because the firm would lose its ability to bid in Milwaukee if it has not been actively bidding there starting

⁶² See <http://apps.fcc.gov/ecfs/document/view?id=7520934888>.

⁶³ Sandro Brusco, Giuseppe Lopomo, and Leslie M. Marx (2011), "The Economics of Contingent Re-Auctions," *American Economic Journal: Microeconomics* 3(2), 165–193.

⁶⁴ Sandro Brusco, Giuseppe Lopomo, and Leslie M. Marx (2009), "The 'Google Effect' in the FCC's 700 MHz Auction," *Information Economics and Policy* 21, 101–114.

- in round one. The result is that a rational firm may not acquire *any* license even though it would have acquired a license in an unrestricted auction.
- (134) The exposure risks and strategic bidding incentives created by the proposal would not be limited to the restricted bidders. For example, the risk that the proposal leaves money on the table is heightened by the fact that non-restricted bidders would have the incentive to bid strategically to ensure that the revenue is target is met, but not exceeded, in order to avoid letting the restricted bidders have the opportunity to bid on more spectrum, which would increase overall bidding.
- (135) In sum, my prediction on the auction outcome under T-Mobile's proposal is that Sprint and T-Mobile would raise their bids just enough to meet the revenue target and win the licenses at depressed prices. They and/or other winners at the auction would then have the ability to sell that spectrum on the secondary market to Verizon and AT&T at higher prices.

VIII. Conclusion

- (136) I have analyzed proposals to restrict the participation of Verizon and AT&T in the Incentive Auction in order to prevent the anticompetitive foreclosure of smaller rivals. The evidence does not support assertions that anticompetitive foreclosure is likely. (1) I have reviewed the outcomes of previous auctions and find no evidence of foreclosure. (2) The evidence from secondary market transactions and previous auctions suggests that Sprint and T-Mobile failed to take advantage of numerous opportunities to purchase low-frequency spectrum. (3) A review of the pricing plans offered by Verizon, AT&T, Sprint, and T-Mobile is consistent with the conclusion that the networks of Verizon and AT&T are capacity constrained relative to Sprint and T-Mobile, implying that little would be gained from foreclosing Sprint and T-Mobile. (4) As both Verizon and AT&T would supposedly benefit from foreclosure of Sprint and T-Mobile, incentives to free ride on the other's efforts would further reduce any gains from foreclosure. (5) Successful foreclosure is complicated and made more costly by the fact that, in the Incentive Auction, an increase in bid amounts to deny Sprint and T-Mobile spectrum will tend to increase the amount of spectrum supplied to the market. (6) Finally, the market for wireless services does not appear to be sufficiently concentrated to make foreclosure profitable.
- (137) While not addressing a real problem, proposals to restrict the bidding of Verizon and AT&T conflict with the goals of the Incentive Auction: reallocation of spectrum to higher valued uses and revenue generation. In order to assess the impact of bidding restrictions, I have simulated their impact on Auction 66 (AWS) and Auction 73 (700 MHz) and found that restrictions would have significantly reduced the revenue generated in those auctions. In addition, I have simulated the exclusion of two bidders in an illustrative example of a two-sided market similar in structure to the Incentive Auction. The results illustrate the trade-off faced by an auctioneer in a two-sided setting between revenue generation and efficiency. Excluding bidders reduces both the amount of spectrum reallocated and the potential revenue generated.
- (138) The Incentive Auction represents a unique opportunity to reallocate underutilized spectrum to higher valued uses. It would be particularly unwise to artificially reduce demand in the Incentive Auction through restrictions on the bidding of Verizon and AT&T. Bidding restrictions conflict with the goals of the Incentive Auction by reducing both the amount of spectrum reallocated and the revenue potential of the auction. Such restrictions risk a complete failure of the auction by making the achievement of minimum revenue and spectrum reallocation thresholds impossible to achieve. Despite the evidence I have presented, if the FCC believes that foreclosure by Verizon and AT&T of smaller rivals is a real problem, I urge the FCC to consider other less distortionary policies to address the potential problem, such as build-out requirements and anonymous bidding. Complicated bidding procedures and bidding restrictions on top of an already complicated two-sided auction put at risk the goals of the Incentive Auction. I find such proposals both unnecessary and counterproductive.

APPENDIX A. CURRICULUM VITAE OF LESLIE M. MARX, PhD

A.1. Education

- PhD, Economics, Northwestern University
- MA, Economics, Northwestern University
- BS, Mathematics, Duke University

A.2. Professional experience

- Fuqua School of Business, Duke University, Robert A. Bandeen Professor of Economics, 2013–present
- Fuqua School of Business, Duke University, William and Sue Gross Research Fellow and Professor of Economics, 2012–2013
- Fuqua School of Business and Department of Economics, Duke University, Professor of Economics, 2008–2013
- Associate Professor of Economics, Fuqua School of Business, Duke University, 2002–2008
- Chief Economist, U.S. Federal Communications Commission, August 2005–August 2006
- Associate Professor of Economics and Management, W.E. Simon Graduate School of Business Administration, University of Rochester, 2000–2002
- Visiting Associate in Economics, California Institute of Technology, January 2000–June 2000
- Associate Professor of Economics and Management, W.E. Simon Graduate School of Business Administration, University of Rochester, 1999–2000
- Assistant Professor of Economics and Management, W.E. Simon Graduate School of Business Administration, University of Rochester, 1994–1999

A.3. Teaching

- MBA: Managerial Decision Analysis, Managerial Game Theory, Environmental Economics
- Executive MBA: Managerial Economics, Managerial Decision Analysis, Managerial Game Theory
- PhD: Game Theory, Industrial Organization

A.4. Publications

- “Tacit Collusion in Oligopoly” (with Edward Green and Robert C. Marshall). In *Oxford Handbook of International Antitrust Economics*, eds. Roger D. Blair and D. Daniel Sokol. Oxford University Press, forthcoming.
- “Economics and the Efficient Allocation of Spectrum Licenses” (with Simon Loertscher). In *Mechanisms and Games for Dynamic Spectrum Access*, eds. Tansu Alpcan, Holger Boche, Michael L. Honig, and H. Vincent Poor. Cambridge University Press, forthcoming.
- “The Economics of Auctions and Bidder Collusion” (with Robert C. Marshall and Michael J. Meurer). In *Game Theory and Business Applications*, 2nd ed., eds. Kalyan Chatterjee and William F. Samuelson. New York: Kluwer Academic Publishers, forthcoming.
- *The Economics of Collusion: Cartels and Bidding Rings* (with Robert C. Marshall). Cambridge: MIT Press, 2012.
- “Plus Factors and Agreement in Antitrust Law” (with William E. Kovacic, Robert C. Marshall, and Halbert L. White). *Michigan Law Review* 110, no. 3 (2011): 393–436. Winner of the Tenth Annual Jerry S. Cohen Memorial Fund Writing Award given for the best antitrust writing during the prior year.
- “Bidder Collusion at First-Price Auctions” (with Giuseppe Lopomo and Peng Sun). *Review of Economic Design* 15, no. 3 (2011): 177–211.
- “Carbon Allowance Auction Design: An Assessment of Options for the U.S.” (with Giuseppe Lopomo, David McAdams, and Brian Murray). *Review of Environmental Economics and Policy* 5, no. 1 (2011): 25–43.
- “Coordinated Effects in the 2010 Horizontal Merger Guidelines” (with Wayne-Roy Gayle, Robert C. Marshall, and Jean-Francois Richard). *Review of Industrial Organization* 39, no. 1 (2011): 39–56.
- “The Economics of Contingent Re-Auctions” (with Sandro Brusco and Giuseppe Lopomo). *American Economic Journal: Microeconomics* 3, no. 2 (2011): 165–93.

- “Break-Up Fees and Bargaining Power in Sequential Contracting” (with Greg Shaffer). *International Journal of Industrial Organization* 28, 451–463 (2010).
- “Slotting Allowances and Scarce Shelf Space” (with Greg Shaffer). *Journal of Economics & Management Strategy* 19, no. 3 (2010): 575–603.
- “Cartels as Two-Stage Mechanisms: Implications for the Analysis of Dominant-Firm Conduct” (with Randall D. Heeb, William E. Kovacic, and Robert C. Marshall). *Chicago Journal of International Law* 10, no. 1 (2009): 213–31.
- “Individual Accountability in Teams” (with Francesco Squintani). *Journal of Economic Behavior & Organization* 72, no. 1 (2009): 260–73.
- “Quantitative Analysis of Coordinated Effects” (with William E. Kovacic, Robert C. Marshall, and Steven P. Schulenberg). *Antitrust Law Journal* 76, no. 2 (2009): 397–430.
- “The ‘Google Effect’ in the FCC’s 700 MHz Auction” (with Sandro Brusco and Giuseppe Lopomo). *Information Economics and Policy* 21 (2009): 101–14.
- “The Vulnerability of Auctions to Bidder Collusion” (with Robert C. Marshall). *Quarterly Journal of Economics* 124, no. 2 (2009): 883–910.
- “Cartel Price Announcements: The Vitamins Industry” (with Robert C. Marshall and Matthew E. Raiff). *International Journal of Industrial Organization* 26 (2008): 762–802. Awarded the 2009 Paul Geroski Best Article Prize for one of the best two articles published in the *International Journal of Industrial Organization* in 2008.
- “Bidder Collusion” (with Robert C. Marshall). *Journal of Economic Theory* 133 (2007): 374–402.
- “Coordinated Effects in Merger Review: Quantifying the Payoffs from Collusion” (with William E. Kovacic, Robert C. Marshall, and Steven P. Schulenberg). In *Annual Proceedings of the Fordham Competition Law Institute: International Antitrust Law & Policy*, ed. Barry E. Hawk, 271–85 (Huntington, NY: Juris Publishing, Inc., 2007).
- “Exploring Relations Between Decision Analysis and Game Theory” (with Jules van Binsbergen). *Decision Analysis* 4 (2007): 32–40.
- “Lessons for Competition Policy from the Vitamins Cartel” (with William E. Kovacic, Robert C. Marshall, and Matthew E. Raiff). In *The Political Economy of Antitrust*, vol. 282, eds. Vivek Ghosal and Johan Stennek, 149–176 (New York: Elsevier, 2007).
- “Rent Shifting and the Order of Negotiations” (with Greg Shaffer). *International Journal of Industrial Organization* 25 (2007): 1109–25.
- “Upfront Payments and Exclusion in Downstream Markets” (with Greg Shaffer). *RAND Journal of Economics* 38 (2007): 823–43.
- “Bidding Rings and the Design of Anti-Collusion Measures for Auctions and Procurements” (with William E. Kovacic, Robert C. Marshall, and Matthew E. Raiff). In *Handbook of Procurement*, eds. Nicola Dimitri, Gustavo Piga, and Giancarlo Spagnolo, 381–411 (Cambridge: Cambridge University Press, 2006).
- “Economics at the Federal Communications Commission.” *Review of Industrial Organization* 29 (2006): 349–68.
- “Inefficiency of Collusion at English Auctions” (with Giuseppe Lopomo and Robert C. Marshall). *Contributions in Theoretical Economics* 5, no. 1 (2005): article 4, <http://www.bepress.com/bejte/contributions/vol5/iss1/art4>.
- “Opportunism and Menus of Two-Part Tariffs” (with Greg Shaffer). *International Journal of Industrial Organization* 22 (2004): 1399–1414.
- “Opportunism in Multilateral Vertical Contracting: Nondiscrimination, Exclusivity, and Uniformity: Comment” (with Greg Shaffer). *American Economic Review* 94 (2004): 796–801.
- “The Joint Determination of Leverage and Maturity” (with Michael J. Barclay and Clifford W. Smith, Jr.). *Journal of Corporate Finance* 9 (2003): 149–67. Winner of Outstanding Paper in Corporate Finance at the 1997 Southern Finance Association Meetings.
- “Adverse Specialization” (with Glenn M. MacDonald). *Journal of Political Economy* 109 (2001): 864–99.
- “Insurer Ownership Structure and Executive Compensation as Complements” (with David Mayers and Clifford W. Smith, Jr.). *Journal of Risk and Insurance* 68 (2001): 449–63. Winner of Outstanding Paper in Financial Services at the 1998 Southern Finance Association Meetings.

- “Dynamic Voluntary Contribution to a Public Project” (with Steven A. Matthews). *Review of Economic Studies* 67 (2000): 327–58.
- “Adaptive Learning and Iterated Weak Dominance.” *Games and Economic Behavior* 26 (1999): 253–78.
- “Odd-Eighth Avoidance as a Defense Against SOES Bandits” (with Eugene Kandel). *Journal of Financial Economics* 51 (1999): 85–102.
- “Payments for Order Flow on Nasdaq” (with Eugene Kandel). *Journal of Finance* 54 (1999): 35–66.
- “Predatory Accommodation: Below-Cost Pricing Without Exclusion in Intermediate Goods Markets” (with Greg Shaffer). *RAND Journal of Economics* 30 (1999): 22–43.
- “Process Variation as a Determinant of Bank Performance: Evidence from the Retail Banking Study” (with Frances Frei, Ravi Kalakota, and Andrew Leone). *Management Science* 45 (1999): 1210–20.
- “Efficient Venture Capital Financing Combining Debt and Equity.” *Review of Economic Design* 3 (1998): 371–87; Winner of the Koç University Prize for the Best Paper of the Year in Review of Economic Design.
- “The Effects of Transaction Costs on Stock Prices and Trading Volume” (with Michael J. Barclay and Eugene Kandel). *Journal of Financial Intermediation* 7 (1998): 130–50.
- “Cost Effective Use of Muscle Relaxants: A Decision Analysis” (with Jeffrey S. Rubenstein, Wendy Colin, Darryl Jackson, Craig Lockwood, and Janice Molloy). *Pediatrics* 100 (1997): 451–52.
- “Nasdaq Market Structure and Spread Patterns” (with Eugene Kandel). *Journal of Financial Economics* 45 (1997): 35–60.
- “Order Independence for Iterated Weak Dominance” (with Jeroen M. Swinkels). *Games and Economic Behavior* 18 (1997): 219–45. “Corrigendum.” *GEB* 31 (2000): 324–29.

A.5. Working papers

- “Antitrust Leniency with Multi-Product Colluders” (with Robert C. Marshall and Claudio Mezzetti), 2013.
- “A Long Way Coming: Designing Centralized Markets with Privately Informed Buyers and Sellers” (with Simon Loertscher and Tom Wilkening), 2013.
- “Monopolization Conduct by Cartels” (with Robert C. Marshall and Lily Samkharadze), 2013.
- “Buyer Resistance for Cartel versus Merger” (with Vikram Kumar, Robert C. Marshall, and Lily Samkharadze), 2013.
- “Buyer Power, Exclusion, and Inefficient Trade” (with Greg Shaffer), 2009.
- “Opportunism and Nondiscrimination Clauses” (with Greg Shaffer), 2002.

A.6. Grants

- National Science Foundation Grant #SES-0849349, Applied Mechanism Design, 2009–2011
- National Science Foundation Grant #SES-0001903, “Economic Analysis of Sequential Vertical Contracting Environments,” 2000–2001
- Emerging Scholar Program Grant from the American Compensation Association, “Compensation and Control in Entrepreneurial Ventures,” 1997

A.7. Selected honors and awards

- Honored as an FCC Woman Leader by The Minority Media and Telecommunications Council, April 2013
- Honored as one of the *Global Competition Review* Top 100 Women in Antitrust, March 2013
- Named *Financial Times* Business School Professor of the Week, July 2012
- Awarded the 2012 Tenth Annual Jerry S. Cohen Memorial Fund Writing Award, given to the best antitrust writing during the prior year (Awarded for “Plus Factors and Agreement in Antitrust Law,” published in the *Michigan Law Review*)
- Awarded the 2009 Paul Geroski Best Article Prize for one of the best two articles published in the *International Journal of Industrial Organization* in 2008

- Simon School Teaching Honor Roll, 1999, 2001
- Koç University Prize for the Best Paper of the Year in Review of Economic Design, 1998
- Outstanding Paper in Financial Services at the Southern Finance Association Meetings, 1998
- Outstanding Paper in Corporate Finance at the Southern Finance Association Meetings, 1997
- Alfred P. Sloan Doctoral Dissertation Fellowship, 1993–1994
- National Science Foundation Graduate Fellowship, 1989–1992

A.8. Professional activities

- Council Member of Game Theory Society, 2013–present
- Editorial Board of *International Journal of Game Theory*, 12/2009–present
- Editorial Board of *Journal of Economic Literature*, 2010–2012
- Advisory Editor for *Games and Economic Behavior*, 2010–2012
- Editorial Board of *American Economic Journal: Microeconomics*, 2007–present
- Academic Affiliate of the Center for the Study of Auctions, Procurements and Competition Policy at Penn State University, 2007–present
- Associate Editor, *International Economic Review*, 2002–2005

APPENDIX B. SECONDARY MARKET TRANSACTIONS, ALL BANDS

Figure 18 Number of transactions, all bands, January 2007–May 2013 (whole and partial licenses)

Counts of trades		Buyer					Total
		Verizon	ATT	T-Mobile	Sprint	Other	
Seller	Verizon		162	63	12	108	345
	ATT	15		85	8	29	137
	T-Mobile	127	36		28	43	234
	Sprint	15	16	17		28	76
	Other	1,010	1,350	121	33	1,847	4,361
	Total	1,167	1,564	286	81	2,055	5,153
buy/sell ratio		3.38	11.42	1.22	1.07	0.47	

Source: Calculations based on FCC data and documentation.

APPENDIX C. BAND PLANS FOR SPECTRUM AUCTIONED IN THE AWS AND 700 MHz AUCTIONS

(139) The figures in this appendix provide background information on the band plans used in the AWS and 700 MHz Auctions.

Figure 19 Auction 66 (AWS-1) band plan, reserve price, and minimum opening bids

Block	Frequencies	Pairing	Bandwidth	Area	Licenses	Total of Minimum Opening Bid Amounts
A	1710-1720 and 2110-2120 MHz	2 x 10 MHz	20 MHz	CMA	734	\$259,332,500
B	1720-1730 and 2120-2130 MHz	2 x 10 MHz	20 MHz	EA	176	\$259,342,000
C	1730-1735 and 2130-2135 MHz	2 x 5 MHz	10 MHz	EA	176	\$129,678,000
D	1735-1740 and 2135-2140 MHz	2 x 5 MHz	10 MHz	REAG	12	\$129,672,000
E	1740-1745 and 2140-2145 MHz	2 x 5 MHz	10 MHz	REAG	12	\$129,672,000
F	1745-1755 and 2145-2155 MHz	2 x 10 MHz	20 MHz	REAG	12	\$259,341,000
Totals					1,122	\$1,167,037,500

Source: FCC documentation. Note: As for the reserve price, the FCC ruled as follows: “the winning bids (net of bidding credits) in the auction must total at least approximately \$2.06 billion in order for the Commission to conclude the auction and award the licenses.” (FCC 06–47, April 12, 2006)

Figure 20 Auction 73 (700 MHz) band plan, reserve prices, and winning bids

Block	Frequencies	Pairing	Bandwidth	Area	Licenses	Reserve Price (\$ millions)	Actual Net Winning Bids (\$ millions)	Net Bids with outright exclusion (\$ millions)
A	698-704, 728-734	2 x 6 MHz	12 MHz	EA	176	1,807	3,876	2,279
B	704-710, 734-740	2 x 6 MHz	12 MHz	CMA	734	1,374	9,068	2,704
C	746-757, 776-787	2 x 11 MHz	22 MHz	REAG	12	4,638	4,747	4,717
D	758-763, 788-793	2 x 5 MHz	10 MHz	Nationwide	1	1,330	Unsold	Unsold
E	722-728	unpaired	6 MHz	EA	176	904	1,267	1,241
Total			62 MHz		1,099	10,053	18,958	10,942

Source: FCC documentation.

APPENDIX D. RESULTS ASSUMING CMA-ONLY LICENSES

- (140) In Auction 66, AWS licenses were defined over 734 small Cellular Market Areas (CMA), over 176 larger Economic Areas (EA), and over 12 large Regional Economic Area Groups (REAG). Under the 33 percent share exclusion rule, if the weighted average MHz market share of low-band spectrum for a large REAG were below 33 percent, AT&T and Verizon would be allowed to bid for such a license. However, if the proposed Incentive Auction is conducted at the CMA level, AT&T and Verizon would be excluded from many CMA markets within the REAG. Alternatively, AT&T or Verizon could be excluded from a particular REAG as a result of the 33 percent share exclusion rule, but would have been allowed to bid in many of the CMA markets within the REAG. Therefore, basing exclusion on shares in larger geographic regions may distort the degree of exclusion from the 33 percent share exclusion rule. As a robustness check, we rescale the AWS spectrum auction so that all licenses are over a CMA. I find that my results are generally consistent with my simulation results without this rescaling.
- (141) In order to account for the circumstances described above, I use the Auction 66 results to create a new set of auction results. For each EA and REAG license, I create a set of artificial licenses associated with each CMA within an EA or REAG. In order to simulate bidding on these artificial CMAs, I assume that the bidders on the artificial CMA licenses are the same as the bidders for the associated EA or REAG, and I allocate the bids on the EA or REAG to the artificial CMA licenses proportionally to the population of the CMA. By creating these artificial CMA licenses, I create an auction in which each CMA has 6 licenses associated with it, one from Block A, which was the original CMA license, and others from Blocks B, C, D, E, and F, represented by the artificial licenses with scaled-down bids.⁶⁵ In this way, I can demonstrate how simulation results change if the 33 percent share cap is applied at the CMA level instead of at the EA or REAG level.
- (142) The results based on the artificial auction with CMA-only licenses do not differ much from the original simulation results. The auction revenue would fall significantly in all scenarios: from 16 percent in the outright exclusion scenario to 8 percent in the scenario in which AT&T and Verizon are excluded from the CMA markets where their post-auction spectrum share would have been above 33 percent had they purchased 10 MHz of spectrum. When exclusion is made at the CMA-level, the degree of exclusion (and associated revenue reduction) based on post-auction shares after 10 MHz purchase in the auction is much higher than the exclusion with the actual set of AWS spectrum licenses (see footnote 49).
- (143) Figure 21 and Figure 22 report simulation results of exclusion in an artificial AWS auction with CMA-only licenses. Auction revenue would fall nearly 16 percent in an outright scenario, and 10–14 percent in share capped exclusion scenarios.

⁶⁵ Counties from one CMA can be included in several EAs or REAGs. In such cases, I allocate all of a CMA's counties to an EA or a REAG that accounts for the highest population share in this CMA.

Figure 21 Simulated auction revenue change with artificial CMA-only AWS spectrum auction licenses in different scenarios of Verizon and AT&T exclusion

Simulation scenarios	Verizon	AT&T	T-Mobile	SpectrumCo (Sprint)	Other	Total
Excluded outright	-100.0%	-100.0%	33.8%	16.4%	5.2%	-15.9%
Excluded if pre-auction share is greater than 33%	-93.6%	-79.1%	30.9%	14.2%	4.1%	-14.1%
Excluded if post-auction share after 20 MHz purchase is greater than 33%	-55.1%	-79.0%	17.4%	14.3%	4.0%	-10.3%

Source: Calculations based on the FCC data and documentation.

- (144) The results based on the auction with CMA-only licenses show that Verizon and AT&T, even under capped exclusion, lose the bulk of their MHz*POPs. These MHz*POPs are captured by T-Mobile and SpectrumCo.

Figure 22 Simulated percent change in the MHz*POP with CMA-only AWS spectrum auction licenses in different scenarios of Verizon and AT&T exclusion

Simulation scenarios	Verizon	AT&T	T-Mobile	SpectrumCo (Sprint)	Other
Excluded outright	-100.0%	-100.0%	64.3%	23.3%	10.5%
Excluded if current share is greater than 33%	-91.4%	-72.1%	57.1%	18.4%	6.8%
Excluded if share after 20 MHz is greater than 33%	-48.5%	-72.0%	33.3%	18.3%	6.1%

Source: Calculations based on the FCC data and documentation.

APPENDIX E. MODELING DETAILS FOR THE SIMULATED INCENTIVE AUCTION

- (145) In this appendix, I provide an overview of the Vickrey mechanism as applied to the sale of multiple units, where buyers potentially desire more than one unit. I refer to this as the multi-unit Vickrey mechanism. I begin by discussing this mechanism in an environment where the auctioneer owns the items for sale. This is the “one-sided” setting. Then I discuss the mechanism in an environment like the Incentive Auction where the auctioneer must provide incentives for sellers to participate. This is the “two-sided” setting.
- (146) Let me first illustrate the multi-unit Vickrey mechanism in a *one-sided setting*—that is, where the auctioneer *owns the items to sell* (so the auctioneer does not have to induce sellers to reveal their willingness to pay). In a single-unit case, the auctioneer will open the sealed envelopes and award the item to the highest bidder (provided her bid exceeds the reserve price), but, using the Vickrey mechanism, the auctioneer will charge the winner the amount offered by the second-highest bidder.
- (147) In the case of multiple units for sale, buyers submit bids consisting of multiple amounts: a bid for the 1st unit, a bid for the 2nd unit, a bid for the 3rd unit, and a bid for the 4th unit. If there are, say, 4 units for sale, the auctioneer awards the items to the bidder(s) who have placed the 4 highest bids (this could be a single buyer whose bids placed in the top four spots in the ranking). The identification of the winners is thus an easy extension of the single-item set-up—the highest bids win.
- (148) The determination of the amount each winning bidder must pay for each unit she won is slightly more complex when more than one unit is being sold, but still follows quite straightforwardly from the single-unit set-up. In the single-unit set-up, the auctioneer can be thought of saying to the winner: “If you had not participated, I would have given the item to the second-highest bidder. Because she was willing to pay the amount she wrote in her envelope, I am now asking for that amount from you (unless the second-highest bid is below the reserve price, in which case you owe me the reserve price).”
- (149) In the multi-item set-up, consider for example a bidder who placed 2 of the top 4 highest bids. The auctioneer would say: “If you had not participated, two lower bids that did not make the top-4 list would have now made the top-4 to replace your bids. As a consequence, I am now charging you those two amounts for the two units you actually won (unless those lower bids

that would replace your two bids are below the reserve price, in which case you owe me the reserve price).”

- (150) Vickrey’s mechanism induces the bidders to truthfully bid their valuations because it gives a bidder no incentive to lie about her valuation: by under-reporting her willingness to pay, a potential buyer only hurts her chances to be named the winner (her bid is less likely to make it to the top of the list), but it does not reduce the amount she pays if she wins because that amount does not depend on her bid at all. It depends only on the nonwinning bids of other buyers.
- (151) Because my illustrative model pertains to a two-sided auction rather than a one-sided multi-unit Vickrey auction, the auctioneer will proceed as follows (see Loertscher and Mezzetti, 2013).
- (152) First, the auctioneer will call out a reserve price and ask buyers and sellers to bid, that is, to report their willingness to pay or to accept in exchange for the license (which they have an incentive to do). Once both sides have submitted their bids, the auctioneer will count how many sellers have submitted a bid below the reserve price: these are the units available for sale at that reserve price. Similarly, the auctioneer will determine how many units the buyers demand at the reserve price.
- (153) When the units offered at the reserve price are fewer than the units demanded (suppliers are on the “short side”), the auctioneer will pay each willing seller the reserve price; the auctioneer will then run a one-sided Vickrey auction to select the winning buyers and determine the price they will pay.
- (154) Each winning buyer (who could win one or more units) pays a “personalized” price for each unit won—as described above, the highest bid(s) that would have made the winning circle in her absence, or the reserve price, whichever is highest.
- (155) Conversely, when the units offered at the reserve price are more than the units demanded, the buy-side is the short side that determines how many units are traded. The auctioneer will collect the reserve price from each of them. The auctioneer will then run a one-sided Vickrey auction among the sellers to select the winners (those asking for the lowest payments), and pay them “personalized” prices—the next-highest request in a winner’s absence, or the reserve price, whichever is the lowest.
- (156) For each possible reserve price that the auctioneer could set between \$0.05 and \$0.95 (in increments of 5 cents), I have computed the average number of trades and corresponding average auction revenues the auctioneer can expect to realize.⁶⁶ These results are illustrated in Figure 15.
- (157) For the purposes of Figure 15, I have assumed that buyers demand up to 20 units while suppliers will offer only up to 10 units. Moreover, I have assumed that buyers are expected, on average, to be willing to pay more for any given unit, \$0.75, than the sellers are asking to give it up, \$0.50. Under these assumptions, an efficiency-driven auctioneer wishing to maximize the number of efficient transactions will use a reserve price well above \$0.50 (about \$0.80), inducing all but the extremely high valuing sellers to give up their units. Then the auctioneer will take advantage of high demand (at that reserve price, sellers will still be more likely than not on the short-side, *i.e.*, demand at a price of \$0.80 likely exceeds supply) to assign those units to buyers valuing them more than the reserve price via the Vickrey mechanism among buyers.
- (158) An auctioneer can increase expected auction revenue at the expense of efficiency by using a lower reserve price. The lower reserve price reduces the number of trades, but allows the auctioneer to collect higher prices from the buyers, who on average will be on the long-side competing for those fewer sales in most or all of the random draws. In my simulation, the highest expected revenue (the top-left point on the blue curve) that can be achieved occurs when the auctioneer uses a reserve price of approximately \$0.40. While only 4 units are sold on average in this case, the “personalized” prices that the auctioneer can extract from each buyer—the expected 5th highest valuation, the first unit that does not make the top 4—is about \$0.90, yielding a $\$0.50 = \$0.90 - \$0.40$ unit margin per sale and \$2.00 in auction revenues. By using a high reserve price, the auctioneer acts like a profit-maxi-

⁶⁶This is based on 5,000 random draws for the sellers’ and the buyers’ valuations.

mizing monopolist that restricts the quantity traded in order to collect high margins.

Senator THUNE. Instead of exploring auction rules to arbitrarily limit or benefit certain carriers, the FCC has the ability to consider setting a limit on the amount of spectrum any single bidder can win in the incentive auction. Such a limit applying equally to every bidder would at least allow all companies to have a fair shot at acquiring the spectrum they need while preventing any single entity from winning all the licenses.

At a minimum, such a proposal should be explored, as it seems to make sense and could result in an open and competitive auction. I hope our witnesses spend some time discussing this and other reasonable ways to find consensus on forward auction bidding.

Another way to encourage more bidder activity and to benefit rural areas in particular is to auction licenses in a variety of geographic sizes. At a previous hearing, our committee heard that offering spectrum licenses covering smaller geographic areas can result in more bidders, more license winners, more revenue, and better service to rural areas. This approach appeared to work quite well in the 700-megahertz auction that occurred in 2008.

I would like to hear our panelists' thoughts on how smaller license sizes have been used in the past, what the results have been, and how they could play a role in the broadcast incentive auction.

Mr. Chairman, the FCC should not be distracted by proposals that could lead to less spectrum being made available and less auction proceeds being realized for national priorities like deficit reduction and FirstNet.

Thanks again for holding today's hearing, and I look forward to hearing from our panelists.

Senator PRYOR. Thank you.

And, again, I want to thank all the panelists for being here. And you all know that your written statements will be made part of the record, which we understand will be a more complete statement than what you will give here in a few moments.

We would ask that you all, if you could, limit your remarks to 3 minutes each. Typically we go 5 minutes, but the rumor going around the Senate rumor mill—we don't know if it is ever true, but we think we are going to be having votes around 4 on the floor. I don't know if we can finish this hearing by then, but if we can keep the opening-statement portion shorter, we will have a better chance of doing that.

So let me just run through who is on the panel, and then I will recognize Mr. Epstein.

First we have Gary Epstein, Chair of the Incentive Auction Task Force and Special Advisor to the Chairman at the Federal Communications Commission.

Next we have Ms. Joan Marsh, Vice President, Federal Regulatory Affairs, AT&T Services, Inc.

Then we have Mr. Hal Singer, Senior Fellow, Progressive Policy Institute.

Then we have Mr. Steven K. Berry, President and Chief Executive Officer, Competitive Carriers Association.

Then Mr. Preston Padden, Executive Director, Expanding Opportunities for Broadcasters Coalition.

Next is Mr. Rick Kaplan, Executive Vice President, National Association of Broadcasters.

And last and certainly not least, we have Mr. Harold Feld, Senior Vice President of Public Knowledge.

Mr. Epstein?

**STATEMENT OF GARY EPSTEIN, SPECIAL ADVISOR
AND CHAIR, INCENTIVE AUCTION TASK FORCE,
FEDERAL COMMUNICATIONS COMMISSION**

Mr. EPSTEIN. Good afternoon, Chairman Pryor and Ranking Member Thune and members of the Committee. Thank you very much for the opportunity to discuss the Commission's efforts to carry out Congress's statutory direction in designing and implementing the Broadcast Television Spectrum Incentive Auction.

This voluntary, market-based means of repurposing spectrum for mobile broadband is an important part of ensuring that our wireless networks are capable of supporting the critical economic, public safety, healthcare, and other important services which are guided by the four primary principles expressed in the Spectrum Act: one, alleviating spectrum constraints to economic growth and development by creating a market-based process for repurposing the maximum amount of UHF spectrum for licensed and unlicensed flexible use; two, fulfilling our statutory obligations and congressional objectives that include reimbursing repacked broadcasters, helping to fund FirstNet, and reducing the deficit; three, providing a unique financial opportunity for participating broadcasters while preserving a healthy broadcast service for those who do not contribute their spectrum; and, four, promoting innovation and allowing the U.S. to continue to lead the world in a new generation of licensed and unlicensed wireless technologies.

Throughout the proceeding, we have engaged stakeholders and the public to promote an open dialogue about how the auction should work, listened to the stakeholders, analyzed the complex issues, and worked to design and develop the actual software systems.

Stakeholder engagement has been the cornerstone of this proceeding. We have released detailed public notices seeking comment. We have held six public workshops on topics including channel sharing, the band plan, broadcast transition costs, and the unlicensed spectrum in the 600-megahertz band, and participated in over 300 ex parte meetings. In addition, we expect to release additional public notices before we finalize our recommendations.

Our new chairman is at the helm, and we have a full commission with the addition of Commissioner O'Rielly. We have been conducting extensive briefings on the full range of incentive auction issues under consideration.

As Chairman Pryor noted, Chairman Wheeler recently issued a blog on Friday stating that we expect to complete developing policy recommendations and to present these policy recommendations to the Commission in a proposed report and order early next year. This will enable the Commission to vote on the report in the spring.

Following the adoption of the report and order, in the second half of the year we plan to release an auction comment public notice

and procedures public notice. This timeline will allow us to conduct the auction in mid-2015.

Throughout our entire process, we will be researching, developing, testing, and retesting the operating system and software necessary to conduct the auction. We will ensure that the auction operating system and software meet the strictest performance requirements and work from the moment the first bid is placed until the final broadcast station is repacked.

We have made significant strides with respect to each of the closely interrelated components and plan to make the auction a success. We will hold an auction which fulfills the statutory objectives and congressional priorities, including funding FirstNet, making a substantial amount of spectrum available for flexible use, preserving a healthy broadcast industry, and promoting innovation.

Thank you very much.

[The prepared statement of Mr. Epstein follows:]

PREPARED STATEMENT OF GARY EPSTEIN, SPECIAL ADVISOR AND CHAIR, INCENTIVE AUCTION TASK FORCE, FEDERAL COMMUNICATIONS COMMISSION

Good morning, Chairman Rockefeller, Ranking Member Thune, and members of the Committee. My name is Gary Epstein and I am the Special Advisor and Chair of the Federal Communications Commission's Incentive Auction Task Force. Thank you for the opportunity to discuss the Commission's efforts to carry out Congress's statutory direction in designing and implementing the Broadcast Television Spectrum Incentive Auction.

This voluntary market-based means of repurposing spectrum for mobile broadband is an important part of ensuring that our wireless networks are capable of supporting the critical economic, public safety, healthcare and other important services on which our Nation's citizens rely. In our effort to design and implement the auction, we are guided by four primary public interest objectives expressed in the Middle Class Tax Relief and Job Creation Act of 2012:

- One, alleviating spectrum constraints to economic growth and development by creating a market-based process for repurposing the maximum amount of UHF spectrum for licensed and unlicensed flexible use.
- Two, fulfilling our statutory obligations and Congressional objectives that include reimbursing repacked broadcasters, helping to fund FirstNet, and reducing the deficit.
- Three, providing a unique financial opportunity for participating broadcasters while preserving a healthy broadcast service for those who do not contribute their spectrum.
- And four, promoting innovation and allowing the U.S. to continue to lead the world in a new generation of licensed and unlicensed wireless technologies.

Throughout the proceeding, we have engaged stakeholders and the public to promote an open dialogue about how the auction should work, listened to stakeholders to improve our processes, analyzed the complex issues underlying the auction's various components, and worked to design and develop the actual software systems that will run the auction.

Stakeholder engagement has been the cornerstone of this proceeding. We have released detailed Public Notices seeking comment on band plans, the new OET-69 methodology and *TVStudy* software for predicting and analyzing interference among television stations, repacking data of permissible channel assignments based on *TVStudy*, and broadcaster relocation costs. We also have held six public workshops on topics including channel sharing, the band plan, broadcaster transition costs and unlicensed spectrum in the 600 MHz band, and participated in over 300 ex parte meetings. In addition, we expect to release additional public notices on key issues before we finalize our recommendations for the Report and Order.

Our new Chairman is at the helm and we have a full Commission with the addition of Commissioner O'Rielly. We have been conducting extensive briefings on the full range of incentive auction issues under consideration. Chairman Wheeler recently stated that since his arrival he has spent more time working on the Broadcast Television Spectrum Incentive Auction than any other single issue. While we

are still in an open proceeding and the Commission has made no final determinations, we are confident that the full Commission will provide invaluable leadership both in guiding our consideration of policy options and in charting a path to a successful auction.

As Chairman Wheeler announced this past Friday, we expect to complete developing policy recommendations and to present these policy recommendations to the Commission in a proposed R&O early next year. This will enable the Commission to vote on the R&O in the spring.

Following the adoption of the R&O, in the second half of next year, we plan to release an Auction Comment Public Notice and a Procedures Public Notice that will provide additional details and seek comment on specific parts of the auction. This timeline will allow us to conduct an auction in mid-2015.

Throughout our entire process, we will be researching, developing, testing, and re-testing the operating systems and software necessary to conduct the auction. As with every part of this proceeding, our software development process will continue to be open and transparent and will involve opportunities for stakeholder input. We will ensure that the auction operating systems and software meet the strictest performance requirements and “work from the moment the first bid is placed until the final broadcast station is repacked.”

We have made significant strides with respect to each of the closely interrelated components of the incentive auction and have a plan to make this auction a success. We will hold an auction that fulfills our statutory objectives and Congressional priorities, including funding FirstNet, makes substantial amounts of spectrum available for flexible use, preserves a healthy broadcast industry, and promotes innovation. We recognize that we must get the incentive auction right and will spare no effort to ensure that the auction is both well designed and well implemented.

Thank you very much. I would be happy to take any questions you may have.

Senator PRYOR. Thank you.

Ms. Marsh?

**STATEMENT OF JOAN MARSH, VICE PRESIDENT,
FEDERAL REGULATORY, AT&T**

Ms. MARSH. Thank you, Chairman Pryor and Ranking Member Thune, for inviting AT&T to join in the discussion today.

Much has changed since the incentive auction proceeding was initiated by the Commission last fall. A once-struggling T-Mobile has dramatically improved its spectrum portfolio by acquiring additional spectrum and, earlier this year, MetroPCS. Fortified by its improved spectrum position, T-Mobile has completed a robust LTE deployment and now runs ads claiming that its network is less congested than AT&T's. And in each of the last two quarters, T-Mobile led the industry in postpaid phone ads.

SoftBank/Sprint, for its part, now has by far the largest spectrum arsenal in the industry. Indeed, its spectrum holdings are so significant that it shocked the wireless industry a few weeks ago when it announced it was no longer interested in pursuing the H Block at auction, a block of spectrum that it had long pursued.

Against this backdrop of robust competition, the FCC has made substantial progress on the incentive auction proceeding, and it has built a significant record on a wide range of issues. Yet many open issues remain, including the key question of who should be permitted to participate at the auction and by what rules. That will be the focus of my comments today.

AT&T continues to believe that an open and unrestricted auction will raise the most revenue at auction while producing a multiplicity of winners. History shows this is true. In the 700-megahertz auction, which was open and unrestricted, over 200 entities qualified to participate and over 100 bidders won licenses. While some allege that AT&T dominated that auction, the fact is that AT&T

bid on and won spectrum in only a single block of the five blocks available at auction.

Nonetheless, some argue that new rules must now be adopted for the incentive auction to ensure a multiplicity of winners. If that is the goal, the lead proposal for restrictions in the auction, the T-Mobile Dynamic Market Proposal, falls far short. T-Mobile's proposal would impose dramatic restrictions on AT&T and Verizon, while leaving T-Mobile and others free to run the table should they so choose. Indeed, if T-Mobile's proposal were adopted, AT&T and Verizon would be limited to bidding on a single 5-megahertz pair in most major markets, an amount that even T-Mobile admits is inefficient for LTE deployment.

AT&T continues to believe that any restriction that disadvantages some bidders to the advantage of others is discriminatory, inefficient, and contrary to statutory language and objectives. We also believe that such an approach will ultimately undermine auction success.

In stark contrast to T-Mobile's proposal, some countries have adopted auction rules that define either by megahertz or percentage the amount of spectrum any one bidder can acquire at auction. Like any proposals that restrict auction participation, these proposals could suppress bidding competition and impact auction revenues. But, assuming such limits were adopted appropriately, this approach would at least ensure multiple winners in a fair and non-discriminatory manner.

One final note on scoring. We are convinced by recent advocacy that no scoring is the best approach. It is simple and transparent, it avoids price discrimination, and perhaps most importantly, it will motivate participation. Without willing participants, this auction cannot succeed.

Thank you.

[The prepared statement of Ms. Marsh follows:]

PREPARED STATEMENT OF JOAN MARSH, VICE PRESIDENT, FEDERAL REGULATORY,
AT&T

Thank you, Chairman Rockefeller, and Ranking Member Thune, for inviting AT&T to join in the discussion today.

Much has changed since the incentive auction proceeding was initiated by the Commission last year. T-Mobile has substantially bolstered its spectrum footprint with additional AWS holdings, and earlier this year, it completed its acquisition of MetroPCS. Over the last few quarters, T-Mobile has re-emerged as a formidable competitor. Indeed, during each of the last two quarters, T-Mobile added more branded postpaid phone customers than either AT&T or Verizon.

SoftBank/Sprint for its part emerged victorious in a battle with Dish to solidify its ownership of Clearwire and now has the largest spectrum arsenal in the industry. According to Sprint's CEO, this spectrum gives Sprint "competitive parity" and "will give us extraordinary capacity and some speed and performance advantages in the market." Indeed, its spectrum holdings are so significant that it recently announced it was no longer interested in pursuing the PCS H Block at auction, a block that is adjacent to PCS spectrum that Sprint already holds and thus uniquely suited to Sprint, and a block Sprint had long fought to protect.

These recent developments underscore the robust and intensifying competition that characterizes the mobile wireless services market in the United States. According to the FCC's most recent report to Congress, the U.S. market remains among the least concentrated in the world—over 90 percent of Americans have 4 or more providers from which to choose, and more than 99 percent of Americans have access to mobile broadband services. Usage continues to skyrocket, with data traffic more than doubling every year for the last four years. Capital investment by the industry has increased as carriers deploy advanced technology and de-

ploy more site density to keep up with demand. And despite soaring capital investment, prices have been in steady decline, with the average price of a minute of voice usage falling from from \$0.47 to less than \$0.04 over the last 18 years. SMS prices have fallen continuously since 2008, and data prices fell from \$0.47 per megabyte to \$0.05 per megabyte, an 89 percent decrease, in just two years.¹ While the FCC has declined in its recent reports to draw any broad conclusions about just how intensely competitive the wireless industry is, the data in its reports speak volumes: this is an intensely competitive market, not one where regulatory intervention is necessary to preserve competition.

This robust competition has made the U.S. industry the envy of the world. U.S. customers use more wireless service than elsewhere, and they pay much less for it. We lead the world in LTE deployment and adoption. We lead the world in smartphone adoption. The most advanced network technologies, smartphones and applications are released in the U.S. first. The reallocation of UHF-TV spectrum to mobile wireless use will be critically important to ensure that this leadership can continue, by affording wireless carriers the opportunity to continue to grow, to advance, and to innovate.

Against the backdrop of all of this competitive activity, the FCC has made substantial progress on the incentive auction proceeding and has built a significant record on a wide range of issues, including the band plan, auction design and repacking. Yet, many open issues remain, including the key question of who should be permitted to participate at auction and by what rules. That will be the primary focus of my comments here today.

AT&T continues to believe that an open and unrestricted auction is the best way forward. First, an open auction is the fairest method to assign licenses because it ensures that all applicants have the same opportunity to obtain spectrum. Second, an open auction would allow market competition, rather than regulation, to allocate spectrum, ensuring that it is put to its best and highest use. Third, an open auction will raise the most revenue at auction, maximizing the amount of spectrum made available for mobile broadband, while raising funds for public safety and deficit reduction. Moreover, an open auction will produce a multiplicity of winners. History shows this is true. In the 700 MHz auction—which was open and unrestricted—over 200 entities qualified to participate and over 100 bidders won licenses. While AT&T is often accused of dominating that auction, the fact is that AT&T bid on and won spectrum in only a single block of the 5 spectrum blocks available.

It bears noting that this single block of spectrum, combined with additional allocations AT&T acquired on the secondary market, have been the foundation for billions of dollars of investment in LTE deployments that have helped to make the United States the world leader in mobile broadband. By that measure, the 700 MHz auction was an enormous success.

Similarly, the AWS auction in 2006 was an open auction, and it attracted 167 different applicants. Notably, T-Mobile, not AT&T or Verizon, was the big winner in that auction. What history shows, therefore, is that no one “runs the table” in an open auction, and—if there were any lingering concerns about that possibility—the heightened scrutiny triggered by the Commission’s existing spectrum screen is more than sufficient to address those concerns.

Nonetheless, some argue that new rules must now be adopted for the incentive auction to ensure a multiplicity of winners. If that is the goal, the lead proposal for restrictions in the auction—T-Mobile’s Dynamic Market Proposal—falls far short. T-Mobile’s proposal would impose dramatic restrictions on only two potential bidders—AT&T and Verizon—while leaving T-Mobile free to amass as much spectrum as it chooses, and at prices depressed by the restrictions on AT&T and Verizon. Indeed, if T-Mobile’s proposal were adopted, AT&T and Verizon would be allowed to bid on only a single 5MHz pair in most major markets, an amount that even T-Mobile admits is too little to deploy LTE efficiently.

The purported justification for proposed auction restrictions are that a carrier must have some low band spectrum—spectrum below 1 GHz—in order to compete effectively. If that were, in fact, true it begs the question of why T-Mobile and Sprint, which are owned by two of the largest telecommunications providers in the world, cannot obtain spectrum through an open bidding process. As noted, they have won spectrum at prior Commission auctions, even when faced with competing bids by AT&T, Verizon and others. But in all events, the argument that low band spectrum is a prerequisite to effective competition is entirely belied by the facts.

As an initial matter, the fact that T-Mobile is adding customers faster than its competitors, despite the fact that it has no “low band” spectrum is proof in itself that low band spectrum is not essential to compete effectively. Moreover, if low band

¹ 16th Report at ¶2.

spectrum were as critical as T-Mobile and Sprint now claim, surely T-Mobile and Sprint would have made some effort to obtain such spectrum at the only recent auction of this spectrum or on the secondary market. In fact, neither company even applied to bid at the auction, although over 100 other carriers bid and won band spectrum at that auction. Likewise, while T-Mobile and Sprint have acquired huge amounts of spectrum on the secondary market in the past year, they did not pursue low band spectrum—despite the availability of such spectrum in the secondary market. Instead, T-Mobile chose to acquire AWS spectrum from AT&T and Verizon, and bought MetroPCS and its high band spectrum portfolio. For its part, Sprint purchased Clearwire and its massive trove of high band spectrum.

The reason T-Mobile and Sprint have not deemed it necessary to obtain low band spectrum is because claims regarding the indispensability of such spectrum are not true. While it is true that, all else being equal, signals can propagate farther over low band spectrum, there is no inherent network quality advantage in using low frequency spectrum versus high frequency spectrum. As a matter of both physics and engineering, a provider can achieve the same coverage with either type of spectrum; it is merely a question of how the provider builds out its network. Likewise, all providers can address in-building penetration challenges with high-frequency spectrum by increasing network density and deploying femtocells, picocells, wi-fi offload, and other means. To be sure, denser networks cost more to build, but to the extent high band spectrum entails higher build out costs, the spectrum itself will sell for lower prices in the marketplace. This is critical because the cost of provisioning a service includes spectrum costs as well as network build out costs. Sprint and T-Mobile's claims about low band spectrum simply write spectrum costs out of the equation.

Beyond that, and in all events, it is no longer the case that low band spectrum permits significantly lower build out costs than high band spectrum. To the contrary, the explosive growth of mobile broadband services has dramatically diminished differences in the real world costs of building out low band and high band spectrum, and that trend will only accelerate in the coming years. As a result of this dramatic growth, the industry faces what former FCC Chairman Julius Genachowski referred to as a “looming spectrum crisis,” under which the principal challenge facing wireless providers today is meeting rapidly escalating demand for bandwidth. What that means is that in today's broadband world, unlike the voice world of yesterday, network deployments are driven by network capacity needs, not coverage. Regardless of whether a carrier is using high band or low band spectrum, it must build dense networks in all but the most rural areas where network congestion is not an existing or looming challenge. And to optimize building penetration, they must deploy small cells as well. Indeed, the superior propagation of low band spectrum leads to certain relative *disadvantages* in the form of increased interference between cells, particularly in densely populated cities.

The restrictions T-Mobile proposes thus are not about ensuring that Sprint and T-Mobile get access to an essential input—they are pretextual. They are intended to ensure that AT&T and Verizon are effectively excluded from the auction, and that T-Mobile itself has an easy path to winning as much spectrum as it would like—at bargain prices. This proposal is not pro-competitive; it is not consistent with the intent of the authorizing legislation; it is not fair; and it is not a reflection of informed public policy.

In stark contrast to T-Mobile's proposal, some countries have adopted auction rules that define either by MHz or percentage the amount of spectrum any one bidder can acquire at auction. Like any proposals that restrict auction participation, these proposals could suppress bidding competition and impact auction revenues. But assuming the limits adopted permitted all winners to obtain at least a 10 x 2 paired allocation, this approach would at least ensure multiple winners in a fair and nondiscriminatory manner—unlike the T-Mobile proposal, which pretends to be fair, but which in reality tries to preclude Verizon and AT&T from effective participation.

As to broadcaster participation, AT&T continues to believe that broadcasters who come to auction are not selling a broadcast business. They are relinquishing their rights to 6 MHz of spectrum much needed for mobile wireless use. Indeed, as AT&T continues to study this problem it is becoming more apparent that the issue that matters the most is how difficult a broadcaster is to repack.

If a broadcaster that presents significant repacking challenges agrees to surrender its spectrum, that deal should be struck, even if a premium is necessary. Any valuation mechanisms adopted in the reverse auction should be consistent with that reality and opening bid prices should be set at a level that will encourage the broadest participation.

Finally, a word on timing. This is by far the most complex auction proceeding ever undertaken anywhere in the world. The Commission must persuade two different sets of auction bidders to participate in two separate but inter-related auctions.

While those auctions proceed, the Commission must conduct a dynamic repacking analysis that protects and repacks the broadcasters that remain. The enormous complexity of this task cannot be overstated. While AT&T is eager to see these new allocations brought to market as soon as practical, we appreciate the enormity of the task the Commission faces and believe that time must be taken to get it right.

In conclusion, AT&T remains confident that under Chairman Wheeler's leadership, the Commission will ultimately conduct a successful auction that maximizes participation, raises significant revenue and achieves all the attendant benefits Congress envisioned.

Senator PRYOR. Thank you.
Mr. Singer?

**STATEMENT OF HAL J. SINGER, Ph.D., SENIOR FELLOW,
PROGRESSIVE POLICY INSTITUTE**

Mr. SINGER. A key policy issue facing this committee is whether to impose asymmetric limits on the amount of spectrum that a bidder may acquire at the auction depending on the location of the bidder's spectrum holdings—that is, whether to impose an asymmetric spectrum cap.

In April of this year, the Department of Justice advocated for policies that would support an asymmetric spectrum cap designed to favor bidders that lacked so-called low-frequency spectrum. And at his first major policy speech at Ohio State last week, Federal Communications Commission Chairman Tom Wheeler cited the DOJ's letter in support of such limits.

I want to make three simple points about the wisdom of an asymmetric spectrum cap from the perspective of an economist concerned with promoting consumer welfare.

First, as a condition of slanting the auction rules in a way to favor certain bidders, one must establish empirically that carriers without access to low-frequency spectrum are impaired in their ability to compete effectively. Although this particular input is not distributed uniformly across carriers, it is hard to detect any impairment in the output market.

Despite its lack of low-frequency spectrum, Sprint's net additions for contract customers were up 18 percent in 2012. And during the third quarter of 2013, Sprint's postpaid service revenues and average revenue per unit hit record levels.

T-Mobile, another carrier that relies largely on high-frequency spectrum, enjoyed its biggest growth spurt in 4 years in the second quarter of 2013, adding 1.1 million new subscribers. In July, T-Mobile was gaining two subscribers from AT&T for every one it lost to AT&T. This evidence is hard to square with the notion of impairment.

If access to low-frequency spectrum were essential to compete effectively, as the DOJ implies in its comments, then AT&T and Verizon would be running away with the wireless prize. But U.S. wireless concentration, as measured by the FCC, has held steady since 2008. And if Sprint and T-Mobile continue to grow faster and steal customers from AT&T and Verizon, wireless concentration could actually decline in the coming years.

Perhaps the alleged impairment has manifested itself in the form of rising wireless prices? Not here. With one exception in 2009, when prices held steady, U.S. wireless prices have declined every year since the Bureau of Labor Statistics began tracking them in

1998. According to a recent survey by Wall Communications commissioned by the Canadian telecom regulator, U.S. mobile broadband prices were within a few dollars of comparable offerings of 5-gigabits-per-month plans in Canada, the U.K., and in Japan.

Second, given the nascent and growing substitution between wireless and wireline broadband services, regulators should not narrowly focus on promoting wireless broadband competition. Instead, they should be focused on promoting broadband competition in any form.

According to the FCC's latest deployment data, 62 percent of U.S. households had three or more broadband providers capable of supporting download speeds of 6 megabits per second. Adding one more broadband pipe to the remaining homes served by one or two providers by stimulating investment by a large nationwide wireless carrier will generate significantly greater consumer benefits than promoting de novo wireless entry.

Third, and my last point, less restrictive remedies than asymmetric spectrum caps can address any alleged impairment leading to competition concerns. For example, if regulators do not like the outcome of an unconstrained auction, they have the power to compel ex-post divestiture under existing law.

And if regulators insist on going down the path of spectrum caps, symmetric auction-specific caps that are agnostic to pre-auction spectrum holdings and treat all bidders equally would protect against the remote possibility that any single bidder acquired too much spectrum at auction.

Thank you.

[The prepared statement of Mr. Singer follows:]

PREPARED STATEMENT OF HAL J. SINGER, PH.D., SENIOR FELLOW,
PROGRESSIVE POLICY INSTITUTE

The key policy issue facing this Committee is whether to impose asymmetric limits on the amount of spectrum that a bidder may acquire at the auction depending on the *location* of the bidder's spectrum holdings—that is, whether to impose an “asymmetric spectrum cap.” In April of this year, the Department of Justice (DOJ) advocated for policies that would support an asymmetric spectrum cap designed to favor bidders that lack low-frequency spectrum. And at his first major policy speech at Ohio State last week, Federal Communications Commission (FCC) Chairman Tom Wheeler cited the DOJ's letter in support of such limits. I want to make four simple points about the wisdom of an asymmetric spectrum cap from the perspective of a competition economist concerned with promoting consumer welfare.

First, as a condition of slanting the auction rules in a way to favor certain bidders, one must establish empirically that carriers without access to low-frequency spectrum are *impaired in the ability to compete effectively*. Although this particular *input* is not distributed uniformly across carriers, it is hard to detect any impairment in the *output* market. Despite its lack of low-frequency spectrum, Sprint's net additions for contract customers were up 18 percent in 2012, and during the third quarter of 2013, Sprint's postpaid service revenue and ARPU hit record levels. T-Mobile, another carrier that relies largely on high-frequency spectrum, enjoyed its biggest growth spurt in four years in the second quarter of 2013, adding 1.1 million new subscribers. In July, T-Mobile was gaining two subscribers from AT&T for every one it lost to AT&T. This evidence is hard to square with the notion of impairment.

If access to low-frequency spectrum were essential to compete effectively, as the DOJ implies in its comments, then AT&T and Verizon would be running away with the wireless prize: But U.S. wireless concentration as measured by the FCC has held steady since 2008. And if Sprint and T-Mobile continue to grow faster than and steal customers from AT&T and Verizon, wireless concentration could decline in the near future.

Perhaps the alleged impairment has manifested itself in the form of rising wireless prices? With one exception in 2009, when prices held steady, U.S. wireless prices have declined *every year* since the Bureau of Labor Statistics began tracking them in 1998. According to recent survey by Wall Communications commissioned by the Canadian telecom regulator, U.S. mobile broadband prices were within a few dollars of comparable offerings of 5 Gb per month plans in Canada, the U.K., and Japan.

Second, although there may have been a role for smaller wireless carriers in the past, given the massive and growing *economies of scale* associated with providing nationwide wireless networks capable of supporting bandwidth-intensive applications like streaming video, it makes no sense to steer scarce spectrum away from companies with large customers bases that have invested heavily in LTE networks in favor of smaller companies that are ill-suited for this colossal undertaking. In the presence of such economies, promoting small carriers is an invitation for higher costs. U.S. consumers take pride in supporting small businesses like cafes, brew pubs, restaurants, and boutiques, but when it comes to wireless services, they want their provider to blanket the country in LTE coverage.

Third, given the nascent and growing substitution between wireless and wireline broadband services, regulators should not narrowly focus on promoting wireless broadband competition. Instead, they should focus on *promoting broadband competition* in any form. According to the FCC's latest deployment data, 62 percent of U.S. households had three or more broadband providers capable of supporting download speeds of 6 Mbps: Adding one more broadband pipe to the remaining homes served by one or two providers by stimulating wireless investment will generate significantly greater consumer benefits than promoting entry among wireless providers.

Fourth, *less restrictive remedies* than asymmetric spectrum caps can address any alleged impairment leading to competition concerns. For example, if regulators do not like the outcome of an unconstrained auction, they have the power to compel ex-post divestitures under existing law. And if regulators insist on going down the path of spectrum caps, *symmetric* spectrum caps that are agnostic to pre-auction spectrum holdings but instead treat all bidders equally would protect against the remote possibility that any single bidder acquired "too much" spectrum at the auction.

In sum, proponents of asymmetric spectrum caps have failed to meet their evidentiary burden of establishing any evidence of impairment among carriers that lack low-frequency spectrum. This Committee should ask the FCC: How has this alleged impairment manifested itself? With persuasive evidence of impairment leading to supra-competitive price or reduced output, it would be reasonable to consider asymmetric spectrum caps. But in its absence of such evidence, this policy appears designed solely to benefit certain competitors at the expense of broadband consumers and taxpayers.

Suggested Reading

The FCC's Incentive Auction: Getting Spectrum Policy Right, Progressive Policy Institute Paper (2013), co-authored with David Balto.

Is the U.S. Government's Internet Policy Broken? Review of Susan Crawford's "Captive Audience," 5 POLICY AND INTERNET 340–63 (2013), co-authored with Robert Hahn.

Avoiding Rent-Seeking in Secondary Market Spectrum Transactions, 65 FEDERAL COMMUNICATIONS LAW JOURNAL (2013), co-authored with Jeffrey Eisenach.

Assessing Competition in U.S. Wireless Markets: Review of the FCC's Competition Reports, 64 FEDERAL COMMUNICATIONS LAW JOURNAL (2012), co-authored with Gerald Faulhaber and Robert Hahn.

Senator PRYOR. Thank you.
Mr. Berry?

STATEMENT OF STEVEN K. BERRY, PRESIDENT AND CHIEF EXECUTIVE OFFICER, COMPETITIVE CARRIERS ASSOCIATION

Mr. BERRY. Thank you, Chairman Pryor and members of the Committee. Thank you for allowing me to testify.

I am here on behalf of CCA, the Nation's leading association of competitive wireless carriers. Our association is made up of over 100 competitive carriers, ranging from small, rural providers serv-

ing less than 5,000 consumers to regional and national providers serving millions of consumers.

The entire mobile ecosystem is dependent on vibrant competition in the wireless industry, and access to spectrum is a critical element in supporting competition. CCA's diverse membership is bound together by a shared goal of a competitive regulatory framework and a shared concern over the growing market power of the "Twin Bells." We do not need an industry marching toward a duopoly.

I know several members of this committee, as well as the FCC, DOJ, and the Small Business Administration, have voiced similar concerns about the increasing consolidated nature of the industry. The incentive auction provides a unique opportunity to promote competition and allow carriers of all sizes access to a limited resource that meets consumer demand. CCA members are prepared to invest, to innovate, and to create jobs, but competitive carriers must have a fair opportunity to acquire the resources to compete. And the FCC has one shot to get it right.

A successful incentive auction must attract sellers and buyers alike, maximizing participation in both the reverse and forward auctions.

In the forward auction, the FCC must provide all carriers a meaningful opportunity to bid for spectrum, focusing on four critical areas. This will increase competition, and we also believe it will enhance revenues. All carriers, including the largest carriers, must have an opportunity to bid on spectrum where needed. One or two carriers should not be allowed to walk away with the entire pie. Spectrum must be made available in sufficiently small geographic areas to allow participation by rural, regional, and nationwide carriers.

The 600-megahertz spectrum must be interoperable. This will ensure open ecosystem access via every carrier. And I commend the members of this committee for their work to restore interoperability in the lower 700-megahertz band. And let's learn from the past: Interoperability is essential.

Finally, policymakers should reject bidding packages that keep smaller carriers from accessing spectrum.

And on the reverse-side auction, broadcasters must show up, they must participate for a successful auction. The whole purpose of the auction is to reallocate valuable, underutilized spectrum to a higher, more efficient use—*i.e.*, mobile broadband. Failure could have significant consequences for competition and consumers.

And under the statute, the Committee was wise. The proceeds of the H Block, the AWS-3, and the incentive auction all will fund FirstNet, a public emergency responder network. While the reclaimed 600 megahertz is critical to the funding sources, the incentive auction is one of several streams established under the Spectrum Act to fund the creation of FirstNet.

So, fortunately, the goals of promoting competition and raising revenue are not mutually exclusive. Auctions with the greatest number of bidders are typically the ones that raise the most revenue.

In summary, to meet these complex, multifaceted goals, CCA proposes the FCC take steps to give every carrier the opportunity to

participate and possibly win in this much-needed low-band spectrum for mobile broadband. And after a decade of consolidation, a successful incentive auction is vital to promote sustainable competition for the digital age.

Thank you for the opportunity.

[The prepared statement of Mr. Berry follows:]

PREPARED STATEMENT OF STEVEN K. BERRY, PRESIDENT AND CHIEF EXECUTIVE OFFICER, COMPETITIVE CARRIERS ASSOCIATION

Chairman Rockefeller, Ranking Member Thune, and Members of the Committee, thank you for inviting me to testify regarding the implementation of the first-ever incentive spectrum auction. I am here today on behalf of Competitive Carriers Association (“CCA”), the Nation’s leading association of competitive wireless carriers. Our association is made up of over 100 competitive carriers ranging from small, rural providers serving fewer than 5,000 customers to regional and national providers serving millions of customers. We also represent over 200 Associate Members—small businesses, vendors and suppliers that provide products and services to carriers of all sizes and employ your constituents. The entire mobile ecosystem is dependent on vibrant competition in the wireless industry at all levels, and access to finite electromagnetic spectrum is critical to supporting this competition.

CCA’s diverse membership is bound together by the shared goal of a competitive regulatory framework and the shared concern over the growing market power of the “Twin Bells”—AT&T and Verizon. Through a steady stream of acquisitions of both competitive carriers and spectrum, these two dominant carriers have turned what once was a robustly competitive wireless marketplace into an industry marching towards duopoly. I know several members of this Committee, as well as the Federal Communications Commission (“FCC” or “Commission”), the Department of Justice (“DOJ”), and Small Business Administration have voiced similar concerns about the increasingly consolidated nature of the industry.

The incentive auction presents a unique opportunity to promote competition in our consolidating industry. Carriers of all sizes require increasing access to limited spectrum resources to provide the services consumers demand. As the DOJ has noted, “spectrum is a scarce resource and a key input for mobile wireless services.” Allowing all carriers, and particularly competitive carriers, to access adequate spectrum resources promotes competition. With an appropriate framework for access to spectrum and other critical inputs, competitors are prepared to invest, innovate, and create jobs to deliver significant benefits to consumers and the economy. Like DOJ Antitrust Division Assistant Attorney General William Baer recently stated, “When you have feisty rivals whose survival depends on innovating and differentiating, they can gain market share and loosen the oligopoly.”

Amidst consolidation in our industry, the incentive auction represents the only near-term opportunity for competitive access to critical low-band frequencies. CCA commends Congress, and particularly the leadership shown by this Committee, for authorizing the FCC to conduct a voluntary incentive auction to reallocate licensed spectrum for mobile broadband use through the Middle Class Tax Relief and Job Creation Act of 2012 (“Spectrum Act”). We are also pleased with the Commission’s efforts, to date, to implement the Spectrum Act with a watchful focus on the importance of competition. The upcoming incentive auction is unique in many ways, including authorizing the FCC to conduct only one reverse auction and repacking of broadcast television spectrum. With one shot to complete this effort, it is vital that the auction is structured to provide maximum benefits to competition and consumers.

A successful incentive auction must attract sellers and buyers alike, maximizing participation in both the reverse and forward auctions. In the forward auction, the FCC must provide all carriers with a meaningful opportunity to bid for needed spectrum. No one or two carriers should be able to aggregate all the reclaimed spectrum and effectively exclude rivals and potential rivals from access to low-band frequencies. Consistent with the Spectrum Act, all carriers, including the two largest carriers, must have an opportunity to bid on spectrum where needed; however, no one should be allowed to foreclose competitors’ access. In addition to reasonable aggregation limits, spectrum must be made available in sufficiently small geographic areas to allow participation by rural, mid-size, and regional carriers, as well as national providers. The 600 MHz spectrum also must be interoperable, so that the largest carriers cannot use their massive market power to prevent competitors from gaining access to the necessary equipment to provide service using spectrum in the

reallocated band. Finally, policymakers should reject bidding packages and blind bidding that may prevent competitive carriers from accessing spectrum even if these other conditions are met, and include bidding credits as appropriate. Beyond creating a successful forward auction, appropriate incentives, outreach, and regulatory certainty are needed for broadcasters to fully consider their options to maximize participation. If broadcasters do not show up to participate in the reverse auction, there will be no forward auction.

These goals and policies will not only promote competition and benefit consumers, but will raise significant revenue for using taxpayer-owned spectrum resources. Proceeds from the incentive auction to fund the First Responder Network Authority (“FirstNet”), a nationwide interoperable broadband network for public safety users, must come from revenue generated in auctions of spectrum identified in the Spectrum Act. While the broadcasters’ reclaimed 600 MHz spectrum is included, the incentive auction is one of several funding streams established through the Spectrum Act that will fund the creation and deployment of FirstNet. Revenue will also support deficit reduction, 911 services, and research and development. Fortunately the goals of promoting competition and raising revenue are not mutually exclusive— auctions with the greatest number of bidders are typically the ones that generate the most revenue.

As a result of Congress’s direction to the FCC to conduct competitive spectrum auctions, competition was introduced, and many of CCA’s members entered the wireless market. After a decade of consolidation, a successful incentive auction is vital to promote sustainable competition for the digital age.

Benefits for Competition

Not all spectrum is created equal, which is why the incentive auction of low-band spectrum is critical to restoring competition in the wireless market. With its excellent propagation characteristics, low band spectrum (or spectrum below 1 GHz) travels greater distances and penetrates into buildings. As AT&T CEO Randall Stephenson stated last year, low-band spectrum “propagates like a bandit.” This makes low-band spectrum important for expanding coverage in all areas, urban and rural. Carriers must be able to provide services responsive to consumer demands, or they do not have a competitive offering. It is more difficult and costly for a competitor to provide service absent low-band spectrum. Low-band spectrum has superior in-building penetration and its broader coverage results in significant deployment cost savings by requiring fewer towers to serve a larger area.

It is important to note that AT&T and Verizon hold the majority of sub-1 GHz spectrum, and that much of this spectrum was given to the two largest companies for use before the FCC had spectrum auction authority. Early commercials for Verizon’s 700 MHz LTE touted its capabilities for “the most consistent speeds indoors or out and obviously astonishing throughput,” and AT&T claimed that T-Mobile “customers [would] enjoy improved coverage, including superior in-building and in-home service, because of the denser grid and access to 850 MHz spectrum” as a benefit to its since abandoned takeover attempt of T-Mobile.

The incentive auction is the only near-term opportunity for increased access to low-band spectrum through FCC auctions. While existing mobile spectrum licenses may be bought on the secondary market, this process is largely controlled by the two largest carriers. For example, in 2012, AT&T and Verizon accounted for nearly 55 percent of all secondary market transactions, and 70 percent of all acquisitions involving spectrum below 1 GHz. For many smaller carriers, the secondary market is not working. This only serves to underscore the importance of gaining access to critical low-frequency spectrum resources through the upcoming incentive auction.

The incentive auction also has significant benefits for rural America. Some have claimed that there are no benefits to rural America in the incentive auction, and that it is an urban-focused or “New York” auction. This is not the case. With its superior propagation characteristics, the 600 MHz spectrum that will be made available through the incentive auction is exactly what is needed to blanket rural America with next generation mobile broadband coverage. On that note, I would also like to dispel the myth that rural Americans, and the carriers that serve them, are not on the cutting-edge of mobile broadband technology and use. In fact, a recently CCA-commissioned study found that 80 percent of rural Americans that plan to purchase a new device within the next three months, plan to purchase smartphones. Specifically, almost 70 percent of individuals surveyed that earn \$25,000 a year or less plan to purchase a smartphone, and 34 percent of rural smartphone owners use wireless exclusively to access the Internet. The benefits of mobile broadband use for mHealth, education, public safety, and economic innovations are magnified in rural areas. Yet close to 40 percent of rural wireless consumers feel they have less choice when it comes to devices and service plans when compared to their city-dwelling

neighbors. Increased access to low-band spectrum for competitive carriers will help bridge this gap, yielding significant benefits for rural America.

Current 600 MHz operations in rural areas also provide auction efficiencies through inclusion in the incentive auction. There are more “white spaces” in the current broadcast band in rural parts of the country. Accordingly, fewer existing broadcasters will need to relinquish spectrum in rural areas, and when remaining broadcasters are repacked following the auction, it will be easier to reach clearing thresholds for the newly reallocated band plan. This means that through the reverse auction, the FCC will need to “buy back” fewer broadcast licenses, while still compensating rural broadcasters that elect to participate, in order to make the same or greater amounts of spectrum available in the forward auction for mobile broadband use. The funds generated from spectrum in rural America will contribute to higher revenue amounts with lower incentive and relocation costs, helping the FCC reach higher clearing thresholds in urban areas as well. While the benefits of increased mobile broadband service in rural America alone are significant, rural carriers also play an important function in the success of the incentive auction overall. It is important, however, that the forward auction is structured so that all competitors have a meaningful opportunity to bid for, win, and provide service using this spectrum.

Priorities for the Forward Auction

Congress has provided the FCC with the necessary tools to structure and conduct a forward auction that incentivizes the maximum number of participants and supports competition while meeting its obligation to promote the dissemination of licenses among a wide variety of applicants, including small businesses and rural operators. Specifically, the Spectrum Act reaffirms FCC authority to “adopt and enforce rules of general applicability, including rules concerning spectrum aggregation that promote competition.” The FCC should utilize these tools to structure a competitive auction that allows all carriers to bid on licenses they need and provide services to meet consumers’ ever increasing demands for mobile broadband access. Specifically, the FCC must prevent spectrum aggregation, right-size spectrum licenses, require interoperability and adopt procompetitive auction procedures.

Prevent Spectrum Aggregation

An auction that cements the two largest carriers’ dominance of low-band spectrum holdings would be detrimental to wireless competition. The FCC can easily prevent this by adopting clear, *ex ante* aggregation limits. The auction’s structure has an enormous impact on whether and how competitive carriers can participate. As Chairman Pryor noted about the 700 MHz auction in 2008, “[h]istory will show that the way the FCC structured the auction basically helped the two big wireless companies to the detriment of competition in this country.” Let’s not make the same mistake. It is vital that the FCC structure the forward auction in a manner that *supports* competition nationwide.

No one, including CCA and its members, has advocated for excluding AT&T or Verizon from participating in the forward auction. As stated above, consistent with the Spectrum Act, all carriers should have the opportunity to participate. Policymakers must ensure, however, that the largest two carriers cannot leverage their tremendous resources to aggregate all reclaimed spectrum in the auction and foreclose competitors from access to the 600 MHz band while they stock their spectrum warehouses. As Chairman Wheeler recently noted, “A key goal of our spectrum allocation efforts is ensuring that multiple carriers have access to airwaves needed to operate their networks.” Accordingly, the FCC must set clear *ex ante* rules that signal to competitors that they will have a realistic opportunity to win spectrum if they participate in the auction, and that the largest two will not be allowed to dominate and foreclose their rivals. The FCC has in the past successfully used auction rules to foster competition while exceeding revenue projections, and should again seek to accomplish both goals through pro-competitive measures.

Some have claimed that smaller competitors seek generally applicable aggregation rules to tilt the playing field in their favor. But it is the opposite: having no aggregation limits in the auction would dramatically tip the scales in favor of the largest incumbents that already control an enormous portfolio of low-band spectrum. Well-crafted auction rules are necessary, not to favor competitors, but to ensure that there can be a dynamic market for competition.

Beyond the incentive auction, the FCC should take steps to prevent excessive spectrum aggregation generally, and I urge the FCC to complete its pending Mobile Spectrum Holdings proceeding and update the broken spectrum screen. More specifically, since the incentive auction is the only near-term opportunity to gain access to low-band spectrum, the importance of effective aggregation rules that promote competition are underscored. Although the incentive auction is the first of its kind

in many respects, policymakers should not rely on theoretical analysis alone to understand the impact of spectrum aggregation restraints in low-band spectrum auctions. The experiences of many international regulatory bodies have not only shown the rural and in-building coverage benefits and cost savings of low-band spectrum, but also have demonstrated that appropriate, up-front aggregation limits promote further competition in auctions and in the market and yield higher revenues.

Right-Sized Spectrum Licenses

Spectrum licenses must be made available in geographic sizes that allow competitors of all sizes to bid for, access and use new licenses won at auction. This is a threshold issue that must be resolved; otherwise competitive carriers will face a barrier to participation. Right-sized spectrum licenses permit smaller carriers to bid for spectrum that matches their current service footprint, while allowing larger carriers to piece together the licenses they need, up to nationwide coverage. This promotes increased carrier participation in the forward auction.

Cellular Market Areas (“CMAs”) are the best geographic license size to promote competition, to raise revenue and to protect the public interest. As a recently CCA-commissioned study demonstrated, CMAs would allow smaller carriers to bid on smaller spectrum licenses without being forced to bid for spectrum they cannot efficiently use. Without smaller geographic license sizes, many smaller carriers will be foreclosed from bidding altogether, putting auction participation and ultimately auction revenues unnecessarily at risk. These smaller license sizes also increase opportunities for market variation in areas where lower amounts of spectrum is reclaimed, and helps mitigate problems regarding coordination along our borders. CMAs also support a more dynamic secondary market for years after the auction has closed. By making more spectrum available for mobile broadband use by reducing the number of licenses with potential encumbrances, CMAs maximize available spectrum and likely increase overall auction revenues. Any auction that does not include sufficiently small license sizes to allow for all carriers to have a meaningful opportunity to bid amounts to regulatory exclusion of smaller carriers. In previous auctions, smaller licenses sizes have raised greater revenue per MHz/POP. For example, in Auction 73, the lower 700 MHz B Block, licensed using CMAs, generated a price twice as high as the larger EA sized lower A Block.

Price of lower A and B Blocks and upper C Block in the 700 MHz auction (March 2008)

Block	A	B	C
Bandwidth	12 MHz	12 MHz	22 MHz
Type	paired	paired	paired
Partition	176	734	12
Price (\$/MHz-pop)	\$1.16	\$2.68	\$0.76

Because the FCC seems focused on using larger Economic Area (“EA”) size licenses, CCA is also currently evaluating the potential for a middle-ground compromise. While we are still vetting the possibilities and socializing ideas among CCA’s members, subdividing EAs into Partial Economic Areas (“PEAs”), may preserve some of the benefits of using CMAs. Along with appropriate spectrum aggregation limits, right-sized geographic licenses, whether CMAs or PEAs, will help to maximize the spectrum available and encourage auction participation by carriers of all sizes.

Require Interoperability

While interoperability was once a shared need, continuing consolidation now requires an up-front requirement that devices utilizing the same technology and operating within the same spectrum band interoperate across all networks using the same technology and band. Interoperability helps ensure nationwide service coverage and preserves consumers’ choice of service provider, and the FCC has historically promoted interoperability of other service bands. CCA commends Chairwoman Clyburn and her staff, the FCC’s Wireless Bureau, and Members of Congress, including several members of this Committee, for their work to restore interoperability to the Lower 700 MHz band. Competitive carriers bid aggressively in Auction 73, including nearly \$2 billion in winning bids from CCA members, under the assumption that the spectrum, like all spectrum before, would be interoperable. It was not until after Auction 73 closed that AT&T created a boutique band class, stranding the Lower A Block without access to devices. After four years, with the help of Chairwoman Clyburn, the industry finally reached an agreement to restore interoperability. During those four years, consumers, especially in rural America, were

not able to realize the benefits of expanded mobile broadband service. Precious resources were expended as capital was stranded on spectrum that could not yet be used and expansive testing and investment focused on restoring interoperability instead of deploying coverage.

I am pleased to report that these carriers are now moving forward to deploy services, and that many competitive carriers are refocused on participating in upcoming spectrum auctions. But it is important that this mistake is not repeated in the incentive auction. An up-front requirement for interoperability in the 600 MHz band is critical to provide the certainty needed for competitive carriers to participate in the incentive auction. Interoperability is necessary to support technological compatibility for consumers to continue to receive service when roaming outside of their carrier's network coverage, a critical element for less-than-national carriers to provide access to the nationwide services consumers demand. A clear rule stating that interoperability will be required is necessary for competitors to raise capital, develop business plans, and invest to provide new services.

Package Bidding and Blind Bidding

As already noted, spectrum aggregation limits, right-sized licenses, and interoperability are critical to the incentive auction's success. But the benefits of an auction that includes these elements may be lost if other practices, such as package or combinatorial bidding and blind bidding, are allowed to undo these competitive safeguards. CCA understands the largest carriers' desires to bid for a large spectrum footprint at once; however, these packages will not change a carrier's incentives to bid on particular markets and may curtail or eliminate participation by smaller carriers and may reduce the revenues generated in the auction. Large packages disproportionately burden rural and regional carriers, and may undermine the benefits of auctioning spectrum using right-sized geographic units.

Additionally, policymakers should avoid blind bidding practices that distort competition in auctions, and support pro-competitive bidding credits to foster a diverse group of bidders. Blind bidding adds unnecessary complexity to the process of valuing spectrum, and may impact the availability of devices and roaming partners. Accordingly, the use of blind bidding has disproportionate adverse effects on smaller carriers. Conversely, the appropriate use of bidding credits promotes participation by small businesses.

Funding Targets and Public Safety Benefits

While previous spectrum auctions have returned significant benefits to taxpayers to the tune of billions of dollars to the Treasury, the incentive auction is again unique in providing particular targets for funds raised through this auction. Among these targets, the Spectrum Act dedicates funding for creating and deploying FirstNet, a nationwide interoperable mobile broadband network for public safety.

Congress wisely provided several funding streams for this important goal, including not only the incentive auction but also several other auctions that will likely be completed and raise billions of dollars before the incentive auction begins. These auctions include the H block, which will be auctioned in January, and the yet-to-be-scheduled AWS-3 auction. CCA commends Congress, the FCC, National Telecommunications and Information Administration and the Department of Defense for recent developments to reallocate the 1755-1780 MHz band to be paired with the 2155-2180 MHz band for auction. This pairing will maximize the use and potential revenue generated from its upcoming auction, and provides another important opportunity for competitive carriers to access needed spectrum in a globally harmonized LTE equipment ecosystem. Based on various estimates, it is likely that these auctions will fully fund the Spectrum Act's \$7 billion obligation to FirstNet before conducting the incentive auction.

FirstNet's success is not only dependent on obtaining this funding, but also on public-private partnerships with the wireless industry to make nationwide mobile broadband coverage a reality. FirstNet benefits from competition among commercial wireless carriers through having additional potential partners for deployment and roaming, as well as having a greater number of potential buyers of excess capacity on FirstNet on a secondary basis. Partner carriers, particularly in rural areas, will require spectrum below 1 GHz to efficiently cover large land masses with low populations. If these carriers cannot gain access to needed spectrum through the incentive auction, either due to aggregation efforts of the largest two carriers or because they were foreclosed from participating due to the size of licenses offered, they will not be able to form partnerships with FirstNet for the benefit of the new nationwide interoperable broadband public safety network.

Broadcaster Incentives

The entire incentive auction process hinges on sufficient participation by broadcasters, and policymakers must ensure that broadcasters are equipped to fully evaluate their options in the incentive auction. This includes not only education and outreach to all potential reverse auction participants, but also the regulatory certainty to evaluate future valuations of broadcast business plans. Pending rulemakings must be completed where possible, as they may have significant impact on how broadcasters approach their decision to relinquish or share some or all of their existing spectrum. Accordingly, the FCC must be open and transparent regarding post-auction broadcaster flexibility, both in terms of repacking and the regulatory regime.

Other Efforts to Promote Competition

I would be remiss if I did not acknowledge other efforts led by members of this Committee to promote competition in the wireless industry. I commend Senators Klobuchar and Fischer for their work to ensure that unused spectrum is available for use by smaller and rural carriers. While this does not replace the need for access to spectrum through auctions, their recently introduced legislation could help smaller carriers access spectrum on the secondary market. Additionally, I support Senator Ayotte's focus on Universal Service Fund issues, and look forward to working with her on making sure that support is competitively neutral. CCA appreciates the opportunity to work with Senators on these and several other issues before the Committee.

Conclusion

The FCC faces many challenges in pioneering the first incentive auction, but also has the potential to reinvigorate mobile broadband competition while generating significant revenue for use of a finite, taxpayer-owned resource. I support Chairman Wheeler's announcement and milestones to conduct the auction in a way that ensures we get it right. I urge policymakers to view a successful auction as one that not only generates revenue, but also reallocates the maximum amount of spectrum to meet our Nation's growing mobile broadband demands, ensures that carriers of all sizes have a meaningful opportunity to bid, and bolsters competition by providing more carriers access to critical sub 1 GHz spectrum. In turn, a competitive mobile broadband industry will yield untold dividends to consumers for years to come. The FCC should use the tools provided by Congress to conduct an auction that delivers not only revenue but also competition to allow continued growth and innovation in the wireless industry under a light touch regulatory regime.

CCA appreciates the Committee's oversight and focus on this important issue, and I thank you for the opportunity to testify before you today. I welcome any questions.

Senator PRYOR. Thank you.
Mr. Padden?

STATEMENT OF PRESTON PADDEN, EXECUTIVE DIRECTOR, EXPANDING OPPORTUNITIES FOR BROADCASTERS COALITION

Mr. PADDEN. Thank you, Mr. Chairman.

I serve as Executive Director of a group of more than 70 TV stations who are open to voluntary participation in the incentive auction under the right circumstances and are committed to making the auction a success.

Consumer demand for wireless broadband is increasing like a hockey stick. Given the dearth of other sources of additional spectrum, the FCC should seek to reallocate the full 120 megahertz specified in the National Broadband Plan.

Unfortunately, the FCC has not attracted the critical mass of spectrum sellers that will be necessary to have a successful auction. Without sufficient TV spectrum sellers, there will be no auction. From this point forward, every issue much be evaluated through the prism of whether it will help or hinder the effort to attract TV spectrum sellers.

According to analysis by recognized auction expert Dr. Peter Cramton, the FCC's proposal to score stations will not improve the efficiency of the auction unless the FCC somehow knows the secret reserve price in the mind of every participating broadcaster, which is obviously impossible, and unless the FCC adjusts its scoring dynamically between every round of the auction, which would add enormous complexity to an already complex auction.

T-Mobile and Sprint are lobbying for bidding restrictions because they want to get this spectrum for less than they would have to pay if they have to bid against AT&T and Verizon. But Fred Campbell, the former chief of the FCC's Wireless Bureau, has conducted a thorough analysis of bidding restrictions in past auctions and concluded that they dramatically reduce revenue—revenue needed in this auction to attract a sufficient number of TV spectrum sellers.

If the FCC hopes to recover significant broadcast spectrum, it must permit and even encourage innovative, out-of-the-box channel-sharing proposals by TV stations. Stations should be free to relocate within their market, to change their City of license, and to share a channel with any other station in their market provided the result is to free up spectrum for the auction.

In a letter to the FCC, some Senators expressed a concern that the incentive auction might interfere with broadcast service to rural viewers by translator stations. Recently, our coalition prepared an analysis of the Minneapolis, Minnesota, market and concluded that rural consumers will continue to have access to translator service after the incentive auction.

Before stations can decide to participate in the auction, they need to know the starting level of prices the FCC will offer, they need to know when they will be paid, and they need to know when they will be expected to cease broadcasting operations. The sooner the FCC can make this information available, the sooner more stations will be seriously able to evaluate auction participation.

In closing, I want to reiterate the enormous respect and appreciation we have for the professionalism, dedication, and openness of the FCC's Incentive Auction Task Force, led by Mr. Epstein.

Thank you.

[The prepared statement of Mr. Padden follows:]

PREPARED STATEMENT OF PRESTON PADDEN, EXECUTIVE DIRECTOR, EXPANDING OPPORTUNITIES FOR BROADCASTERS COALITION

Chairman Rockefeller, Ranking Member Thune, and Members of the Committee, my name is Preston Padden. I had a long career in television including many appearances before this Committee. I retired from the Walt Disney Company in 2010, taught Communications Law for three years, and now serve as Executive Director of the Expanding Opportunities for Broadcasters Coalition. Our Coalition is comprised of more than 70 TV Stations weighted toward the largest markets. These Stations are open to voluntary participation in the Incentive Auction under the right circumstances.

Our Coalition is committed to working with the FCC to make the Incentive Auction a success. We believe that if it adopts the right rules and policies, the FCC can achieve the Congressional goals of reallocating 120 MHz of spectrum from broadcasting to wireless broadband, raising \$7 billion to fund FirstNet, and raising additional monies to contribute to deficit reduction.

The FCC's Incentive Auction Task Force has great leadership and is doing a terrific job. All parties interested in the Auction have enjoyed extraordinary access to the dedicated professionals who comprise the Task Force. The process has been

open, constructive, and collaborative. In fact, as someone who has been around the FCC for 40 years, I have never seen a more impressive administrative effort.

Graphs of increased consumer demand for wireless broadband look like a “hockey stick.” And, consumer embrace of online video, including wireless video, has dramatically increased the importance of supplemental downlink to support asymmetric network architecture. Given the dearth of other sources of additional spectrum, the FCC should press to reallocate the full 120 MHz specified in the National Broadband Plan.

Unfortunately, the FCC has not yet attracted anything approaching the critical mass of TV Station volunteers that will be necessary to have a successful auction. The “Canary-In-The-Coalmine” of this Auction is the fact that a top FCC media bureau official, whose responsibilities included outreach to broadcasters, just resigned to take a job with the broadcasting company most opposed to the auction. Without sufficient TV Station volunteers, the FCC will have no spectrum to auction, consumers will get no relief from dropped calls and spinning pinwheels, and there will be no money for FirstNet or for deficit reduction.

Our Coalition believes that the case **can** be made to convince TV Stations to participate in the auction. The key is the “Spectrum Value Gap” identified by the FCC in its Omnibus Broadband Initiative (OBI) Technical Paper # 3. The opportunity to monetize a Station’s spectrum based on the higher values present in the wireless industry is the incentive to bring TV Stations in the front door of the auction. But, broadcasters do have alternatives. Just one of those alternatives is to wait for a new digital transmission standard and then to deploy the Tower Overlay system that was demonstrated successfully this past August at the International Broadcasting Convention. This system would enable TV Stations to embed LTE transmissions to wireless devices in their broadcast transmissions, potentially earning an ongoing revenue stream from wireless carriers. Some stations find this potential route to monetize their spectrum compelling.

Going forward, the FCC’s number one priority must be to convince more broadcasters that the Incentive Auction is a more attractive and more immediate opportunity to monetize their spectrum. The FCC has spent a lot of time thinking about a band plan. But if enough broadcasters don’t walk through the front door of the Auction, there will be no need for a band plan. And, the FCC has spent a lot of time debating bidding restrictions. But without enough broadcast volunteers, there will be no need to restrict bidding because there will be nothing for any wireless carrier to bid on.

From this point forward, every issue, every rule, and every procedure must be evaluated by the Commission through the prism of whether it will help or hinder the effort to attract a critical mass of TV Stations. No matter how compelling other considerations might be, the FCC simply cannot afford to make decisions or to adopt policies that will discourage broadcaster participation. Let me offer a few examples.

Scoring: The FCC’s Notice of Proposed Rulemaking for the Auction proposes to “score” stations based on population covered or some other station characteristic. This proposal is contrary to the statutory directive that payments to stations should be based on the market forces of an auction. Stations are selling 6 MHz of spectrum, not TV station businesses. The only legitimate basis to distinguish between stations is their relative contribution to repacking the broadcast band and to clearing spectrum. For this purpose, scoring is unnecessary because the Commission’s auction design automatically will freeze hard-to-repack stations at early, higher-priced rounds of the auction.

Recognized expert auction economist Peter Cramton recently presented a deck to the FCC’s Staff demonstrating that scoring would produce inefficiencies in repacking and clearing spectrum. That deck is attached to my testimony as Exhibit No. 1. Professor Cramton explains that scoring TV Stations in the Auction cannot be effective unless: (1) the FCC knows the reserve price of every TV Station in the Auction, which is impossible; and (2) the scoring weights are dynamically adjusted between Auction rounds, which would add unacceptable complexity and delay to what already is the most complex auction ever attempted by human kind. Most importantly, the prospect of some arbitrary and opaque scoring mechanism is breeding distrust among broadcasters and is driving them away from the Auction. Scoring is an example of a proposal that the FCC must evaluate through the prism of whether it will help or hinder the effort to attract to the Auction a critical mass of broadcasters.

Bidding Restrictions: There has been vigorous advocacy among the carriers regarding bidding restrictions on AT&T and Verizon. Our Coalition, which receives no funds from any carriers, strongly opposes such restrictions. The wireless market is at least workably competitive. T-Mobile is coming on strong and actually beat AT&T and Verizon in subscriber growth in recent quarters. Sprint is now controlled by

Softbank—a company that has enjoyed enormous competitive success in Japan’s wireless market.

T-Mobile and Sprint’s claims about the superiority of lower band spectrum are overstated, and it would be perverse to reward these two companies for their decision to not bid in the 700 MHz auction. Fred Campbell, former Chief of the FCC’s Wireless Bureau, conducted a thorough analysis of bidding restrictions in past auctions and concluded that they dramatically reduce auction revenue. His analysis is appended to my testimony as Exhibit No. 2. Reduced auction revenue would leave the FCC without the funds necessary to attract a sufficient number of TV station spectrum sellers. Whatever the perceived benefits of bidding restrictions, those benefits must be weighed against the very real danger of inadequate revenue to buy the spectrum necessary for a successful auction.

Channel Sharing: The FCC has a legacy of strict rules regulating a TV Station’s City of license, changes in City of license, and signal coverage over that City of license. In the Incentive Auction Notice of Proposed Rulemaking, the FCC proposed to adhere to these legacy rules by, for example, requiring that a station that surrenders its channel and then shares another station’s channel continue to place a city grade signal over every square inch of its current City of license. But, in this new world, with a statute that encourages stations to simply go out of business and to serve absolutely no one, strict adherence to City of license regulation simply makes no sense. If the FCC hopes to recover significant broadcast spectrum, it must permit, and even encourage, innovative “out-of-the-box” channel sharing proposals.

Specifically, stations should be free to relocate within their market, to change their City of license, and to share a channel with any other station in their market provided that the result is to free up spectrum for the Commission. The stations that are co-located at a market’s central “antenna farm” typically will take up only one channel in the repack of the TV band while stations scattered elsewhere in a market each are likely to take up three channels because of adjacent-channel interference. This engineering fact means that channel sharing, City of license changes, and moves to a central “antenna farm” can be critical to clearing sufficient spectrum for reallocation to wireless. A decision to continue to require compliance with legacy City of license regulation is an example of a decision that would work against the goal of a successful auction.

TV Translators: In a letter to the FCC, some Senators expressed a concern that the Incentive Auction could interfere with broadcast service to rural viewers by translator stations. However, translators are used to bring broadcast service to viewers in areas that primary broadcast transmissions do not reach. By definition, translator areas are not areas characterized by spectrum scarcity. Recently our Coalition prepared an analysis of the Minneapolis, Minnesota market and concluded that rural consumers will continue to have access to translator service after the Incentive Auction. A copy of that analysis is appended to my testimony as Exhibit No.

3.

Auction Pricing: TV stations are ongoing businesses with building leases, equipment leases, programming contracts, and employment agreements—all of which need to be renewed from time to time. Before stations can decide to participate in the auction they need to know the level of starting prices the FCC will offer; they need to know when the auction will be held; and they need to know when they will be expected to cease broadcasting operations. The sooner the FCC can make this information available, the sooner more stations will be seriously able to evaluate auction participation.

* * *

In closing I want to reiterate the enormous respect and appreciation we have for the professionalism, dedication, and openness of the FCC’s Incentive Auction Task Force. Although our Coalition does not always agree with their current views on every critical issue, we absolutely are committed to the success of the Incentive Auction and will do everything possible to help to achieve that result.

Mr. Padden also submitted the following documents, which can be found on-line.

1. Peter Cramton, Professor of Economics, University of Maryland, “Scoring in Reverse Auction” [slides], December 4, 2013. <http://apps.fcc.gov/ecfs/document/view?id=7520960932>
2. Fred B. Campbell, Adjunct Professor of Law, University of Nebraska Space, Cyber, and Telecom Program and former Chief of the Wireless Telecommunications Bureau, Federal Communications Commission, “Maximizing the Success of the Incentive Auction,” prepared for the Expanding Opportunities for Broadcasters Coalition and the Consumer Electronics Association, November 4,

2013. <http://www.ce.org/CorporateSite/media/Government-Media/GLA/auction-whitepaper-10-31-2013-FINAL-revised-v2.pdf>

3. Letter dated November 21, 2013 to Marlene Dortch, Secretary, Federal Communications Commission, from Preston Padden, Executive Director, Expanding Opportunities for Broadcasters Coalition, Re: Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, GN Docket No. 12–268 <http://apps.fcc.gov/ecfs/document/view?id=7520959122>

Senator PRYOR. Thank you.
Mr. Kaplan?

**STATEMENT OF RICK KAPLAN, EXECUTIVE VICE PRESIDENT,
NATIONAL ASSOCIATION OF BROADCASTERS**

Mr. KAPLAN. Good afternoon, Mr. Chairman, Ranking Member Thune, and members of the Committee. Thank you for inviting me, on behalf of the National Association of Broadcasters, to testify before you today.

At the outset, NAB would like to commend Chairman Wheeler on his recent decision to step back and take a deep breath and appreciate the enormous complexity of the incentive auction. He clearly understands that there are a number of critical unresolved issues that are going to take more work before we give ourselves the best chance for a successful auction.

We at NAB believe there are at least three essential ingredients necessary to craft a successful auction.

First, the FCC should take public engagement to an all new level. This means providing as much information to the outside world as possible and demanding the best fact-based data from all of us along the way. This could entail further notices on issues such as the new band plan, co-channel interference, or, as Commissioner Rosenworcel has suggested wisely, a series of en banc hearings.

Second, the FCC must preserve broadcasters' coverage areas and populations served. This directive from Congress is not as much about broadcasters as it is about viewers, your constituents, who rely on us for essential news and information. The notion is simple: If their stations remain on-the-air broadcasters, the constituents should continue to receive them.

Third, as Chairman Wheeler acknowledged, this auction is exceedingly complex. There are many i's to be dotted, t's to be crossed. Members of this committee have noted a few. For example, Senators Begich, Fischer, Heller, and Klobuchar have asked, what are the effects of different policy decisions on the future of translators and low-power television in rural America? This must be studied and understood by the FCC.

And with the leadership of Senator Klobuchar, Senators Klobuchar, Ayotte, Blumenthal, Boxer, and Johnson have recognized how critical it is to secure agreements with Canada and Mexico. Without them—I want to be clear about this—the auction will raise hundreds of millions, if not well over a billion dollars less, harming FirstNet and other congressional priorities. It will also make subsequent repacking and a future unified band plan nearly impossible.

So thank you again for the opportunity to appear here today, and I very much look forward to answering your questions. Thank you.

[The prepared statement of Mr. Kaplan follows:]

PREPARED STATEMENT OF RICK KAPLAN, EXECUTIVE VICE PRESIDENT, STRATEGIC
PLANNING, NATIONAL ASSOCIATION OF BROADCASTERS

Good afternoon, Chairman Rockefeller, Ranking Member Thune and members of the Committee. Thank you for inviting me, on behalf of the National Association of Broadcasters (NAB), to testify before you today.

Broadcasting, unlike any other medium, reliably offers local and national news, emergency information, sports and entertainment without charge to Americans throughout our great country. We connect people to their communities—wherever they may live—provide them with critical, lifesaving information, and embrace public service obligations that are unique to our industry. While new technologies have come and gone, broadcasting has long endured because local stations are indelibly woven into the fabric of American society.

NAB is committed to doing everything we can to ensure that the broadcast television incentive auction has the best chance for success. If done correctly, the auction could benefit consumers, public safety through FirstNet funding, and the U.S. Treasury in the form of deficit reduction. We believe there are at least three elements essential to achieving these aims.

First, as NAB has recently demonstrated, when parties engage constructively, where there is a respect and healthy appreciation on all sides for the value of various communications services, and where decisions are based on facts and data, almost anything can be accomplished. When we began working with the Department of Defense (DOD) this summer on sharing the broadcast auxiliary spectrum (BAS) at 2025–2110 MHz, very few observers were optimistic about the chances of reaching agreement, especially in the short time available. However, both DoD and NAB came to the table constructively, made a genuine attempt to understand the key concerns of the other party, and grounded our decisions in facts and data, rather than clinging to unyielding demands about the need for exclusive-use spectrum. All parties to the incentive auction proceeding, including the Federal Communications Commission (FCC), should take a page from that book, and proactively and constructively engage with an eye towards fostering consensus among the stakeholders wherever possible, and to base their positions and decisions, respectively, on facts and not merely desired outcomes.

Second, not only does the Spectrum Act require it, but common sense and consumer welfare also dictate that the FCC make all reasonable efforts to preserve non-auction participants' coverage areas and populations served. While television viewers may inevitably lose a favorite station or link to certain news or information because a particular station volunteers for the auction, TV viewers should not lose access to channels that remain on the air as a result of an untested, sub-optimal repacking software and band plan.

Third, "crafting a successful auction" means a number of things. It certainly means that the FCC should make it as simple as possible to participate in the auction (although it does not mean actively encouraging or coercing broadcasters into participating). Crafting a successful auction also means developing a good, long-term band plan, and ensuring that rural and underrepresented consumers do not lose essential television service as a result of discounting rural or diversity concerns. Moreover, it undoubtedly means taking the time to maximize auction revenue (and thus being able to fund FirstNet) by ensuring that broadcasters along the border regions can be repacked.

Constructive Engagement

Everyone at this table understands that the voluntary broadcast incentive auction and repacking process is extremely complex. It has been called "first in the world," "unprecedented," "unique," "groundbreaking," and a host of other adjectives that make it clear we are venturing into unexplored territory. Despite the challenges of this novel enterprise, I can say with confidence that if we all work together—Congress, the FCC, stakeholders—there is a sweet spot where the auction can be a success for all involved.

NAB has been at the forefront in working collaboratively and solving problems in the incentive auction process. In this proceeding, we have worked closely with AT&T, T-Mobile, Verizon Wireless, Sprint, Google, Shure, NCTA, CTIA, Qualcomm, Microsoft, Intel and members of the public interest community to try to find areas of common ground. In our view, such collaboration is essential to a successful auction.

Where we identify a problem or concern, we propose solutions. We are always looking for areas of agreement and compromise and have been an open book for

other industries and the FCC. We have shared widely our extensive data and analyses—as well as any assumptions that underlie them—and have done everything we can to listen and understand the ideas of others and share our views on the various paths to success.

As I noted earlier, this approach led us to remarkable progress in an unrelated spectrum proceeding. Despite the fact that NAB and its members had little to gain, we nonetheless worked hard to find a way, based on facts and data, to arrive at a framework with DoD officials to help free up 50 megahertz of spectrum that will benefit the wireless industry and, we hope, the greater good. This effort to help Congress, the Administration and the FCC achieve their spectrum goals demonstrates NAB's commitment to constructive engagement, and hopefully, can serve as a model for other industries, including the wireless industry, in the future.

Protecting Viewers

Along with many others, I have worked tirelessly on this auction for well over a year. What has surprised me most during this time is that lost in the debates over competitive rules, band plans, and unlicensed versus licensed spectrum, are the tens of millions of over-the-air television viewers.

It was not that long ago—less than five years, in fact—that Congress was so alarmed about the impact of the digital television (DTV) transition on viewers, it extended the transition deadline and put significant resources into ensuring that viewers could still receive their invaluable free television services. Congress recognized that millions of consumers could lose access to channels that were critical to their everyday lives. Even with the delay and a renewed emphasis on informing every consumer, I am sure those of you on this Committee who served in Congress at the time are well aware of the many challenges your constituents nevertheless faced.

Unfortunately, the DTV transition will be a walk in the park compared to the repacking process that is part and parcel of this auction. The final channel changes of the DTV transition involved the FCC repacking only about 100 stations. Both viewers and broadcasters had more than five years to prepare for the change, and each station had a second channel on which to ensure a smooth transition. In the post-auction repacking, it is likely that many more stations will be repacked—perhaps in excess of 500—and stations will be required to “flash cut” to their new channel—meaning there is no second channel, and stations will have to quickly move from one frequency to another, resulting in a bumpy ride for consumers.

It must be the FCC's job to minimize the negative impact of the auction on the tens of millions of Americans who rely on free, over-the-air TV—especially those who are most vulnerable, such as senior citizens, lower-income viewers and the underserved. This entails preserving the service areas and people served by stations that remain on the air. And despite representing broadcast companies, I recommend that the FCC view this process through the eyes of the *consumer*, not just the station owner. If a full-power or Class A station remains on the air—and the vast majority of them will—a consumer should continue to receive that station. Some of the FCC's proposals, however, suggest that viewers are fungible—meaning that as long as the station retains the same *net* number of viewers, everything is fine. But it's the *viewers* that matter most, and *consumers should have access to the stations they receive today after the auction*, provided those stations remain on the air.

Under another proposal currently being developed, the Commission would use a “proxy” channel to calculate a station's service area during the auction process, instead of the station's actual channel. Thus, rather than measuring the actual interference a station will receive from another station on the channel it will operate on after repacking, the FCC will choose a different “proxy” channel to measure interference. This kind of approximation, however, cuts corners, and could result in a service loss or gain in a significantly large number of instances.

As it moves toward this auction and repacking, the Commission should not forget what has been, and will continue to be, the *backbone* of our communications system for local news and emergency information. Broadcast television has been there every step of the way to support your constituents, and survey after survey demonstrates that broadcast television is still what they rely upon most. It is imperative to protect viewers in this process. Let's think about it this way: Your constituents will have no idea whether their wireless provider acquired an extra 10 megahertz in the auction to add to its 135 megahertz in their market; but I can guarantee they will start dialing your phone numbers when they are suddenly no longer able to receive the broadcast television stations they've relied upon for years, if not decades.

Getting It Right

A number of critical auction issues remain far from resolved. Each of these must be dealt with fully, and before an auction order is released by the FCC, for the auction to have a realistic chance to succeed. If unresolved or unduly rushed, any one of these issues threatens the success of the auction and, in turn, the quality of broadcast and broadband services for the American people going forward.

Many members of this Committee and the Senate as a whole have raised the question of how the auction will impact broadcast stations along our borders with Canada and Mexico, and what spectrum for wireless broadband will be foregone if the auction fails to account for agreements with our neighbors. As a result of long-standing agreements with Canada and Mexico, the U.S. cannot repack any stations along the borders without undertaking a formal consultation process. If the current agreements are left in place and new ones not reached, there are at least two damaging outcomes for the auction. First, the Commission will find it nearly impossible to reclaim sufficient spectrum within 250 miles of the Canadian border and 150 miles of the Mexican border, because it will be relying solely on buying out stations, as it will be unable to move them through repacking. Second, if the Commission approves an auction order without these agreements and does not deal with the border areas at this time, it will almost certainly *never* be able to repack stations there. Once the post-auction repacking takes place, there will be few, if any channels in the future to which border stations can be moved. The television band will already be tightly packed, essentially guaranteeing different band plans in the north and south as well as the center of the country for decades. The result would undeniably be a jigsaw, suboptimal approach.

The reality here is that without the ability to repack stations along the border, the Commission would be foregoing hundreds of millions, if not more than a billion dollars of potential revenue. So it makes little sense to forge ahead with an order, without first coming to an agreement with our neighbors. An agreement allows for a coherent repacking of television stations throughout the country, including the border regions, and, consequently, for money to flow to FirstNet and the U.S. Treasury for deficit reduction.

The impact of the auction on rural America is another important concern. We all know this auction is designed to ameliorate the alleged spectrum challenges in a handful of heavily urban markets, such as New York, Los Angeles and Chicago. *No one* claims, however, that rural America is facing a spectrum crunch. But what's at stake in this auction for rural America is the elimination of television translators and low-power television stations (LPTVs) that provide service to areas otherwise unreachable. In a number of markets, especially in the West, if the FCC elects to reclaim 120 megahertz of television spectrum, rather than 60 or 84 megahertz, hundreds of translators and LPTVs will be forced to go off the air. This is a serious issue that deserves serious study and consideration before the FCC makes its various policy choices.

There is one final thought I would like to offer. When Congress authorized the FCC to conduct a voluntary broadcast incentive auction in the Spectrum Act, it grounded that process in market-based principles. The authors of the National Broadband Plan believed that, in many cases, television spectrum would be more valuable in the hands of wireless carriers than broadcasters. The FCC's job in the upcoming auction is to see if this claim is true. If the auction is truly market-based, the FCC will do this on a voluntary, non-coercive basis. Some, however, have encouraged the Commission to twist its authority to try to force broadcasters off the air. They see no problem with decimating an industry that accounts directly and indirectly for well more than a million jobs and helps drive the local and national economies, but that also is the lone communications service statutorily designed to serve the public. The Commission does not have the authority to do this under the Spectrum Act; such actions also would be unwise and severely harm the American people. To be clear: The Commission's directive is *not* to push broadcasters to participate in the auction; but rather, to make it as easy as possible for them to participate if the economics make sense. That is the auction Congress intended, and that is the auction NAB will work tirelessly to help come to fruition.

We thank the Committee for assuming its oversight function in this process. This role is essential to ensuring that the Commission faithfully adheres to the statute this body crafted so carefully to achieve a balance between broadcast and broadband. I urge this Committee to continue to hold such hearings, as it sheds a much needed light on the auction process and will ultimately lead to a better result. Thank you again for inviting me here today. NAB is anxious to see a successful incentive auction and will play an active role in ensuring that happens. I look forward to answering your questions.

Senator PRYOR. Thank you.
Mr. Feld?

**STATEMENT OF HAROLD FELD, SENIOR VICE PRESIDENT,
PUBLIC KNOWLEDGE**

Mr. FELD. Thank you for inviting me to testify.

I have repeatedly urged that a well-structured incentive auction could be a rare policy trifecta, a win-win-win that provided more licensed spectrum and more efficient access to unlicensed spectrum in this extremely useful set of frequencies. In addition to raising revenue for an interoperable public safety network, now called FirstNet, the auction of licenses in this band for mobile broadband could also enhance competition to the benefit of consumers.

The last 2 years have proved the importance of unlicensed access, especially in the TV bands. In particular, TV white spaces has seen rapid growth and development in the last year. The Gigabit Libraries Network is using TV white spaces in 10 pilot programs to extend free public Wi-Fi into the local community. Gig.U is using TV white spaces in partnership with the University of West Virginia to bring high-speed broadband access to homes and businesses around their campus. It seems that nearly every month brings announcement of another new product or new investment both here and abroad.

The last 2 years have also shown the value of regulatory steps to promote competition. Regulatory intervention to make spectrum available to competitors has led directly to billions of dollars in new investment and a resurgence of competition. No longer starved for spectrum, rival carriers have forced what had become a complacent duopoly to upgrade their networks. And for the first time in years, consumers are seeing real innovation in pricing plans, such as Sprint's lifetime unlimited and T-Mobile's international roaming and equipment upgrade plans.

All of this highlights the importance of getting the rules for this incentive auction right. The Department of Justice has identified access to low-band spectrum as critical for competition. This spectrum is highly valued for its ability to travel long distances and penetrate buildings and trees. Companies looking to invest in unlicensed, such as Comcast, Google, and Microsoft, have likewise identified the broadcast band as critical for developing the next generation of unlicensed services.

What does getting it right mean? First, we must stop creating false choices and pushing the FCC to choose sides. Congress passed a compromise bill that gave the FCC authority to use the auction to enhance unlicensed and promote competition but within limits. We should collectively embrace this compromise rather than re-fighting old battles. The priorities of this auction must work together, not push against each other and fly apart.

We should recognize that well-structured guard bands will both provide adequate spectrum for unlicensed use and increase the value of the service as a whole.

Finally, we need to make sure that we have enough participation in the auction to make it worth holding. The best way to ensure that enough bidders show up is what I call a no-piggies rule. Don't

ban anyone from the auction, but limit the number of licenses that any one company can win.

Opponents of a no-piggies rule argue that we need to have AT&T and Verizon in the auction. I agree. But the beauty of the no-piggies rule is it lets AT&T and Verizon participate and I believe it is consistent with what Senator Thune suggested and what I am now hearing from AT&T. It just makes sure that there are enough licenses to make it worthwhile for competitors like Sprint and T-Mobile and DISH to show up as well. An auction with only AT&T and Verizon will be just as much a failure as an auction that banned AT&T and Verizon.

To conclude, key to a successful incentive auction is a balanced approach, and we get there by continuing our current deliberative process. We can still achieve a public policy trifecta, a win-win-win for mobile broadband competition, unlicensed access, and public safety. It would be a shame to miss this chance by fighting old battles instead of working together.

Thank you, and I look forward to your questions.

[The prepared statement of Mr. Feld follows:]

PREPARED STATEMENT OF HAROLD FELD, SENIOR VICE PRESIDENT,
PUBLIC KNOWLEDGE

Good morning, Chairman Rockefeller, Ranking Member Thune, and members of the Committee. I am Harold Feld, Senior Vice President at Public Knowledge, a public interest nonprofit dedicated to the openness of the Internet and open access for consumers to lawful content and innovative technology. I am pleased to have the opportunity to appear before you once again to discuss the implementation of the FCC's first ever spectrum incentive auction.

Executive Summary

A little over 2 years ago, I testified before the House Energy and Commerce Subcommittee on Communications and Technology about what was then a proposal to consider giving the FCC authority to conduct incentive auctions. As I said at the time, the incentive auction provides a rare case for a 'win-win-win' in public policy. Done thoughtfully, the incentive auction could provide new low-band spectrum licenses for wireless carriers to meet expanding demand and enhance competition, provide revenue to pay for a national wireless network for first responders, and enhance the efficiency of the unlicensed TV white spaces service while preserving free over-the-air television.

I still believe we can do this. But we cannot succeed if we rush heedlessly forward out of impatience to hold an auction however ill-designed. Nor will we achieve this by forcing false choices between licensed and unlicensed spectrum, or between enhancing competition and paying for FirstNet. To the contrary, efforts to follow what seems like the straightforward path to maximizing revenue by minimizing guard bands or refusing to adopt rational spectrum aggregation limits are likely to make this auction a failure rather than a success.

Background

Congress' inclusion of Title VI in the Middle Class Tax Relief and Job Creation Act of 2012 was a groundbreaking and critical step forward for U.S. communications policy and the advancement of new and innovative technology in the 21st century. It was groundbreaking because of the creation of the FCC's authority to create and execute a two-sided incentive auction for the first time in history. This mechanism for fairly repurposing spectrum that is already allocated uses market based principles to encourage more efficient use of this valuable public resource and make room on the spectrum allocation for new uses and technologies to develop. The legislation was a critical step because it opened up spectrum to allow for greater growth and competition in the licensed wireless broadband market, while preserving a commitment to unlicensed spectrum to be used for new innovative services, some of which may not even have been invented yet. The legislation also balances the priorities of repurposing spectrum for new uses with the goals of funding an interoper-

able public safety wireless network in accordance with the recommendations of the 9/11 Commission.

I continue to believe that all these goals remain possible. Certainly it takes patience and a well developed record to find the way to balance these competing goals. I commend the FCC for working so diligently to get the numerous details right so that all these working parts will mesh together, rather than fly apart. Chairman Wheeler's recent blog post¹ outlining a schedule for how the FCC will make its decisions and a target date for the auction is realistic, and provides important transparency for the industry.

Conversely, I find it very unfortunate that some continue to try to create artificial choices among the goals Congress created. We are well aware that the final language of the Act represented a compromise between Members and stakeholders with very strongly held opinions on the appropriate policy to follow. Rather than refight these battles again and again, we should embrace the compromise. Rules that ignore the compromise struck by Congress, pretending that one faction triumphed over the other when it did not, do more than violate the language of law. Such efforts threaten to unbalance the complex machinery Congress dictated for running the auction, potentially dooming all these efforts.

Allow the FCC to do its job

Perhaps most importantly, Congress should remember that every economist that testified on incentive auctions—regardless of political affiliation—urged that the FCC must have maximum discretion to design and run the auction. Certainly Congress must maintain oversight. But Members should also recognize both the tremendous skill and experience the FCC has brought to bear on this complex problem and the FCC's history of success since Congress authorized spectrum auctions 20 years ago. It is entirely appropriate to require the FCC to explain its choices. It is counterproductive to tell the FCC before it even makes choices that it has chosen wrong.

Since passage of the Act, the FCC has moved quickly to design this first-ever incentive auction to reflect the several goals of the legislation and with the input of all critical stakeholders. In order for the incentive auction to be successful two things are necessary. First, all stakeholders and FCC staff need to work in a transparent, participatory way to determine the various aspects of auction design, band plan options, and repacking processes. Second, the FCC must enact rules that respect and balance the various goals of the legislation rather than bowing to pressure from one interest in favor of another.

Most importantly for those following from outside, the structure created by Congress depends on maximizing the difference between what it has to pay broadcasters and what it can persuade wireless carriers to pay. If the FCC recovers 120 MHz of spectrum, but ends up giving 90 percent of the proceeds to broadcasters to facilitate recovering that much spectrum, the auction cannot pay for FirstNet. By contrast, an auction that recovered somewhat less spectrum, but where the Federal Government kept much more of the revenue, would potentially produce far more revenue for the government. As a result, the FCC must strike a balance between providing real incentive to broadcasters to return some or all of their spectrum use rights—particularly in constrained markets—while not proving so generous that the government fails to meet its revenue goals.

This means that, invariably, some stakeholders will not get the rules they want. Furthermore, because the interest of the Federal Government is somewhat at odds with the interest of both wireless carriers (who would prefer to acquire licenses as cheaply as possible) and broadcasters (who would prefer to sell for the highest value possible), any so-called “industry consensus” requires very careful examination.

At the same time, as the agency narrows its focus, all stakeholders must begin to abandon their opening positions and seek real consensus wherever possible. In particular, I am hopeful that unlicensed users and secondary licensees such as wireless microphone operators and LPTV operators can reach a consensus on how to co-exist within the newly reconfigured broadcast band. Clearly there is much to be gained by finding a way to accommodate all the existing stakeholders rather than forcing the FCC to choose among them, and I hope that policymakers supportive of these interests will encourage the parties to work together rather than against each other.

Balanced Goals

Returning to substance over process, we must likewise remain focused on the statute as written. Since the Middle Class Tax Relief Act was passed, many folks have

¹Tom Wheeler, “The Path To A Successful Incentive Auction,” FCC Blog (December 6, 2012), available at: <http://www.fcc.gov/blog/path-successful-incentive-auction-0>

worked to reframe the goals of the law. The statute however is clear and provides for a variety of goals and outcomes that, if implemented well, should all be attainable.

As an initial matter, the Middle Class Tax Relief Act preserved existing FCC authority both generally, and specifically with regard to implementation of the TV “white spaces” service, unless explicitly altered by statute.² The statute did nothing to alter the overall goals of the FCC’s auction authority to promote the public interest by adopting rules that encourage innovation³ and that “avoid excessive concentration of licenses.”⁴ Congress also retained the prohibition on consideration of auction revenue as a public interest benefit.⁵

Congress did make several specific alterations with regard to both unlicensed operation in spectrum recovered from broadcasters and with regard to limits on participation in the incentive auction. These explicit provisions provide the outlines of the balanced path the FCC must follow to actualize the goals Congress included in the Middle Class Tax Relief Act provisions on spectrum.

Funding for FirstNet

I recognize the importance of this auction for generating revenue to establish a national, interoperable public safety broadband network, as recommended by the 9/11 Commission. While I agree that funding FirstNet is important, I also want to remind Senators that there are multiple opportunities to raise revenue for FirstNet beyond the incentive auction of the 600 band. The recently announced 1755 MHz/AWS-3 auction alone could easily clear \$10 billion and pay for FirstNet, which needs to raise \$7 billion in funding.⁶ Additionally, the H-block auction scheduled for January 2014 is estimated to automatically clear at a minimum of \$1.56 billion.⁷

Finally, those concerned that adoption of a spectrum aggregation limit will reduce auction revenue should consider that the Government Accountability Office (GAO) estimated that the Incentive Auction could raise \$20 billion. Some private sector estimates placed the value even higher. The H Block auction will raise approximately \$1.5 Billion, leaving only \$5.5 billion to pay for FirstNet.

Even those who believe that preventing AT&T and Verizon from foreclosing competitors from these licenses would reduce auction revenue, a claim I and others dispute, no one can seriously suggest that adoption of a modest limit on how many licenses AT&T and Verizon can win will deprive the incentive auction of *over \$15 Billion in revenue*. Assuming that the earlier estimates of how much an Incentive Auction could earn are at all correct, the allegation that a “No Piggies Rule” of the kind proposed below would jeopardize the ability to pay for FirstNet flies in the face of reality. Given that those most loudly claiming that any restriction on AT&T and Verizon’s ability to win all the licenses offered would put funding for FirstNet in danger were among those claiming that the auction would earn in excess of \$20 billion, these doomsday predictions should be viewed with considerable skepticism.

Nurturing Continued Innovation In Unlicensed

As members of Congress and FCC Commissioners across the political spectrum have repeatedly stated, unlicensed spectrum remains one of our great spectrum innovations. The United States became the first country in the world to authorize flexible access to spectrum through a simple certification mechanism that dramatically lowered barriers to entry and innovation. Simply try to imagine a world today without such everyday devices such as garage door openers or free Wi-Fi in public buildings, from coffee shops to the halls of Congress. Bluetooth technology which op-

² § 6403(i)

³ 47 U.S.C. § 309(j)(3)(A).

⁴ 47 U.S.C. § 309(j)(3)(B).

⁵ 47 U.S.C. § 309(j)(7)(B). By implication, Congress clearly intended that the combination of revenue from the incentive auction and the additional auctions required by Section 6401, but there is a considerable difference between an expectation expressed in the statute that a combination of spectrum auctions would raise \$7 billion to cover FirstNet’s construction costs and a command to maximize auction revenue for the incentive auction in direct violation of 47 U.S.C. § 309(j)(7)(B).

⁶ This 1755 MHz/AWS-3 auction is one that while hoped for, was uncertain. Furthermore, the 1755 band is not only in a decent bandwidth range and compliments the AWS footprints of the larger national carriers but this spectrum is also harmonized for LTE internationally. The amount of money carriers would save in equipment costs for that band is substantial. See FierceWireless, *T-Mobile CTO: 1755-1780 MHz is prime spectrum for LTE*, February 27, 2013, <http://www.fiercewireless.com/tech/story/t-mobile-cto-1755-1780-mhz-prime-spectrum-lte/2013-02-27>.

⁷ FierceWireless, *Analysts: Sprint, T-Mobile ditched H Block to focus on other spectrum, avoid Dish complications*, November 13, 2013, <http://www.fiercewireless.com/story/analysts-sprint-t-mobile-ditched-h-block-focus-other-spectrum-avoid-dish-co/2013-11-13>.

erates over unlicensed spectrum has made phone conversations in cars safer with hands free technology, and the automobile industry is already testing the use of unlicensed spectrum to move the idea of auto piloted cars from science fiction to reality.

In particular, authorization to use TV white spaces (TVWS) under Republican FCC Chairman Kevin Martin, and subsequent modifications under Democratic Chairman Julius Genachowski, have opened the door to dramatic advances in hared spectrum technology. Earlier this year, West Virginia University announced that it would utilize TVWS to provide wireless broadband for its entire campus and surrounding neighborhoods, including free Wi-Fi on public transit. In Cape Town, South Africa Google is piloting wireless broadband connectivity using TVWS to rural areas that lack electricity using solar powered devices. With the large reserve of TVWS in rural areas of the U.S., many communities will look to TVWS networks as a possible solution to the economic challenge of rural broadband deployment. It is too early to know if this will succeed, but initial projects on college campuses through Air U. and in small cities like Wilmington, NC will help answer these questions over the coming years.

Congress knew that the incentive auction could either enhance the efficiency of TVWS and encourage new investment, or wipe out this promising new technology altogether. Congress opted for the first course, instructing the FCC to structure the incentive auction in a way that compensated for the loss of spectrum in some markets by creating the potential for meaningful use in all markets through unlicensed in the 600 MHz guard bands.

The final version of the Act rejected both the initial House approach of restricting TVWS use solely to the surviving broadcast bands, and the Senate approach of authorizing a direct allocation for exclusive unlicensed use if the FCC recovered more than 84 MHz of spectrum from broadcasters. The compromise version explicitly preserved the use of the remaining broadcast service for TVWS, while permitting the FCC to authorize unlicensed use in the 600 MHz guard bands.⁸ At the same time, the use of unlicensed spectrum should not undermine licensed use of the 600 MHz band either by causing harmful interference⁹ or by inflating the guard bands beyond what is “technically reasonable.”¹⁰

This compromise illustrates the necessary balance the Commission should adopt. Congress clearly intended to foster the further development of unlicensed technology and TVWS in particular. The FCC may consider how to facilitate this development through the use of guard bands, and may certainly take the impact of its decisions on the development of the TVWS into account. At the same time, consideration for unlicensed use alone cannot drive the Commission’s decision making.

In short, according to the Middle Class Tax Relief Act, unlicensed remains an important part of the wireless ecosystem. But it is only one part. The size of guard bands can—and should—reflect, among other things, a desire to ensure sufficient national access to unlicensed spectrum to encourage investment and deployment in urban markets as well as rural markets. At the same time, concerns over unlicensed use cannot so dominate the Commission’s thinking that they actively undermine the viability of licensed services.

On November 8, the FCC held a workshop to highlight the important role TVWS is already playing in providing needed broadband services in rural areas and urban areas alike.¹¹ Chairman Wheeler became the latest FCC Chairman to reaffirm the importance of unlicensed spectrum and TVWS stating, “Unlicensed spectrum has been, and must continue to be, the catalyst of innovation. Therefore, we must make sure that unlicensed spectrum is a key part of whatever decisions that we make.”¹²

Witnesses at the workshop included Elizabeth Bowles, president of a WISP based in Little Rock Arkansas, who described how the availability of unlicensed spectrum—and TVWS in particular—allowed her to bring broadband to schools, small businesses, and others who could not otherwise afford access. Others described use of the TVWS for higher education projects, and to bring affordable broadband to poor urban neighborhoods, and to create economic opportunity for women and minority owned businesses. Witnesses described innovative new devices already avail-

⁸ See §§ 6403(i); 6407.

⁹ § 6407(e).

¹⁰ § 6407(b). By adopting this language, Congress explicitly rejected the alternative—and more restrictive—language that guard bands be no bigger than ‘technically necessary.’ The word ‘reasonable’ denotes discretion (albeit bounded discretion), especially when combined with the Commission’s responsibility (unaltered by the statute) to encourage innovation and flexibility. See, 47 U.S.C. §§ 303(g); 309(i)(3)(A).

¹¹ A video archive of the event is available at <http://www.fcc.gov/events/learn-workshop-discuss-unlicensed-spectrum-issues>.

¹² *Id.* at 8:30–8:51.

able from such retailers as Amazon.com, and how other countries are actively looking to develop their own TVWS technology.

In short, the value of the TVWS is well established. Beyond the contribution to the economy, unlicensed lowband spectrum empowers traditionally marginalized communities to take part directly in the emerging wireless future. The power of unlicensed to give these communities new opportunities is a social good that cannot be measured in dollars, but is utterly critical to the American spirit.

Public Knowledge believes the FCC should issue a further public notice at the January meeting where, under Chairman Wheeler's recently proposed schedule, key policy decisions will be outlined. This will allow stakeholders to come together around a common sense, consensus framework that promotes a robust TVWS on a national basis. Until details can be filled in, Public Knowledge continues to support calls from a broad range of stakeholders such as Comcast, Broadcom, The Wireless ISP Association (WISPA), and Google—along with public interest organizations such as Free Press, Consumer Federation of America, and the New America Foundation—to create a 20 MHz contiguous block of spectrum for unlicensed in the “duplex gap” between the uplink and downlink paired spectrum. Based on previous experience with duplex gaps, and in light of the propagation characteristics of the 600 MHz spectrum, this size would represent the optimum trade-off for licensed services to build inexpensive handsets that minimize internal filters and potential self-interference while providing adequate spectrum on a national basis for broadband in both urban and rural settings.

Critically, the 20 MHz duplex gap is not the only way to provide adequate unlicensed spectrum to meet urban and rural needs. This is why a further public notice is imperative. As Chairman Wheeler stressed at the November 8 FCC Workshop, now is the time for parties to focus on practical proposals rather than insist that “the world will end” if they do not get exactly what they want.

Opportunity for Other Players to Come to the Table for a Deal

Since multiple users will operate in the spectrum between 470 MHz and 796 MHz this presents an opportunity for other players besides the wireless carriers and broadcasters to come to the table for a deal. Potential stakeholders that could benefit from participating in these auction discussions include owners of wireless microphone equipment. Public Knowledge is part of the Public Interest Spectrum Coalition (PISC) whose members believe the FCC has an opportunity to facilitate innovation and investment in unlicensed technologies while still preserving the use of wireless microphones. When the FCC adopted orders allowing unlicensed use of TVWS it reserved two channels for the use of wireless microphones. Because unlicensed devices cannot use channels used by broadcasters in neighboring TV markets, even low-power unlicensed devices are not allowed to operate in the majority of vacant TV channels in each local market.

Conversely, wireless microphones have been successful in operating on the same channel as broadcast stations in distant or neighboring markets. The additional channels that are not available for use by unlicensed devices include unoccupied TV channels below Channel 21 and the larger category that includes channels where microphones have historically operated co-channel to broadcast stations in distant media markets. Incentive auction rule changes should include policies that ensure both wireless microphone operators and unlicensed broadband networks and devices have a sufficient amount of low-band spectrum available nationwide.

PISC has also provided proposals that would protect LPTV operators that provide service to their local community, while also accommodating use of the TVWS for unlicensed users. I am pleased that in recent days representatives from the LPTV community have begun to reach out to PISC members to begin discussion for a possible way forward.

These negotiations will work best if policymakers urge all parties to focus on co-existence and reasonable spectrum sharing. As demonstrated by the recent agreement between the Department of Defense and broadcasters to share the 2021–2110 MHz band,¹³ and the recent voluntary agreement between the 700 MHz licensees and DISH to promote interoperability,¹⁴ spectrum sharing must become the norm in an

¹³ Letter of Karl Nebbia, Associate Administrator, Office of Spectrum Management, National Telecommunications Information Administration (NTIA), to Julius Knap, Chief, Office of Engineering and Technology, filed in GN Docket No. 13–185 (November 25, 2013), available at <http://apps.fcc.gov/ecfs/document/view?id=7520959441>

¹⁴ See Promoting Interoperability in the 700 MHz Commercial Spectrum, WT Docket No. 12–69; Request for Waiver and Extension of Lower 700 MHz Band Interim Construction Benchmark Deadlines, WT Docket No. 12–332, *Report and Order and Order of Proposed Modification*, (Octo-

increasingly crowded spectrum world. Parties that insist on standing on what they believe is their due under the law should recall that the Communications Act unequivocally states that *no one* has any right to use spectrum. Accordingly, the best results can be achieved by genuine consensus among stakeholders realistically assessing their needs, rather than by forcing the FCC to choose among stakeholders.

The Myth of “Inflated” Guard bands

Opponents of unlicensed use have repeatedly stated that the law prohibits the use of unlicensed in the guard bands. Some have even gone so far as to argue that the law prohibits guard bands entirely, or requires the FCC to confine them to some arbitrary minimum. As noted above, this ludicrous claim violates the plain language of the statute, which not only explicitly preserves FCC authority to create band plans with guard bands but which rejected the more restrictive “technically necessary” for the more flexible “technically reasonable.”

The alternative argument of opponents of unlicensed use is the effort to create a false choice between guard bands and auction revenue. This ignores that well managed guard bands enhance the value of licensed portions of the spectrum by lowering the cost of equipment design. Similarly, the increasing synergistic use between licensed and unlicensed spectrum, notably in the development of “Wi-Fi off-load” and “carrier grade Wi-Fi,” show how permitting Wi-Fi in the guard bands would actually enhance value and thus *increase* auction revenue.

To illustrate this point, consider the following analogy. The development firm of Henry and Anna decide to develop some prime real estate for residential use. They build houses with lawns and driveways so that people can invite guests and hold parties while protecting the neighbors from each other’s noise. They leave some open common space for playgrounds and to enhance the feeling of community. They use some land for green space to set the houses back from the main road. They end up building 20 houses.

Fred and Greg, rival developers who hold a similar plot of land, can’t believe how much money they think Henry and Anna are leaving on the table with all this “wasted” space. They build townhouses jammed up as close to each other as possible, with the bare minimum number of parking spaces. By leaving no common space or open area, they cram in 30 houses.

But a funny thing happens. Henry and Anna can sell their houses for \$500,000 a house, because they have all this space and it makes a very nice community. Fred and Greg can only get \$150,000 for their houses, because no one wants to pay as much for houses jammed on top of each other, with everyone hearing their neighbor’s business, no place for friends or relatives to park when they visit, and houses flush against the street.

At the end of the day, Henry and Anna make \$10,000,000, while Fred and Greg make only \$4,500,000. Despite all the wasted “green space,” Henry and Anna end up making \$5,500,000 more than Fred and Greg.

The same logic holds true with guard bands. Maximizing the number of MHz auctioned by having licenses piled one on top of the next with no guard bands does not mean more revenue from the auction any more than maximizing the number of houses in a development automatically means more money for the developer.

Competition: Spectrum Aggregation/Band Plan

Perhaps the most important goal to consumers in the construction of a balanced incentive auction implementation is the assurance that the rules will promote competition in the mobile broadband industry. Following the dominance of the 700 MHz Auction in 2008 by AT&T and Verizon, it became conventional wisdom that the overwhelming advantage of AT&T and Verizon in low-band spectrum meant a long, slow slide to duopoly. Only aggressive action by the Commission in 2011 and 2012—adoption of data roaming rules, blocking AT&T’s effort to acquire T-Mobile, and pressure on Verizon to divest spectrum to T-Mobile as part of the Spectrum Co. Review—created any expectation that competition remained viable.

The benefits of competition have become increasingly visible since the FCC and the Department of Justice Antitrust Division (DoJ) took steps to ensure that the market would contain at least 4 national firms. Billions of dollars of new investment flowed into the market as both T-Mobile and Sprint attracted new interest. AT&T began a process of “refarming” its 2G spectrum for 4G use and, spurred by competitive pressure, has moved rapidly to deploy LTE nationally. A revitalized T-Mobile has offered major innovations in handset upgrades and data plan pricing, forcing AT&T and Verizon to respond.

It is no coincidence that this dynamic market action follows regulatory action to promote competition, whereas the market remained virtually moribund from 2008–2012 when competition appeared dead. Only competition forces companies to invest in network improvements and pass along efficiencies of scale to customers rather than shareholders. By contrast, when competition declines, the surviving dominant firms can afford to decrease capital expenditures on network improvements because frustrated customers have nowhere else to go.

AT&T and Verizon continue to enjoy dominance in part because of their superior holding of spectrum below 1 GHz, aka “low band spectrum.” These companies acquired this advantage in substantial part from free low band licenses distributed to the incumbent local exchange carriers (ILECs) before the Commission began to auction spectrum in 1993. To pretend that this market distorting regulatory largess constitutes a free market triumph that regulators should respect is therefore quite disingenuous.

Likewise, the claim that AT&T and Verizon need additional spectrum because of their large customer base profoundly misstates the facts. To the contrary, as noted above, it is competition that forces companies to become efficient and pass those efficiencies on to their customers. As both the Department of Justice and the FCC transaction team found in the AT&T/T-Mobile transaction, AT&T in particular has used spectrum acquisitions to support a profoundly *inefficient* network architecture. Indeed, the fact that Verizon supports more customers with less spectrum demonstrates that the problem for AT&T is not a spectrum shortage to meet demand, but a refusal to reengineer its network to provide more efficient coverage.

The DOJ has emphasized the importance of getting low band spectrum into the hands of competitors. Because the incentive auction represents the last chance to put valuable low band spectrum in the hands of competitors, the FCC should adopt rules of general applicability—as permitted by the Middle Class Tax Relief Act of 2012—to prevent AT&T and Verizon from capturing the lion’s share of the licenses.

This Auction is about Future Spectrum Needs, and the Future of Competition

My fellow witness Dr. Hal Singer has submitted a paper to the FCC with David Balto arguing that T-Mobile’s recent revitalization shows that the DoJ is wrong in its concern that competitors require access to lowband spectrum.¹⁵ Setting aside other objections to Balto & Singer’s analysis, and the irony that T-Mobile enjoys its current success to from antitrust enforcement of the kind Balto & Singer object to here, the paper misses a key point about the Incentive Auction. Since its initial proposal as part of the National Broadband Plan, the Incentive Auction has been about meeting the *future* demand for spectrum, the so-called “spectrum crunch.” The relevant question is therefore not merely whether T-Mobile and Sprint have sufficient spectrum to compete *today*, but whether they will have sufficient spectrum—particularly lowband spectrum—to remain competitive going forward. Indeed, under the logic proposed by Singer and Balto, it does no harm to AT&T and Verizon to be entirely excluded from the Incentive Auction because they currently have the best performing 4G networks.

Unlike the DoJ merger review, which looks to see whether a transaction is likely to substantially reduce competition, the FCC is required by law to consider how to use auctions to *promote* competition and avoid excessive concentration of licenses.¹⁶ Even if Balto & Singer were correct that T-Mobile’s recent performance alleviates competitive concerns in today’s spectrum environment (a claim subject to considerable dispute), the failure of Balto & Singer to address adequately how foreclosure would impact future need leaves their analysis fatally flawed.

The “No Piggies” Rule

The FCC can promote these competition goals in two ways. First, it can adopt a total limit on the amount of spectrum, particularly low band spectrum, a single company can hold. The Commission had such a hard “spectrum cap” until 2003. Not coincidentally, elimination of the spectrum cap initiated a period of steady consolidation and a dramatic decline in competition to the detriment of consumers.

Alternatively, the Commission could adopt an auction specific rule that would prohibit any one company from capturing too many licenses in the 600 MHz auction.

¹⁵ See David Balto and Hal Singer, “The FCC’s incentive Auction, Getting Spectrum Policy Right,” Progressive Policy Institute (September 2013), available at http://www.progressivepolicy.org/wp-content/uploads/2013/09/09.2013-Balto-and-Singer_Getting-Spectrum-Policy-Right.pdf

¹⁶ See 47 U.S.C. § 309(j)(3)(B).

This “No Piggies” rule would permit AT&T and Verizon to participate, while leaving significant spectrum on the table to attract many smaller bidders.

No Piggies Means More Auction Revenue

Auction experts will tell you that maximizing revenue requires two things. First, lots of bidders need to show up. Second, they cannot collude to divide the licenses among each other.¹⁷ To achieve step one requires creating a set of rules that encourages as many bidders as possible that they can actually win enough licenses they need to make showing up worth the expense of playing. Participating in an auction costs a great deal of money. Companies go to capital markets to arrange for both the large “up fronts” needed to participate and to be able to pay for the licenses if they win. The companies set up huge “war rooms” with auction experts to track and advise them. Failing to win licenses, not only means the vast expenditure of money and resources is wasted. Publicly traded firms will lose significant stock value if they fail to win licenses deemed critical to their future growth, or if they are deemed to have been forced by AT&T and Verizon to significantly overpay.

Unless a firm believes it has some chance of success in the auction that will justify the cost and the potential risk of market backlash for a failed auction attempt, it will do better to sit on the sidelines.

Without the No Piggies Rule, there is every reason to believe that AT&T and Verizon will repeat their success from 2008 700 MHz auction. No matter how much T-Mobile or Sprint (or other competitors) may need the spectrum in absolute terms, it is not worth the risk if they cannot win.

A simple analogy illustrates the problem. My neighborhood association sponsors a basketball tournament with a \$10 entry fee and a \$500 prize. Should I enter? Well, if we pretend I am a decent amateur player, then it would make sense. The entry fee is relatively small, and even if I am not the best basketball player in the neighborhood, I am close enough to my neighbors that I believe I have a chance to win.

Now pretend that instead of playing my neighbors, I have the option to participate in a basketball tournament against the 1985–86 World Champion Boston Celtics. The entry fee is \$50,000, but the prize is \$10 million! This is a much higher potential return on my investment than the previous example, albeit for a much higher upfront cost and with a much reduced (*i.e.*, non-existent) chance of winning. Should I enter?

Unless I’m in the market for a divorce, the obvious answer is no. This bet makes absolutely no sense despite the potential return on investment. I would need to mortgage my house and go into crippling debt simply to enter the competition, fully aware I would have no chance of winning against Larry Bird today, never mind when he was at the peak of his career.

Similarly, in the absence of a No Piggies Rule, it makes no sense for T-Mobile or Sprint to spend millions of dollars to enter the spectrum auction because they have virtually no chance of winning enough licenses to justify participation. Sadly, spectrum auctions are not Disney movies. Failure is always a (very painful) option, and the need to win does not make winning any more likely than not really needing to win. The fact that these companies really need the spectrum does not, oddly enough, make it any more likely they will win or make it cheaper for these companies to get the necessary capital. To the contrary, the fact that they need the spectrum to remain competitive but are unlikely to win it drives up the cost of capital and increases the backlash when they lose.

Even without a No Piggies Rule to encourage smaller players to participate, the number of potential bidders has dropped significantly since the 700 MHz auction in 2008. Alltel and MetroPCS no longer exist. Leap may not exist by the time the auction takes place.

Opponents of the No Piggies Rule like to paint a stark picture of the auction failing if AT&T and Verizon do not participate. But an auction limited to AT&T and Verizon is equally likely to fail. The FCC must bring all potential bidders to the table, something only a No Piggies Rule can hope to accomplish.

Band Plan, Bidding Rules and Other Factors

Numerous other factors impact the likely success of the auction. With regard to bidding rules and other factors such as repacking, we lack a good sense of the FCC’s current thinking. These matters will, hopefully, become the subject of future public notices to further develop the record.

¹⁷ See, *e.g.*, Paul Klemperer, “Using and Abusing Economic Theory,” *Journal of the European Economic Association*, 2003, 1, 272–300.

With regard to the band plan, the one thing agreed upon by nearly all competitors agree upon is that the band plan should optimize paired spectrum. Inclusion of supplemental downlink (SDL) spectrum below Channel 37 appears more likely to increase competition problems in light of the difficulties in integrating spectrum below Channel 37 with other low band spectrum below 1 GHz. Furthermore, based on the current experience with 700 MHz A & 700 MHz B block spectrum, it seems unlikely that manufacturers will develop equipment for supplemental downlink unless AT&T and/or Verizon capture significant SDL licenses.

Market Variability

Finally, the Wireless Bureau's May Band Plan Public Notice raised the question of "market variability." This would give the FCC flexibility to recover more spectrum in some markets than in others. Market variability potentially resolves the problem of holdouts in the most constrained markets. Without such flexibility, the FCC is limited in every market to the spectrum available in the most constrained market. This could essentially starve the auction for spectrum.

At the same time, too much variability creates significant problems. It is highly unlikely that equipment will be developed for markets where large amounts of spectrum can be recovered given that the largest markets are most likely to be constrained. Commenters have also noted significant interference potential if there is too much variability in the band plan caused by market variation.

To balance these concerns, the Commission needs a *uniform core* with *flexible edges*. The Commission should establish a clear limit on the potential variation from the uniform core set by the most constrained market. This would reduce the value of holding out in the most constrained markets, without introducing so much uncertainty in the band plan as to undermine the ability of potential bidders to adequately assess the value of the licenses.

Thank you to the members of the Committee for your time and I look forward to the opportunity answer your questions.

Senator PRYOR. Thank you.

We are going to do 5-minute rounds here and follow the Committee's normal early bird rule.

Ms. Marsh, let me start with you. I would like to hear from AT&T on this. I know that your company's preference is for no restrictions, but you also talked about some possibilities in your opening statement—I wrote it down. This approach would at least ensure multiple winners." And it is a little bit of follow up on what Mr. Feld was just talking about.

So are there any bidding limits, I guess I could say, or parameters that might be imposed in a neutral fashion that you think your company could support?

Ms. MARSH. Thank you, sir.

You are correct; we support an open and unrestricted auction, because we think that is the format that will raise the most revenue. And given the important revenue targets in this auction, we think that that has to be taken into careful consideration. What we have said, and no such proposal has been put on the record to date: If there is to be a limit, we think it has to be applied neutrally and fairly to all participants.

There has been discussion of what those limits might look like. I think you have to take care, because if those limits are too restrictive, you could undermine the efficiency of the spectrum. For example, every bidder must be able to get to a 10-by-2 allocation to be able to do efficient LTE deployment. And so you have to take care about how such limits are expressed.

But, certainly, if the goal is to ensure multiple winners, we think it should be a rule that applies to all bidders in a very fair and neutral way.

Senator PRYOR. OK.

Mr. Berry, let me dive in with you, if I can, and that is, you know, we have all talked about the consequences of this auction, both good and bad. And so, what are the consequences for your members if they are not able to purchase any spectrum in the auction?

Mr. BERRY. Well, for our competitive carriers, I think it would be disastrous.

We haven't had an auction since the launching of the iPhone. And the data consumption by consumers, as Preston just said, goes up like a hockey stick. Our carriers need access to low-band spectrum. It propagates extremely well in rural America but also reaches the inner sanctums of this hearing room and other in-building penetration.

It is important to be able to serve the customers and the consumers in the way in which they use your device. And the way they use their device now is inside and outside. So it would be extremely difficult for our members to build the 4G LTE network and stay competitive without access to the spectrum.

And I am encouraged by AT&T's statement that Randall Stephenson made today, that there may be some rules and restrictions on how much spectrum any one carrier could acquire at the auction. Maybe we are making some progress on finding solutions that the entire wireless industry can benefit. We need multiple winners for sure in the auction.

Senator PRYOR. One little bit of housekeeping here is that I said earlier that the rumor was we were going to have votes around 4. Now it looks like they are going to be around 5. So we do have a little bit more time.

Senator Thune?

Senator THUNE. Does that mean they can give their full statement now?

Senator PRYOR. Yes, I will go back and give you another 2 minutes. Thank you.

[Laughter.]

Senator THUNE. No. No.

Mr. PADDEN. I think you just proved we can do it in 3.

[Laughter.]

Senator THUNE. Yes, that was impressive. This was a good exercise for us.

Dr. Singer, like you, I do not believe anyone should be restricted from bidding in the incentive auction. In your testimony, however, you suggest, and I quote: "If regulators insist on going down the path of spectrum caps, that so-called 'symmetric spectrum caps' would protect against the remote possibility that any single bidder acquired too much spectrum at the auction."

Now, knowing that is not the ideal outcome for a truly market-based auction, can you explain why this idea may nonetheless provide a sort of middle-ground resolution of the competing perspectives of some of the other witnesses today?

Mr. SINGER. Sure.

I have heard many arguments that have expressed a concern that one single bidder would gobble up all the spectrum in the auction. And if that is a concern, that could be addressed in less re-

strictive ways than the proposals that have been put out by T-Mobile and Sprint.

I actually don't think that one bidder has a very good chance of gobbling up all of the spectrum, in light of a good and fair competition. But if people are genuinely concerned about that contingency, a cap that hit all bidders equally—that is, that didn't treat bidders differently depending upon their coming into the spectrum auction—would mitigate that concern.

Senator THUNE. OK. Thank you.

Mr. Berry, we both agree that smaller geographic spectrum licenses can attract more bidders to an auction and may increase revenue. And, indeed, you specifically mention in your testimony the 700-megahertz Lower B Block sold for much more than other blocks auctioned with larger license areas.

It is my understanding, however, that AT&T and Verizon Wireless were both very active bidders for B Block licenses. So my question is, could you explain why you expect their presence in future auctions will reduce revenue when their presence in the previous B Block auction instead resulted in very high returns?

Mr. BERRY. There was a lot of interest in the B Block in the lower Band 12. Many of our members, as you know, the smaller carriers, did come out and bid in very high ratios.

If you look at the C Block, which was the Verizon large aggregated REAG area, it didn't receive as much revenue as the lower block of spectrum. And I think what you see in that is, with the smaller geographic areas and the desire to bid, one of the larger carriers have already bought the C Block. And, as you know, the lower Band 12 brought in over twice as much in terms of revenue per pop per meg.

So I believe that this is unusual, in the sense that this is the first opportunity for a greenfield 600-megahertz low-band spectrum. It may be the last opportunity we have in over a decade. And if the small carriers do not have access and if they don't have an opportunity to bid without being sort of purchased out from under them by the largest carriers, then I think you are going to have a consolidation, further consolidation, in the industry, because you will not be able to compete as a small carrier without getting to a 4G LTE.

And remember, this spectrum is efficient in and of itself, especially in rural areas. One cell site, one tower can cover the distance of four or five towers in a higher—in a spectrum band at 1–2.5. And it is critical that our smaller carriers and literally every carrier has an opportunity to get access to this.

You know, if you already own 80 percent of the low-band spectrum, which Verizon and AT&T do, it is a lot easier to be noncommittal about how much spectrum the small carriers should, in fact, be able to bid on.

Senator THUNE. But do you think, going back to the B Block auction for just a moment, that the B Block would have sold for more if AT&T and Verizon had not been bidding on those licenses?

Mr. BERRY. No, I don't think it would have sold for more had AT&T not been bidding. But we are not suggesting that AT&T and Verizon not bid. As a matter of fact, I want them to bid. I want them to bid in every market and every opportunity, because we get

into the same ecosystem. We want handsets, we want devices. We want partners, and we want partners that have the same bands in their devices so that we can roam and we can have, you know, partners to serve our customers.

So we want them to bid. I have never, ever said we didn't want AT&T and Verizon to bid. I just don't want them to be able to walk away with the entire pie, one, two, or three carriers.

Senator THUNE. Mr. Chairman, my time has expired, and we have other colleagues who want to ask questions. So, thank you.

Senator PRYOR. Thank you.
Senator Booker?

**STATEMENT OF HON. CORY BOOKER,
U.S. SENATOR FROM NEW JERSEY**

Senator BOOKER. Thank you, Senator.

First of all, this is obviously very exciting to me. I think there are a lot of wins we can be achieving here—added wireless capacity, funding FirstNet, helping local broadcast affiliates make some money, which is not a bad thing indeed, and of course helping bring more revenue for deficit reduction or other needs.

There is one area of all this, actually, that we are not discussing that I just want to pull out a little bit. There are television white spaces, or guard bands, that have just begun to offer new exciting access and innovation opportunities for our economy. It is unclear what is going to become of them after this auction when it is all said and done.

And so, the unlicensed spectrum in higher ranges has already brought us incredible innovations, from Wi-Fi, Bluetooth, cordless phones, RFID, and wireless microphones, to name a few. And now white spaces in and near this auction's range offer greater reach and penetration that some have even dubbed "super Wi-Fi."

These characteristics promise, again, new innovations and access potential that really excites me, as I am concerned with disadvantaged populations. And we are just beginning to see the research in this space and how it is really offering real great opportunities for increased investment in new technology.

But this is going to be hampered if there is uncertainty. So I want to see these spaces protected as we repack the spectrum, and predictability, which is so important for investment, is provided to innovators and investors.

So, really, to start out, to Harold Feld, I was Mayor of Newark and became really concerned about the digital divide. And there is this powerful democratizing force going through our society that is allowing poor folks, disadvantaged folks to connect into, using the Internet, opportunities that we never once even imagined, from Kickstarter and Kiva, access to capital, to many other things.

And so I am really concerned about this phenomenon of the digital divide really hampering us in education and social mobility and other things. It was interesting; the *Wall Street Journal* ran an article about children actually even needing to go to McDonald's just to get access to do what they need for education.

Your testimony talked about a pilot program by libraries to extend their Wi-Fi into communities using these TV white spaces, which really excites me. Assuming the E-Rate statute would allow

it, could public schools use TV white spaces to provide access to schoolchildren when schools are closed?

And, more importantly, are there other ways this technology could make Wi-Fi connectivity abundant instead of scarce? What are your concerns regarding the potential impacts of this incentive auction on those TV white spaces?

Mr. FELD. Thank you.

And, yes, one of the most exciting things about the TV white spaces, as we have seen with other forms of unlicensed, is once you make this available and start making this an equipment purchase rather than a multibillion dollar license purchase, it really frees the potential in innovation. There are many people who have commented, this is the innovation band. And that means down at every level of society.

We are looking at a world where, through TV white spaces, schools would be able to extend their connectivity from the school out into the neighborhood. The propagation characteristics allow you to set up line-of-sight and even non-line-of-sight links connecting to people's homes so that Wi-Fi could follow your kid home so that you could actually do your homework at home and not at McDonald's.

I also need to add that the FCC had a workshop in which we had representatives from a number of communities who pointed out that one of the biggest issues is getting knowledge of this resource out to minority entrepreneurs, having them be informed of what is available, have that reliability to invest, and that they have discovered that once people make this discovery of what is available, it is really just phenomenal to see how access to the resource and imagination allows for much greater participation for both economic opportunities and educational opportunities.

Senator BOOKER. Great. And I would just add that that entrepreneurialism is not going to happen if people are uncertain about what is going to happen in this space.

And so, in the little bit of time I have remaining, to Joan Marsh, what is AT&T's position on protecting unlicensed spectrum in TV white spaces through this process?

Ms. MARSH. So, certainly, sir, there would be a lot of white spaces left in the 500-megahertz band because only the upper part of the TV broadcast bands are likely to be reclaimed. And given the distances that are necessary to separate broadcasters, to protect them from each other, you will see the continuation of white space availability through 500.

We also think unlicensed can live in the 600-megahertz band, consistent with statutory direction. And that direction was to build the guard bands as technically necessary, and then, once those guard bands are built consistent with technology requirements, at that point there is the possibility that unlicensed uses could live in a guard band.

Of course, we would want to make sure it doesn't create interference for the neighboring wireless allocations. Because introducing interference into the band, once built, would be a big negative. But, certainly, we would be happy to consider any unlicensed uses that do not create interference.

Senator BOOKER. Thank you.

Thank you, Mr. Chairman.
 Senator PRYOR. Thank you.
 Senator Markey?

**STATEMENT OF HON. EDWARD MARKEY,
 U.S. SENATOR FROM MASSACHUSETTS**

Senator MARKEY. Thank you, Mr. Chairman, very much.

You know, spectrum is the oxygen of the wireless system, and parts of it are now gasping for air. So we are obviously having a discussion now, as this whole phenomenon unfolds, to make sure that we do provide more spectrum. But at the same time, you know, we have to balance the various interests that we have here.

So back in 1993, when I was the chairman of the telecommunications committee in the House, what we did as part of the deficit-reduction package of President Clinton, on a bipartisan basis, we added in an auction of 200 megahertz of spectrum that created the third, fourth, fifth, and sixth license in each market. Because the two incumbents were both analog—names going unmentioned right now—and they were charging 50 cents a minute, and no one had a cell phone in their pocket because it was the size of a brick.

By 1996, with the third, fourth, fifth, and sixth license, it had dropped to under 10 cents a minute; everyone started to buy a device in their pocket. That is the year you bought your device. And all of a sudden we had a revolution that has everyone here today with one device in their pocket but many people have two. You know, so that is a tremendous change that took place.

And what we said at that time was, while we wanted to maximize the revenues in the auction for deficit reduction in 1993, we didn't want to do it at the expense of innovation and consumer protection. Because think of it from a consumer perspective, the difference between 50 cents a minute and 10 cents a minute. So it is not just deficit reduction; it is also what are the benefits for consumers and saving money and having more services.

So we have to think that part of it through, as well, in terms of who can bid for which part of this new spectrum that is going to be out there to make sure we get it right, to balance everything that we are trying to achieve, including innovation.

So let's go to white spaces, if we can, in terms of what that means. And maybe, Mr. Feld, briefly you can talk about what white spaces can mean economically. We might not make as much money in the short term, but what could happen in the long term, in terms of devices, applications, and other new economic investment?

Mr. FELD. Thank you.

I would like to say first, I don't think there is a conflict between maximizing auction revenue and being reasonable. And I must correct Ms. Marsh. The statute speaks not of guard bands that are only technically necessary but technically reasonable. Congress actually looked at, if you need to trade a couple of megahertz over here—

Senator MARKEY. Can you deal with my question, please—

Mr. FELD. But, yes. But your—

Senator MARKEY.—deal with my question, please, sir?

Mr. FELD. Yes.

Senator MARKEY. Thank you.

Mr. FELD. Unlicensed, as we have seen, is generating enormous amounts of income throughout the value chain. We are seeing it is a device generator which generates both retail sales and other sales of new devices for a variety of new purposes. It creates wholly new services. It allows for the expansion of existing services.

In rural communities and in some urban communities, it is the method by which cheap broadband access is available and customized to terrestrial use as opposed to what is available for mobile use. It is essentially the glue that binds together wireline and wireless.

Senator MARKEY. Mr. Epstein, do you agree with that, in terms of the economic benefits that could flow from having licensed and unlicensed spectrum out there?

Mr. EPSTEIN. Yes, the Commission is on record as agreeing with the tremendous benefits of the use of unlicensed spectrum.

And, you know, we are implementing I think as Chairman Pryor and Ranking Member Thune said is the bipartisan compromise between licensed and unlicensed spectrum in this particular proceeding. And it is quite clear that, given under the statutory constraints that Congress put before us, which have to do with guard bands, the Commission clearly does believe in the benefits of unlicensed spectrum.

Senator MARKEY. OK.

And let me ask you this. We have heard concerns that as a result of repacking and the TV stations then potentially have to upgrade their transmitters or towers, that a number of FM radio stations, including WBUR in Boston, that currently collocate their transmitters with TV stations may be negatively impacted.

What is the FCC going to do to deal with that issue for that station but for others all across the country?

Mr. EPSTEIN. The issue of broadcaster transition, Senator, is one which is pretty complex. We have spent a lot of time on it already. We have had a workshop, we have hired an outside consultant, we have had a number of different studies, because we are very concerned about viewer disruption and the ability of stations actually to make the transition with respect to collocation of towers and other matters.

The transition will be complex, will take some period of time. And it is one we know we have to take into account in the transition. So we are concerned about it. And that station, I can assure you, "Wait, Wait, Don't Tell Me," we will make every effort—

[Laughter.]

Senator MARKEY. Well, we are trying to tell you, though—

[Laughter.]

Senator MARKEY [continuing]. So that you get it right. And it is really an important issue for us.

Mr. EPSTEIN. Yes, sir.

Senator MARKEY. And we want to deal—I think we all want to deal with all of the legitimate issues that each of you have raised. We have been able to do that in the past. And I think that as long as we listen to each of you and we understand the engineering issues and we are respectful of them simultaneously while also trying to create a robust marketplace with many participants, then I think we will get the right answer.

Thank you, Mr. Chairman.
 Senator PRYOR. Thank you.
 Senator Klobuchar?

**STATEMENT OF HON. AMY KLOBUCHAR,
 U.S. SENATOR FROM MINNESOTA**

Senator KLOBUCHAR. Thank you, Mr. Chairman, for holding this hearing.

And I guess, Mr. Epstein, if Senator Markey gets “Wait, Wait, Don’t Tell Me,” I get the Garrison Keillor Lake Wobegon show, right?

[Laughter.]

Senator KLOBUCHAR. OK.

I did want to thank Senator Markey for his years of leadership in this area. Actually, when I was practicing regulatory law and involved in very complicated rate hearings, a telecommunications one, I remember Senator Markey has been doing this for a long time. So I am glad he is in the Senate.

I just wanted to lead with one of the rural questions. Mr. Berry, thank you so much for your support of the bill I introduced with Senator Fischer, the Rural Spectrum Accessibility Act. I think you know that rural carriers need to be part of any solution to make sure that consumers, no matter where they live or work, are able to connect to their families.

How do you view this bill as complementing what your members would like to see from the auction?

Mr. BERRY. Thank you.

And, yes, we do appreciate and support what you are trying to do. I think you are going to allow smaller carriers, especially in rural areas of service, provide service to the consumers in that area with high-speed LTE service by being able to reclaim some of the spectrum that heretofore is not accessible.

You know, the build-out restrictions in the rules that are currently in place, if we could increase the flexibility, which your bill provides for, I think we can squeeze out more capability in the rural areas for spectrum that is desperately needed.

And I think your bill and Senator Fischer’s bill is a great way to approach a real problem in a very practical fashion. And I am hoping that our members will deliver results for you.

Senator KLOBUCHAR. Thank you very much.

I want to thank, Ms. Marsh, AT&T for helping us in a rural area. The Governor and Senator Franken and I were down in Hills, Minnesota, probably not the first town on your mind right now, during an ice storm where they lost all their trees. And all they wanted to talk about was how they didn’t have cell phone service. And I got involved, and you guys have been very helpful in building out down there. They literally couldn’t use cell phones in the middle of an emergency. So I thank you for that.

I had some questions that I will actually put on the record about AT&T’s work on making sure that rural customers have—that spectrum is effectively utilized to reach them in an auction.

I wanted to move to something else that, actually, Mr. Kaplan raised with you, Mr. Epstein, which is some of the concerns regard-

ing spectrum coordination along the northern and southern borders and that the FCC is handling in advance of the auction.

Where is the FCC in the process of its coordination efforts with Canada and Mexico?

Mr. EPSTEIN. The commission has recognized since day 1 the act's requirement to coordinate with Canada and Mexico. We have had more than over the last 6 months a series of technical meetings with Canada and more recently with Mexico, who has recently had a substantial change in both its constitutional and statutory foundation for its regulator.

We are really pleased to report that both countries have publicly recognized the significant advantages of a common band plan with the U.S., both from the Canada standpoint and Mexico in a recent conference has stated that.

We have placed hugely high priority upon these meetings about achieving some sort of, you know, technical solution with respect to Canada and Mexico's border. Acting Chairwoman Clyburn made this such a high priority that she traveled—

Senator KLOBUCHAR. I know that.

Mr. EPSTEIN.—to Canada, helped make a great breakthrough. Chairman Wheeler has already met with both Canadian and Mexican representatives.

We have a strong charge to the International Bureau to push as quickly as we can because we recognize the need for certainty with respect to both the Canadian and Mexican borders. So it is extremely high on our—

Senator KLOBUCHAR. OK.

Mr. EPSTEIN.—list for the—

Senator KLOBUCHAR. Thank you.

Mr. EPSTEIN.—reasons that Mr. Kaplan stated.

Senator KLOBUCHAR. Appreciate that. Thank you.

And then, Mr. Padden, I know the broadcasters are very concerned about the method that the FCC is going to use to place monetary value on the spectrum. How will the calculation method that the FCC uses impact the potential revenues of the auction as a whole, and how will it impact the decisions of broadcasters who are interested in participating?

Mr. PADDEN. Well, thank you very much for that question.

The FCC is buying 6 megahertz of spectrum; they are not buying broadcasting businesses. And in their notice, they propose to score stations based on some characteristic of their broadcasting operation. We think that doesn't have anything to do with what the FCC is buying. It is creating distrust among broadcasters and driving them away from the auction.

And as Professor Cramton discussed with the FCC just last week, the scoring is not going to improve the efficiency unless somehow the FCC knows the secret bottom line in the mind of every broadcaster, which is clearly impossible, and unless they dynamically change their scoring weights between each round, which would add enormous complexity to what is already going to be the most complex procedure in the world.

So we think they should not score the stations; they should hold a straight-up auction. And we think that is what the statute provides for.

Senator KLOBUCHAR. OK. Thank you.

I am out of time, but, Mr. Kaplan, I will follow up on the record with some questions about the eligible expenses issue, which I know is important, as well as, in general, Mr. Epstein, about some antitrust—I am head of the Antitrust Subcommittee in the Judiciary Committee—and on some of the competition issues.

So thank you very much. And thank you all for your work on this important topic.

Thank you, Mr. Chairman.

Senator PRYOR. Thank you.

Senator Blunt?

**STATEMENT OF HON. ROY BLUNT,
U.S. SENATOR FROM MISSOURI**

Senator BLUNT. Thank you, Mr. Chairman.

Mr. Padden, will eligibility in the auction have any impact on your coalition members? Is that an area that—

Mr. PADDEN. Are you talking about bidding restrictions in—

Senator BLUNT. Yes.

Mr. PADDEN.—the forward auction?

Senator BLUNT. Yes.

Mr. PADDEN. Yes. We—and I want to be clear—we talk money from no carriers at all. We are entirely funded by broadcasters. We are as pure as the driven snow.

[Laughter.]

Senator BLUNT. At least somebody in here can say that. That is good.

[Laughter.]

Mr. PADDEN. All we care about is maximizing the revenues generated by the forward auctions so that there is money to get the spectrum in the first place.

I would note that most of the questions here have been about how to divide up this spectrum.

Senator BLUNT. Right.

Mr. PADDEN. But unless enough broadcasters come forward, there is not going to be any spectrum to divide up. You won't have to have fights over bidding restrictions because there won't be anything to bid on.

And we think the FCC needs to get very serious about sharing information with stations like what the prices are going to be. I have a house that has been on the market for quite a while. The broker just called me and said, "Good news, we have a contract." The first question I asked is, "How much?" And the FCC needs to start telling broadcasters what kind of price range they are going to be looking at, or else they are not going to get the participation and all these folks won't need to fight with each other because there won't be anything to fight over.

Senator BLUNT. And how is that price range going to be determined, as best you understand it?

And then I will ask Mr. Epstein to weigh in.

Mr. PADDEN. Well, the statute calls for an auction, and the question is where the auctioneer begins. And at the moment, we have no information about that.

Senator BLUNT. And would the amount of the auction then go to the broadcaster that released that spectrum in total? Or how would that be determined?

Mr. PADDEN. The broadcasters can either release their spectrum in total or they can bid to release their spectrum and share a station with another station or they can offer to move from a UHF to a VHF channel.

Senator BLUNT. All right. Mr.—

Mr. PADDEN. But one important fact: the FCC is only going to be buying spectrum in a limited number of markets, but they are going to be getting the forward auction revenue from every market in the country, which is going to give the FCC plenty of financial leverage to pay what they need to pay to get the broadcast stations in the few markets where they need to buy them.

Senator BLUNT. And is there any understanding between the broadcasters and the FCC as to how that price is going to be arrived at?

Mr. PADDEN. At the moment, no, sir.

Senator BLUNT. Mr. Epstein?

Mr. EPSTEIN. Yes, Senator, thank you.

The construct that Congress set up and that we are implementing is a reverse auction, OK? So that means you start high and you say, how many are in, how many will sell your station or share your station or move from U to V at a very high price. OK? And then it will tick down.

And we established this proposed mechanism—the Commission ultimately must rule on it—to make it easy for broadcasters. All they have to know is when they want to stop out.

The key thing that Mr. Padden is talking about, and I agree with him, is: what price do we start at? What is the price that we first offer to broadcasters to make this attractive? And my instructions from the Chairman, the prior Chairman, and the Commissioners are exactly as he stated. We won't have an auction unless the broadcasters participate.

So we are looking at mechanisms to start with a very high reserve price, not based upon the fair-market value of broadcast stations but based upon potentially a number of different factors which the Commission will have to determine, including things like the per-pop price of spectrum in an auction.

So the key is to attract broadcasters, the key is potentially to have an auction which is simple for broadcasters to use, and to start at an attractive price to make the auction a success.

Senator BLUNT. Well, it obviously is the key element to all of this working.

Mr. Berry, are there things besides spectrum that are going to relieve some of the crunch—better towers, fast siting, other things I don't understand? Are we going to constantly need to look for more space rather than better use of the space we have?

Mr. BERRY. Thank you for the question.

I would say, over the past few decades, the capacity has been increased by technology. And I fully expect technology to continue to move us forward. But I think we are going to need additional spectrum throughout the United States.

But, yes, we are getting new technologies. The LTE, long-term evolution, technology is going to increase speeds. Sprint just rolled out the Spark product, which is advanced LTE, and they are going to get speeds, you know, maybe as much as 10 times higher.

So there is always that evolutionary impact to bring more speed and more capability to the network on the spectrum you currently have. I mean, Verizon just announced an opportunity to compress, you know, video over wireless broadband which is five times greater than what was available last month.

So we are going to see both, but we definitely need spectrum, and especially in rural areas, if we are going to stay up with the demand that consumers expect.

Senator BLUNT. I thank the Chairman.

Senator PRYOR. Thank you.

Senator Blumenthal?

**STATEMENT OF HON. RICHARD BLUMENTHAL,
U.S. SENATOR FROM CONNECTICUT**

Senator BLUMENTHAL. Thank you, Mr. Chairman.

Thank you all for being here today and for all your good work on this very complex, profoundly significant, and fast-changing area. And I know I share the frustration of many of my colleagues that our questioning is limited to 5 minutes. It could easily take 5 hours or longer, although you may not welcome that opportunity.

[Laughter.]

Senator BLUMENTHAL. I speak with some humility in the presence of Senator Markey, who has a longstanding involvement in this area, and thank him for his very important work.

I would analogize the spectrum and the entire service that you provide not so much to oxygen as to the blood supply, because it is the blood supply that carries oxygen to parts of the body, it carries nutrients and everything that is essential to our body working. And I think more and more the spectrum is that blood supply, and the American public ought to understand how important it is.

I have endorsed measures that would provide more access to spectrum. I believe strongly and I have written and used the oversight hearings of the Judiciary Committee, where I serve, to encourage the Department of Justice to continue policies and to encourage the FCC to adopt policies that ensure that smaller carriers have access to spectrum so that they can provide competition and competitive discipline, not for the sake of competition but for the sake of consumers, not for the sake of any companies but for the sake of the people, ultimately, who benefit.

And I appreciate, Ms. Marsh, your concern about producing the best fiscal result for the Federal Government, but there is a larger interest here, in my view, that is really among the core, profound interests that this committee can help serve.

And so my hope is that Chairman Wheeler's recent comments, which seem to signal that he agreed with the Antitrust Division of the Department of Justice, are an indication of his willingness to entertain some auction eligibility directives. I don't like the word "restrictions" as much as "directives." I understand they should be neutral and fair, but they have to adopt policy approaches that really encourage the public interest, and that may not be neutral

to everybody who is involved. That is the name of this process. But they should be fair.

And so I am hoping, and I am going to ask this question of Mr. Epstein, that the FCC will pursue a spectrum policy that best enables competitive forces to benefit consumers and will adopt the Department of Justice recommendations or the kinds of screens or caps that limit the amount of spectrum that any one company can have, simply so that there can be more competition.

Is that the direction that you see Chairman Wheeler going?

Mr. EPSTEIN. Senator, I do know that Chairman Wheeler has stated in the one month he has been here that his mantra is competition, competition, competition. And he has stated it numerous times—

Senator BLUMENTHAL. I know that he has stated it a lot because I have heard him say it. Can you commit to us that he is moving in that direction with screens or caps or specific measures that will promote greater access and more competition?

Mr. EPSTEIN. I can't commit to either what Chairman Wheeler will do in the future or what any of my commissioners will do.

I do know that they take these arguments quite seriously. They looked at with interest the recent statements of AT&T, as stated by Ms. Marsh here. And I know that they also—I know that the chairman has stated that the letter filed by the Department of Justice, because it is part of the administration, is something that they give persuasive weight to, but they also give persuasive weight to the multiple other filings. There have been more filings, I think, on this issue in the proceeding than, I think, anything else.

Senator BLUMENTHAL. Ms. Marsh, is that the kind of policy that you think AT&T could accept?

Ms. MARSH. Well, the FCC currently has policies in place that do look at spectrum aggregation for the specific purpose you identified: to make sure no one carrier is aggregating more spectrum or that aggregation wouldn't create a competitive impact.

And we think that tool can be a very effective tool here. It has been effective in all the mergers and acquisitions the FCC has reviewed. And it needs to be updated, and everybody needs to understand the rules of the road very clearly, but we think that tool, in and of itself, could be a very effective tool if it is used in connection with the auction.

Senator BLUMENTHAL. My time has expired. I thank you, Mr. Chairman. And I may have some additional questions, as well, for the record.

Thank you.

Senator PRYOR. Thank you.

We have been joined by Senator Warner, the only member of the Wireless Hall of Fame that is on this committee.

[Laughter.]

Senator PRYOR. So thank you for joining us today.

**STATEMENT OF HON. MARK WARNER,
U.S. SENATOR FROM VIRGINIA**

Senator WARNER. Well, thank you, Mr. Chairman. Thank you for that courtesy.

I apologize for not being here for most of this hearing. This is an area of more than some interest to me. We had our final housing finance committee hearing today on a piece of legislation that Senator Corker and I have been working on for some time. So, my apologies.

And also my apologies to my colleagues and the witnesses, because nothing worse than a member dropping in at the last moment and asking questions that have already been asked.

And it is true, I am a member of the Wireless Hall of Fame—the only hall of fame I will ever be inducted into.

[Laughter.]

Senator WARNER. I was hoping for the Old White Guy Basketball Hall of Fame designation, as well, but I am not sure that is going to come by.

Senator BOOKER. Somehow they gave that to me.

[Laughter.]

Senator WARNER. There are a lot of directions we could go with that.

[Laughter.]

Senator WARNER. Mr. Chairman, you know, I know we have probably exhausted the topic already about, you know, spectrum caps and allocations, and I am sure that has been thoroughly discussed with the Committee. What I wanted to, you know, start with is actually digging in a little bit with Mr. Epstein on some of the questions about how we get these auctions right.

And I—you know, editorial comment—believe that Chairman Wheeler is probably right to go ahead and move this to 2015, trying to get this process set up the right way. You know, we have one crack at this. And as we hear, going forward, not knowing completely what the budget deal may be, but there may be even more interest in seeing how we can obtain additional spectrum going forward, which we all desperately need, or the industry and the American public desperately needs, there may even be more budgetary constraints on it.

So, you know, as we think about the reverse auctions, based on audience size, population, other factors, one of the things that I wanted to talk about was market variation. And I understand at the Commission there has been an idea which would allow for a common downlink band nationwide but would provide variation for uplink bands. And, clearly, this would recognize the difference between markets and volume and what have you.

Broadcasters, obviously, worry about interference issues here, which I know has also been probably dealt with.

So, Mr. Epstein, if you could spend a couple minutes talking about market variation, the market variation approach, as you think about these auctions. You know, we will get at markets in different ways. Is this a way, rather than trying to have a one-size-fits-all rule, is this a way that we might be able to maximize spectrum but at the same time give, you know, the overall marketplace some level of predictability?

And if you have any specific comments about some of the performance issues and interference issues, I would love to hear them.

Mr. EPSTEIN. Yes, Senator. Thank you very much. I think you have touched on an extremely important issue.

You know, what the Commission would very much like to do is to have a nationwide reasonable amount of spectrum, the entire nation, which would be a good, solid amount.

We recognize that in certain parts of the country, perhaps because of the international issues that we have talked about before, perhaps because of some of the inability to repack in the crowded northeast part of the United States, that we may not be able to recover the core amount of spectrum in those areas.

Therefore, we felt it very important from day one not to go to a least common denominator—in other words, not to take the least amount of spectrum in every market that we can get in the least market. And I think there has been some consensus—it has been a controversial issue, but we are, I think, narrowing to a band plan which will take that into account, the issue of market variation.

But that raises certain complications, and important complications, and complications which the NAB appropriately has brought to our attention. That means in some markets where you have more spectrum next to adjacent markets where there is less spectrum, you have the potential of a broadcast station operating on the same channel as you do a base station in another market. We can't have that, OK? There would be a statutory violation one way and also, potentially, an interference with the wireless operation in another.

So what we are working on is establishing so-called co-channel interference standards and protections. And so it is, again, a balance. We don't want to be driven to the least common denominator, but at the same time we know we have obligations, both to the public interest and under the statute, to protect, you know, the different services operating in different areas. And that is the direction that we are looking toward going in the recommendations to the Commission.

Senator WARNER. My time has expired. I would simply say that I know an issue that I am sure has also been raised, Mr. Chairman, is, you know—this also kind of backs us back into the definition of, all right, what is the geographic definition of the marketplace here? You know, MSA, RSA, other geographic definition. How we take into account particularly some of the midsize carriers who provide very good quality service but in a number of very limited, specific markets, that they don't end up getting completely pushed out.

So there is a lot on your plate.

And I really appreciate the courtesy of the Chair to let me slip in a little bit late.

Senator PRYOR. Thank you.

And we are going to actually do a second round for all the senators who want to stick around if they are able to, if their schedule permits.

Senator Nelson?

**STATEMENT OF HON. BILL NELSON,
U.S. SENATOR FROM FLORIDA**

Senator NELSON. As a matter of fact, we ought to put you up there.

[Laughter.]

Senator NELSON. Because you know as much about this as any one of them.

Senator WARNER. I was very current circa 2000.

[Laughter.]

Senator NELSON. Mr. Epstein, this is going to be a sophisticated auction. You are going to have to put together a very sophisticated bidding platform to maximize the participation and protect the integrity of the information.

So can you tell us about the FCC, where it is in the auction information technology process?

Mr. EPSTEIN. Yes, Senator.

This was one of the key issues that Chairman Wheeler focused on from the day he walked in the door. We have been focusing on it for a long time, but because of his background in venture capital, he immediately focused on it. And we have some of the best auction design and software people in the world working both on the inside and outside as contractors with us.

But that is not sufficient in either our mind or in the chairman's mind. And that is one of the reasons that he thought a more realistic schedule for the auction was mid-2015 instead of beginning 2015. And it was for the very reason of adequately testing the software that we are developing with respect to the auction.

Some of the software we are using in the forward auction are things that we have been doing for 10 or 20 years already. I mean, we have had multiple forward auctions. In the reverse auction, we are doing something which hasn't been done before.

And the combination of both the reverse auction and the forward auction, it is a challenge but one which we know that we have to meet and we have to make it right. We have to have both inside testing, we have to have outside testing, and we have to have testing by the participants before we are willing to go ahead.

Senator NELSON. Well, you also have to have confidence by all stakeholders in the process. And so, what are you all doing to maintain the transparency?

Mr. EPSTEIN. We will have, as we go forward with respect to the implementation of all of the software that is involved, the bidding platforms, the interference platforms—we have already released a lot of data. We had a so-called data public notice. We are encouraged by the fact that the broadcasters and other participants have looked at it carefully, given us feedback. And we will continue to be transparent there.

Before we have this auction, you know, we will have a mock auction, and we will have the participants actually in there trying to stress-test the actual software that gets developed before we go to actual market.

Senator NELSON. Mr. Chairman, as you know, the newspapers have speculated on the fact that maybe spectrum sold would be a part of the revenues that would be produced for a budget agreement. We haven't had the budget agreement announced yet, but—so would this be, in that 10-year period that they are looking, would this be the source of that revenue?

Senator PRYOR. Well, again, we don't know exactly what the budget deal is they are contemplating, but certainly in this budget environment that we are in, there are a lot of people looking for

revenue. And they are looking for it anyplace they can get it. So it is very possible.

And this may not be the last spectrum auction. You guys are working on this one feverishly and working triple-time on this one, but, you know, in all likelihood, there are more to come.

Do you have any other questions?

Senator NELSON. No.

Senator PRYOR. OK. Thank you.

Senator Ayotte?

**STATEMENT OF HON. KELLY AYOTTE,
U.S. SENATOR FROM NEW HAMPSHIRE**

Senator AYOTTE. Thank you, Mr. Chairman.

I want to thank all the witnesses for being here.

Mr. Kaplan, first of all, let me just thank the broadcasters for their ongoing role. It has been very constructive, in the spectrum-clearing process, so thank you very much for that.

I have a follow-up to a question Senator Klobuchar had asked and that is really about New Hampshire as a border state. We are in a unique position and I can understand Minnesota being in a similar situation. When it comes to the incentive auction, because of the need to coordinate channel assignments with Canada, we are in a position similar to Minnesota in that regard.

Beyond the impact to New Hampshire television stations and viewers, which I have already weighed in on with the FCC, what are the potential consequences to the repacking process and, ultimately, auction revenues if international coordination is delayed in substantial part until after the auction?

Mr. KAPLAN. Thank you, Senator, especially for your leadership on this issue. And this actually gets back to, I think, even a conversation before about auction revenues.

One of the key things along the borders—and we are not just talking about the most northern or southern border. We are talking about, for example, the entire state of New Hampshire, within 250 miles of the Canadian border and within 150 miles of the Mexican border. Those stations cannot be repacked without an agreement with Mexico and Canada. Otherwise, you would have to go through some sort of—the current process is 30 to 45 days at a minimum to get through that process.

Senator AYOTTE. Right.

Mr. KAPLAN. So some agreement needs to be reached.

And, in our view, both from a broadcasters' standpoint but from an auction revenue standpoint, from a creating-the-best-possible-wireless-band standpoint, so that it is not a separate New Hampshire band but you are actually part of the United States with the rest of us—

Senator AYOTTE. We think we are unique, but we—

Mr. KAPLAN. Yes. Right. Not that unique.

Senator AYOTTE.—don't want a separate New Hampshire band.

Mr. KAPLAN. Exactly, right—that the FCC needs to take the time to get those agreements done. Because that solves a lot of technical problems, as you point out, but it also allows you to auction off the band as a whole.

The other thing that many people don't talk about is it is very hard to have two repackings. So some people might say, repack now and then repack New Hampshire and Minnesota later. That, actually, is very, very difficult to effectuate, because once you take us and the rest of the country's broadcasters and squeeze us together, there is no way for the stations in Concord or elsewhere to come down—there is no space for you anymore. So once we do the repacking, it doesn't work.

So it has to be a holistic repacking solution. And it could be one that lasts over 10 years and expects that New Hampshire may repack later. But it has to be done at once, because you can't do it twice, which is why we are happy Chairman Wheeler created some more time and space here to try and get that agreement done.

Senator AYOTTE. Thank you so much for that answer.

And, Ms. Marsh, certainly I was very pleased last month that DOD, NTIA, and the FCC announced an agreement to get the 1755 to 1780 megahertz band ready for auction. I have behind the scenes, also serving on the Armed Services Committee, urging the parties to get together to really take action to protect DOD's interests, but we know that we need to get this band in particular out to auction.

What is your perspective on this process? And are you confident that commercializing this spectrum is moving in the right direction? Are we seeing a moving-forward process here that is going to get us to a result that we need?

Ms. MARSH. So this work is really important. This band, in and of itself, could free up 25 megahertz of paired spectrum, which would also be very useful and welcome by the wireless industry.

The process itself has been a challenging one just because of the number of different services that are in 1755 and 1780. We have been encouraged by some of the recent successes and the progress that is being made.

And I think all of the agencies, the NTIA as well as FCC, DOD, and the wireless industry are all working together I think very productively on this band right now to try to bring it to auction within the statutory requirements, which does require that it be allocated by I think 2015, February of 2015.

Senator AYOTTE. OK.

Ms. MARSH. So, yes, we are encouraged by the progress being made.

Senator AYOTTE. Good, because I think it sat around here for a long time. We all knew that it needed to be done, and there wasn't the impetus to move it forward. So I am encouraged to hear this.

And, Mr. Feld, I wanted to get your perspective on Chairman Wheeler's announcement of the delay. What I have heard from the panel is that no one has been critical of the decision and I certainly agree that we need to get it right and make sure we go forward, get these issues resolved, and are constructive.

Do you believe the FCC has the tools and the expertise it needs to design the auction in a way that can both maximize revenue and, obviously, promote ample competition in the marketplace?

Mr. FELD. I do believe that—first, I applaud Chairman Wheeler for taking a step back and saying, you know, we are going to do this right.

What we need is transparency around scheduling the process and certainty with regard to when we think it is likely to happen. Industry needs that with regard to, like, getting capital and being prepared. The TV white spaces also will need to know when the resolution of their uncertainty is likely to be resolved. So I think the announcement does all that.

With regard to FCC resources, I think that, yes, the FCC has led the way in developing auction software in the world. I think this has attracted a lot of interest from experts who are eager to work on the first-ever incentive auction. I think that the one thing we need to be sensitive to is whether the FCC has the money that it needs to buy the equipment and expertise that it needs.

And in this regard, I think that we ought to encourage the agency not to be shy. I know we are in a time of sequester, but the auction revenue can, in part, be used after the fact to help defer the costs of running the auction itself. But you need to actually build software and hardware that works to have a good auction. So we just need to be sensitive about that, as well.

Senator AYOTTE. Thank you.

I want to thank you all. I know my time is up, but I just have to thank Mr. Berry for mentioning my legislation on the reform of the Universal Service Fund in his written testimony. And I look forward to continuing to work with you on this important issue. I thank you all for being here.

Senator PRYOR. Thank you.

Mr. Padden, let me start with you. We will do a second round here; we will do another 5-minute round.

Let me first ask a little bit of a followup. You said earlier that broadcasters weren't sure about the price, about how much money they might get. Is that the biggest impediment, or is it just kind of the complexity and just, you know, from their perspective, perhaps, the lack of clarity about how all this is going to work?

Mr. PADDEN. I think the price is far and away the most important fact that broadcasters need to know.

And Senator Nelson asked a question about transparency. Although the FCC has not yet given us information about pricing—I think that is in part because they haven't made up their mind yet—those things that they have decided, they have been tremendously transparent and open. It has been a great experience. They grant you meetings time after time. So the process has been very open.

But in answer to your question, nothing is more important to attracting broadcasters than to give them some idea of how much money they are going to get paid if they give up their spectrum.

Senator PRYOR. Yes.

And let me ask, just kind of a one-minute tutorial on the channel-sharing concept that you mentioned earlier. And just tell the Committee how that works. How do two stations share a channel?

Mr. PADDEN. Sure. In digital, two stations can share a 6-megahertz channel, both broadcast on the same channel. And so one of the options in this auction is for—let's say Rick and I each have a station in the same city. We might agree that I will turn in my spectrum and get a check from the Government that I will then share with Rick, and we will both broadcast out of his tower.

Now, in the FCC's Notice of Proposed Rulemaking, they said that if we do that, I need to be able to cover every inch of my City of license from Rick's tower or else I can't share with him. And it is kind of weird, they are quite fine if I turn off my transmitter completely and spend the rest of my life serving no one. That is fine. But if I can only serve 85 percent of my current audience from the sharing tower, that is a problem. So we have urged the FCC to be much more flexible in these sharing arrangements.

And there is an engineering fact that could provide tremendous leverage for the Commission here, and that is, all the stations that are on a central antenna farm in a city will each occupy only one channel in the repack. But stations scattered around the perimeter of the market can each take up to three channels in the repack. So if you let some of those perimeter channels move into the central antenna farm, you dramatically reduce the number of channels you need in the repack, and it makes reallocating this spectrum much better.

I should say, in our informal conversations, the FCC has shown considerable interest in these arguments. And while no final decisions have been made, we are encouraged that they are listening to us.

Senator PRYOR. Thank you.

And let me ask Mr. Epstein—I am going to change gears on you. And here again, I would love just kind of a 1-minute-or-less answer. And that is, some of the broadcasters have expressed concerns about translator and booster stations. How does FCC intend to address those concerns?

Mr. EPSTEIN. The translators and boosters and low-power television are really important, particularly in rural areas, and we recognize that. And one of those balances, in the Act, Congress did not determine that they would not be protected and were not eligible for compensation. But we still, nevertheless, recognize their importance, and there are two ways we are attempting to address it.

One of them is to make it clear that in rural areas we are seeking this core amount of spectrum; we are not seeking the maximum amount of spectrum. So that potentially could be more difficult, but we are not seeking to take all the spectrum.

And, number two, we are talking to the industry about technical solutions, such as multicasting from a single tower, alternate programming distribution, and even favorable rule modifications to allow them to apply more quickly.

Senator PRYOR. OK.

Mr. Kaplan, let me ask you a question, as well. The legislation that we are all working under here says the FCC is to make all reasonable efforts to protect TV stations in the repacking process. From your standpoint, is the FCC committed to complying with that?

Mr. KAPLAN. We are working very closely with the FCC staff on this and have met with them a number of times, and our hope is that we get to that place. There are some ideas out there now that we think don't meet that standard, but they are not the final ideas, they haven't been the things voted on by the Commission yet.

But we want to make sure the Commission understands that, you know, as would concern members of this committee, again, it

is the viewers that matter. The people today who get the stations should get them afterwards. So any proposal that treats viewers as fungible—you may gain 50,000 here, lose 25,000 here. Each viewer that relies on those stations that still remain on the air should get them. And we are working closely with the Commission to try and get to that point.

Senator PRYOR. And does the FCC, from your standpoint, have sufficient flexibility to do the repackaging?

Mr. KAPLAN. They absolutely do. And they do to both the repackaging to preserve white spaces, which is very important, as well as to get the amount of megahertz that the wireless industry says it needs.

Senator PRYOR. Senator Booker?

Senator BOOKER. Thank you very much.

So, you know, first of all, again, I think this is a wonderful situation that presents many opportunities. But what sort of worries me is that we are just dealing with still table scraps compared to what the growing and mushrooming demand is going to be. And seeing the incredible growth of the information that is being transmitted wirelessly, the demand is going up, I am really wondering, looking ahead, if maybe you guys could help me understand how we in government could do things more efficiently and more effectively.

And, specifically, the Government is sitting on a tremendous treasure trove of spectrum right now. And I believe we should be doing everything possible to free up what we can for both licensed and unlicensed usages. It could really fuel our economy and have a ripple effect in tremendous ways—in democratizing forces, in closing the digital divide, and promoting entrepreneurialism, innovation, economic growth, and more.

And so, while government spectrum is vital and we obviously need to preserve that, with technology obviously coming—I think that even for the Government it is going to become more and more important, and I have seen the urgencies that are often needed in crisis situations. But I am wondering if there are ways that we could be doing a better job to identify those inefficiencies and convert available spectrum to nongovernmental applications with a greater sense of urgency and, frankly, predictability.

And so, really, for the entire panel, and I would love maybe to start with Mr. Feld, followed by Ms. Marsh, Senator Ayotte pointed it out, that we are about to free up DOD's 1755. But from what I am reading, it has taken us about a decade to get that out there, which seems remarkably inefficient in this time that we are moving not in the speed of decades or years, but month to month there are growing demands.

And so I am just curious what you all believe in an informative way, what should we be doing for our next steps to meet this urgency and to provide that predictability?

Mr. FELD. Thank you very much.

I will say that Public Knowledge, we have issued some white papers on this going back to 2010. We believe that there is a lot that can be done to promote this efficiency.

We think that spectrum sharing is the beginning. It is allowing broadcasters and the military to now begin to share their spectrum to clear for auction. It can also be used to allow for access in com-

mercial use. The FCC is looking at the next stage of this in its 3.5-gigahertz proceeding.

But I will suggest that one of the things that we need to do is invest in more efficient spectrum equipment for government and to have a better, more comprehensive government plan. We have suggested a spectrum budget for the Government, where agencies would zero-base their spectrum needs, and that they would use these more advanced flexible technologies.

And I will just leave it at that and let others take that up from there.

Senator BOOKER. Thank you.

Ms. MARSH. So thank you for this question. It is such an important area because, as you observed, there is so much spectrum that the Government has, and the government hasn't had the same incentives as the industry to use it efficiently. But there are also very important Government uses that we have to protect.

So I agree with Mr. Feld, spectrum sharing is going to be a piece of this. And we are very active in the 3.5-gigahertz proceeding, as well, to determine how we can protect government uses while freeing up spectrum for the commercial industry.

But I also think that there are opportunities here to get exclusive licenses for the wireless industry, and I think the answer is around incentives. And Mr. Feld mentioned a couple things, in terms of aligning incentives for the Government to actually try to remodel its spectrum use and drive toward a more efficient use. I know there is some legislation that is also being considered as well as incentives. It has been a difficult challenge, but ultimately I think that is how we are going to break through, is make sure incentives align with use within the Government bands.

Senator BOOKER. Yes?

Mr. KAPLAN. Thank you, Senator. I do want to point out—nothing replaces smart spectrum policy. That is clear. But I do want to point out this is not just a Federal Government issue. There is a lot of commercial wireless spectrum that is not in use today. DISH has 40 megahertz of spectrum, it will likely be 50 soon, sitting on the sidelines. There are a lot of other companies—and Harold's organization has many times come to the FCC with a proposal of "use it or share it."

So when we talk inventory, you know, the Federal Government is obviously one place to look, but the wireless industry, too, sits on a lot of spectrum it doesn't use, some in certain areas. Tribal areas, another great example, where tribes try and get access to the spectrum, can't get calls back, wireless and otherwise.

But the bottom line is that I think a spectrum inventory about how everyone is using their spectrum, broadcasters included, is really important. Then we will really understand. Because you are asking a very central question. It applies both, though, to Federal and commercial. And we would be happy to participate in that.

Senator BOOKER. And you are saying tribes cannot get their—

Mr. KAPLAN. So when a large license is purchased and it is purchased, let's say, in New Mexico over an area where there is an Indian reservation, when I was at the FCC not that long ago, there was a proceeding that is laying dormant now, but I remember in the proceeding there were a number of tribes who came to us and

said, we are trying to get access but we can't get a call back from carrier X, who has that license. We would like to pay for it, we would be happy to. But it is not really worth the time of a major carrier to do that.

But there needs to be something—and this is maybe a place where the Government could step in—to make sure that the commercial industry is using their spectrum across the country as effectively as possible.

Senator BOOKER. I think I am out of time, Mr. Padden.

Senator PRYOR. Go ahead.

Senator BOOKER. I am sorry, go ahead, please.

Mr. PADDEN. I would just say, in the quest to get more spectrum, I would start in this proceeding. The National Broadband Plan calls for this auction to reallocate 120 megahertz of spectrum. There are some people in the process suggesting the FCC should settle for a lesser number, 84 megahertz or something lower. Given the demand and the dearth of other supplies, I think it would be almost unthinkable for the FCC to do anything other than go for 120 in this proceeding.

Senator BOOKER. Mr. Epstein, do you agree?

Mr. EPSTEIN. The ultimate amount of spectrum that will be available will be determined by market forces, by the auction, OK? And we certainly would rather have more than less.

Senator BOOKER. Thank you.

Senator PRYOR. Senator Nelson?

Senator NELSON. This is unprecedented, so what do you think is the most challenging thing on this incentive to have this auction be successful?

Mr. PADDEN. I think it is real clear and real simple. The FCC has to figure out how to incentivize enough broadcasters to walk through the front door of this auction and tender their spectrum. If they don't do that, nothing else matters. They won't need a band plan, they won't need bidding restrictions.

And the number one factor to influence the broadcasters' decision, like anybody else considering selling something they have, is what is the price. And somehow the government has to get some pricing information out to the stations.

Mr. KAPLAN. To me, that is an important factor but somewhat narrow and only focuses on the buy side. To me, the most important thing for this auction—the Chairman mentioned it, Gary Epstein mentioned it—is getting the software right to make the entire thing work.

It is not just an auction; it is a repacking of broadcasters that has never been done before. So we can even have a great auction that divides up the licenses perfectly, but at the end of the day, if all the stations of your constituents are all messed up and interfering with one another, interfering with unlicensed, interfering with licensed, it doesn't do anyone any good.

So the one point I want to make that differs from where Mr. Epstein is is I think that software needs to be done and tested before the order, not the auction. We shouldn't be sitting here in the middle of June, about to press the button on the auction, and then realize the software doesn't work. We need to know in advance that

it can actually do the gymnastics we need it to do, which is very unique.

Repacking every station, every station in the country, or 500 more stations in the country, which has never been done before, during an auction, in 30 minutes, that is pretty incredible. So let's make sure we get that right.

Senator NELSON. Mr. Epstein, I want to ask you a very sensitive question. If this thing doesn't go swimmingly and if we were, Lord forbid, to have another major terrorist disaster and we had to get spectrum to the Government for purposes of national security, does the FCC have eminent domain power, that they could go and get spectrum for national security?

Mr. EPSTEIN. Senator Nelson, that is really a tough question, one I don't think I am really competent to answer. Maybe I could, you know, respond to you.

The Commission does have strong war powers under the Communications Act, but there is not a lot of precedent for, you know, actually utilizing them and the conditions under which it would utilize them. But there are strong powers in certain parts of the Communications Act.

I am not aware of situations where the Commission had done it. And you, indeed, are talking about an extraordinary situation.

Senator NELSON. Thank you, Mr. Chairman.

Senator PRYOR. Thank you.

Senator Booker, do you have any other questions?

Senator BOOKER. Not for this panel, sir, but I have many questions.

[Laughter.]

Senator PRYOR. I understand. Me, too. Thank you.

Well, listen, I want to say again thank you to the panel, and I will need to thank Senator Rockefeller for allowing me to chair this and for organizing this hearing today. I want to thank all of our witnesses for coming. Again, I know some had to rearrange schedules because of the ice and snow and whatnot.

The record for this hearing is going to stay open for an additional 2 weeks. I know we had a couple of Senators who could not remain to ask their questions; I am sure we will have some submitted for the record.

And if you could work with us to try to get your answers back as quickly as possible, it would be very much appreciated.

So, again, I want to thank everyone, thank all the Senators for participating, thank Senator Rockefeller.

And, with that, we will adjourn the hearing. Thank you.

[Whereupon, at 4:24 p.m., the hearing was adjourned.]

A P P E N D I X

PREPARED STATEMENT OF HON. JOHN D. (JAY) ROCKEFELLER IV,
U.S. SENATOR FROM WEST VIRGINIA

Almost two years ago, I authored legislation with Kay Bailey Hutchison to give the FCC a new tool, voluntary incentive auctions, to make sure the Nation's limited spectrum resources are used smartly. Our legislation reflected widespread agreement from both sides of the aisle that we must continue to lead the way with innovative spectrum policies that generate real benefits for all Americans and help strengthen the United States' global leadership in mobile broadband.

Critical to that bipartisan legislation was the directive that those incentive auctions would, in turn, provide an important means to help fund a pressing national need—creation of a nationwide, interoperable wireless broadband network for our first responders, FirstNet.

There is no doubt that the FCC's incentive auction proceeding is one of the most important undertakings in the agency's history. That is why we are here today. To hear from the FCC and from various stakeholders as to how we can make sure that the upcoming incentive auction is a success.

There is too much at stake to be complacent:

- A successful incentive auction will set a new model for international spectrum policy, just as we did 20 years ago with the first spectrum auctions. It also will pave the way for future incentive auctions in the United States.
- A successful incentive auction will mean more robust wireless communications networks both for voice and data in rural and urban areas around the country. It will make sure the United States continues its global leadership in wireless and preserves room for the innovation brought about by unlicensed spectrum use.
- A successful incentive auction will offer broadcasters an opportunity to relinquish some or all of their current spectrum usage rights for an incentive payment.
- A successful incentive auction will minimize disruptions and expense to those broadcasters who choose to remain in the business.
- Finally, a successful incentive auction will raise significant revenue for FirstNet. As I have said before, this auction must be driven by one simple principle—it must raise the resources needed for the FirstNet network.

This is a complicated proceeding that affects whole industries. As Congress has always done, we deferred the intricacies of auction design and development to the expert agency. Having generated approximately \$50 billion for the U.S. Treasury and awarded tens of thousands of licenses through spectrum auctions, the FCC is the undisputed expert on spectrum actions.

The FCC also must be afforded the flexibility necessary to make sure that all of the tools it uses as part of the auction are as accurate as possible.

FCC Chairman Tom Wheeler has analogized the challenging and interlocking nature of the various parts of the incentive auction to a type of Rubik's cube. That is apt. Getting these auctions right and making them simple enough to encourage sufficient broadcaster participation will be an incredibly complex process. But I know that Chairman Wheeler understands better than anyone that, unlike a Rubik's cube, this auction is no game. By his own account, he has spent more time on the incentive auction than any other issue in his first month as chair of the agency.

Given the stakes, I look forward to a constructive dialogue from the witnesses today about their perspectives on how the FCC can craft a successful incentive auction. Thank you.

WRITERS GUILD OF AMERICA, WEST; PUBLIC KNOWLEDGE;
NEW AMERICAN FOUNDATION; FREE PRESS
December 10, 2013

Hon. JOHN D. ROCKEFELLER IV,
Chairman,
U.S. Senate,
Committee on Commerce, Science, and
Transportation,
Washington, DC.

Hon. JOHN R THUNE,
Ranking Member,
U.S. Senate,
Committee on Commerce, Science, and
Transportation,
Washington, DC.

Dear Chairman Rockefeller and Ranking Member Thune:

In a wireless industry increasingly dominated by just two providers, the United States faces the very real prospect that in the months and years to come wireless investment will stall, prices will rise, and our Nation's economy will never fully realize the economic growth that wireless broadband can enable. For this reason, we urge you to protect consumers, content creators, and wireless competition by supporting reasonable spectrum-aggregation limits on spectrum below 1 GHz.

As you know, low-band frequencies such as the 600 MHz band penetrate buildings better and travel farther than other frequencies can, and represent a critical building block for any carrier hoping to reach consumers where they live, work, and play.¹ Unfortunately, AT&T and Verizon currently control nearly 80 percent of all available low-band spectrum.² These two dominant incumbents also control more than 80 percent of the wireless industry's profits and two-thirds of its subscribers—up from just 43 percent of wireless subscribers in 2001.³

Given their commanding share of the market, AT&T and Verizon have an incentive to acquire the remaining low-band spectrum they do not already control to prevent competitors from undercutting them by offering consumers superior service, pricing, terms, or technology. The United States Department of Justice has grown concerned enough about this anti-competitive outcome to have urged the Federal Communications Commission to adopt rules ensuring non-dominant carriers have a fair opportunity to access low-frequency spectrum resources.⁴ Protecting competitors' access to low-band spectrum, the Department of Justice has noted, is essential to "serv[ing] the dual goals of putting spectrum to use quickly and promoting competition in wireless markets."⁵ The Small Business Administration recently voiced its support for reasonable spectrum-aggregation limits as well because reasonable aggregation limits have the potential to enhance competition, accelerate deployment, and increase auction revenues.⁶

We agree. Vigorous, sustainable wireless broadband competition means more innovation and enhanced economic growth as well as increases in hiring and investment. The Commission should design its rules in a manner that gives bidders of all sizes in the upcoming 600 MHz auction a meaningful opportunity to acquire spectrum where needed, rather than simply allowing AT&T and Verizon to dominate the auction and continue to foreclose competitors' access to vital low-band spectrum.

Even the two dominant carriers agree that spectrum-aggregation limits should exist with respect to low-band spectrum. The only question is when and how those limits should apply. In this case, AT&T and Verizon prefer post-auction divestitures

¹ See, e.g., Martin Cave & William Webb, *Spectrum Limits and Auction Revenue: the European Experience*, attached to *Ex Parte* Presentation of Sprint Corporation, GN Docket No. 12-268 & WT Docket No. 12-269 (July 29, 2013); Competitive Carriers Association Notice of *Ex Parte*, GN Docket No. 12-268 & WT Docket No. 12-269 (Sept. 4, 2013).

² Sprint Nextel Comments, WT Docket No. 12-269, at 5-6 (filed Nov. 28, 2012).

³ Comments of Free Press, WT Docket No. 12-269, at 5 (filed Nov. 28, 2012) (citing Petition to Deny of Free Press, In the Matter of Applications of AT&T, Inc. and Deutsche Telekom AG For Consent to Assign or Transfer Control of Licenses and Authorizations, WT Docket No. 11-65, at Figure 2 and SNL Kagan Wireless Industry Benchmarks (May 31, 2011)); Letter from Rebecca Thompson, General Counsel, CCA, *et al.*, to Acting Chairwoman Mignon Clyburn *et al.*, Docket No. WT 12-269, at 2 (May 20, 2013).

⁴ *Ex Parte* Submission of the United States Department of Justice, WT Docket No. 12-269 (Apr. 11, 2013).

⁵ *Id.* at 23.

⁶ See Letter from Winslow L. Sargeant, Ph.D., Chief Counsel and Jamie Belcore Saloom, Assistant Chief Counsel for Telecommunications, U.S. Small Business Administration Office of Advocacy, to Thomas E. Wheeler, Chairman, Federal Communications Commission, 3 (Nov. 22, 2013), available at <http://www.sba.gov/advocacy/816/766951> (last accessed Dec. 2, 2013) (asking the FCC to "consider seriously the possibility that imposing a cap on the amount of sub-1 Ghz spectrum any one carrier may acquire will increase participation in the auction, drive greater auction revenues, and provide further opportunities for competition to flourish in mobile broadband").

to clear, upfront rules. But after-the-fact spectrum aggregation review by the FCC would involve more process, delay, and uncertainty than putting clear, upfront spectrum-aggregation limits on spectrum below 1 GHz. Worse, an after-the-fact limit on spectrum concentration would allow the two dominant carriers to pick and choose which competitors will have access to low-band spectrum, thereby blocking or delaying the emergence of meaningful competition. An after-the-fact regulation would increase the power of the two dominant incumbents, with consumers paying the price.

Competitive markets are best for the public interest. With the upcoming 600 MHz auction, the FCC has a unique opportunity to promote competition in the wireless marketplace. We urge you not to let this opportunity pass and, on behalf of consumers everywhere, ask you to support transparent, well-crafted spectrum-aggregation limits.

Respectfully submitted,

ELLEN STUTZMAN
Director of Research & Public Policy
Writers Guild of America, West

HAROLD FELD
Senior Vice President
Public Knowledge

MICHAEL CALABRESE
Director, Wireless Future Project
Open Technology Institute
New America Foundation

MATT WOOD
Policy Director
Free Press

December 10, 2013

Hon. JOHN D. ROCKEFELLER IV,
Chairman,
U.S. Senate Committee on Commerce,
Science, and Transportation,
Washington, DC.

Hon. JOHN R. THUNE,
Ranking Member,
U.S. Senate Committee on Commerce,
Science, and Transportation,
Washington, DC.

Dear Chairman Rockefeller and Ranking Member Thune:

Many times in many different forums our companies have recommended that the Federal Communications Commission adopt reasonable spectrum-aggregation limits on critical, low-band spectrum. The Department of Justice, the Small Business Administration, public interest groups, consumer advocates, and consumers across the country have joined us in support of reasonable limits. Most recently, our chief executive officers wrote FCC Chairman Tom Wheeler asking him to encourage investment, accelerate deployment and protect consumer choice by adopting modest, well-crafted spectrum-aggregation limits. A copy of this letter is attached.

Throughout our advocacy, no one has ever suggested that the two dominant incumbents be excluded from the upcoming incentive auction. But, they already control nearly 80 percent of all available low-frequency spectrum. As a result, AT&T and Verizon have a powerful economic incentive to acquire the remaining low-band spectrum they do not already control to prevent competitors from undercutting them with superior service, pricing, terms, or technology. Reasonable spectrum-aggregation limits can prevent this outcome and help trigger new competition that can reduce prices, increase consumer choice, encourage investment and innovation, and accelerate next generation mobile deployment.

Reasonable spectrum-aggregation limits also have the potential to increase—not decrease—revenue from the incentive auction. They will encourage robust auction participation from the non-dominant carriers because these companies will no longer risk incurring the substantial costs of participation without having any realistic possibility of acquiring the spectrum they need. Without spectrum-aggregation limits, however, the non-dominant carriers may either avoid the 600 MHz auction or may curtail their bidding because they know they cannot outbid the dominant carriers. This is especially true among some smaller and rural carriers that may struggle to finance auction participation absent clear rules that allow them a meaningful opportunity to participate. In this scenario, the dominant incumbents—far from paying a premium to achieve an anti-competitive result—may take the licenses for far less than they are worth.

Competitive markets are best for the public interest. With the upcoming 600 MHz auction, the Commission has a unique opportunity to promote competition in the wireless marketplace. We urge you not to let this opportunity pass and, on behalf

of consumers everywhere, ask you to support reasonable spectrum-aggregation limits.

Respectfully submitted,

KATHLEEN HAM
Vice President, Federal Regulatory
 T-Mobile USA, Inc.

LAWRENCE R. KREVOR
Vice President, Legal and Government
 Affairs
 Sprint Corporation

ERIC B. GRAHAM
*Senior Vice President—Strategic
 Relations*
 C Spire Wireless

TIM DONOVAN
Vice President—Legislative Affairs
 Competitive Carriers Association

JEFFREY BLUM
*Senior Vice-President and
 Deputy General Counsel*
 DISH Network LLC

GRANT SPELLMEYER
Vice President, Federal Affairs
 & Public Policy
 US Cellular

CATHY SLOAN
Vice President, Government Relations
 Computer & Communications Industry
 Association

November 14, 2013

Hon. THOMAS WHEELER,
 Chairman,
 Federal Communications Commission,
 Washington, DC.

Re: *Ex Parte Notice
 Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, GN Docket No. 12–268;
Policies Regarding Mobile Spectrum Holdings, WT Docket No. 12–269

Dear Chairman Wheeler:

Congratulations on your confirmation as Chairman of the Federal Communications Commission. Your leadership of the FCC comes at a critical time for the wireless industry. Preserving a framework for effective competition is as important as ever.

Taken together, the companies and industry groups represented on this letter employ more than 100,000 Americans, provide service to more than 100 million subscribers, and generate greater than \$75 billion in annual revenue. Beyond the sheer numbers, however, our companies play an outsized role in accelerating innovation, investing in new technologies, and deploying broadband services throughout the United States.

None of us fears competition. Consumers benefit from the give-and-take of the competitive market. But to ensure those benefits keep flowing, it is vitally important that the two dominant wireless incumbents not be allowed to lock competitive carriers out of acquiring low-band spectrum in the upcoming 600 MHz auction. That result would disserve the public interest by fundamentally undermining the wireless industry competition that has served our Nation so well.

AT&T and Verizon already hold licenses for nearly 80 percent of the low-band spectrum available for commercial broadband use. They have economic incentives to acquire the remaining low-band spectrum in the 600 MHz band to stop our companies—their competitors—from offering truly sustainable, competitive wireless broadband service across America. Low-band spectrum, with its excellent propagation and building penetration properties, is an essential element of the spectrum mix wireless carriers must have to offer wireless customers spectrally-efficient competitive pricing, terms, features, and technology.

Recognizing a real risk to competition, the United States Department of Justice has urged the Commission to adopt rules ensuring that all wireless carriers have a fair opportunity to acquire low-band spectrum at auction. Protecting competitors' access to low-band spectrum, the Department of Justice has noted, is essential to protecting consumers' interest in continued innovation and investment in wireless broadband in the United States.

We agree with the Department of Justice on this critical topic. To be clear, none of us has ever suggested excluding the largest two carriers from the 600 MHz auction. Reasonable spectrum-aggregation limits, however, will help ensure that carriers of all sizes have a meaningful opportunity to acquire the low-band spectrum

they need to sustain effective and efficient competition. More competition, in turn, means more jobs, more investment, faster innovation, and more economic growth in America. Competition will also enable the Commission to maintain its “light-touch” regulatory approach to the wireless industry, rather than the aggressive regulation that duopoly tends to engender.

In the upcoming 600 MHz auction, the Commission has a unique opportunity to take an important step to promote competition in the wireless marketplace. We urge you not to let this opportunity pass.

Respectfully submitted,

CHARLIE ERGEN
Chairman
DISH Network Corp.

JOHN J. LEGERE
President and Chief Executive Officer
T-Mobile US, Inc.

DANIEL R. HESSE
President and Chief Executive Officer
Sprint Corporation

HU MEENA
President and Chief Executive Officer
C Spire Wireless

EDWARD BLACK
President and Chief Executive Officer
Computer & Communications Industry
Association

STEVEN K. BERRY
President and Chief Executive Officer
Competitive Carriers Association

KENNETH R. MEYERS
President and Chief Executive Officer
U.S. Cellular

JONATHAN FOXMAN
President and Chief Executive Officer
MTPCS, LLC d/b/a Cellular One

RONALD SMITH
President and Chief Executive Officer
Bluegrass Cellular

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARK WARNER TO
GARY EPSTEIN

Question 1. The Federal Communication Commission’s (FCC) Broadcast Television Spectrum Incentive Auction Notice of Proposed Rulemaking (NPRM), released in December 2012, requested comments about the process of scoring bids in the reverse/broadcaster auction based on factors such as “population coverage, geographic contour, or other relevant measurable factors.” I am glad to see the FCC is exploring innovative new concepts as we try to overcome barriers to clearing spectrum in major markets. I would like to know more about the scoring bids concept. How is the FCC evaluating the potential use of scoring bids?

Answer. As you note, the Incentive Auction Notice of Proposed Rulemaking (NPRM) sought comment on whether and how the Commission should recognize the heterogeneous nature of the television spectrum that different broadcasters might contribute to the auction. In particular, the Commission introduced the possibility of “scoring” broadcaster bids, to reflect the differences between the spectrum contributions of different bidders. We are not considering taking into account a station’s value as an ongoing broadcasting concern. We are currently considering whether scoring bids could lower the cost of clearing spectrum in the auction by improving how the auction selects the stations that are assigned a channel and those that are paid to relinquish spectrum rights. The record currently is under review, and there have not been any final recommendations made to the full Commission.

Question 1a. Is it possible that such a model could be applied in larger markets (*i.e.*, markets where spectrum is in demand, expected to be competitive)?

Answer. If the Commission adopts a scoring process, it could be applied in larger markets.

Question 1b. Do you have a sense of whether such a valuation process may yield more spectrum than the more traditional options—single round or multiple round?

Answer. Staff is currently considering whether scoring bids could lower the cost of clearing spectrum in the auction by improving how the auction selects the stations that are assigned a channel and those that are paid to relinquish spectrum rights. Regardless of auction type, lowering these costs could increase the likelihood of a successful auction that clears the maximum amount of spectrum.

Question 1c. Should the FCC focus most of its attention on overcoming barriers to clearing spectrum in major markets?

Answer. Staff expects that clearing spectrum in major markets will be a key Commission priority, and has focused significant attention to those markets to date. However, given the potential for market variation due to border and other potential constraints, and the resulting potential for inter-service interference to adjacent markets, staff has not limited its analysis to major markets.

Question 2. During the hearing, I asked you about a proposal that would allow for a common downlink band nationwide, and would provide for variation in the uplink band. Do you have any additional information you would like to provide, to expand upon your answer?

Answer. In the NPRM the Commission identified the ability to accommodate market variation (*i.e.*, the varying amounts of spectrum that the auction could recover in different geographic areas) as an important objective. In order to accommodate market variation, the NPRM proposed implementing a band plan that keeps the downlink spectrum consistent nationwide while varying the amount of uplink spectrum in more spectrally constrained markets. The Commission has examined approaches to accommodating market variation through a thorough and transparent comment and reply comment process, band plan workshop, and public notice. We continue to explore how the 600 MHz band plan can accommodate different levels of spectrum recovery and have made this a central factor in our band plan consideration.

Question 3. In their December 2012 Broadcast Television Spectrum Incentive Auction Notice of Proposed Rulemaking (NPRM), the Federal Communications Commission (FCC) sought comment on the use of spectrum aggregation limits in the forward auction. There is a wide range of opinions on this issue. What is the most equitable way for the FCC to administer a spectrum screen? Should the FCC require carriers to divest comparable spectrum below 1 GHz in order to meet limits? Why or why not?

Question 3a. Given the fact that it is less expensive to build networks using lower-band spectrum, should the FCC consider these costs in its evaluation of competition? Why or why not?

Question 3b. Has the FCC considered applying a market-by-market review of spectrum assets limited to major markets, since these are the areas which have the greatest demand for spectrum? Why or why not?

Answer. The longstanding directives of Section 309(j) of the Communications Act require that, with respect to spectrum auctions, the Commission “shall include safeguards to protect the public interest in the use of the spectrum,” and seek to “promot[e] economic opportunity and competition and ensur[e] that new and innovative technologies are readily accessible to the American people by avoiding excessive concentration of licenses and by disseminating licenses among a wide variety of applicants . . .” The relationship between spectrum policy, competition and consumer choice was reinforced in a filing submitted to the Commission by the Antitrust Division of the Department of Justice in April 2013. Commission staff also recognizes that under Section 6404 of the Middle Class Tax Relief and Job Promotion Act of 2012, no qualified bidder may be excluded from the auction, but that Section 6404 affirms the Commission’s authority “to adopt and enforce rules of general applicability, including rules concerning spectrum aggregation that promote competition.”

The United States has a long and successful history of spectrum auctions that have promoted competition, facilitated profound benefits for consumers, and generated substantial revenue for the U.S. Treasury as a means of recovering for the public a portion of the value of the public spectrum resource. Commission staff is committed to recommending to the Commission an auction that fully meets all statutory obligations and objectives, including freeing up a significant amount of spectrum for commercial use in a manner that promotes competition and drives our economy forward.

Commission staff is carefully reviewing the records in both the Mobile Spectrum Holdings proceeding and the Incentive Auction proceeding, including the record on the specific questions you raise, and has not yet presented a recommendation to the Commission.

Question 4. The Middle Class Tax Relief and Job Creation Act of 2012 allows the Federal Communications Commission (FCC) to create new guard bands in the 600 MHz band for unlicensed use. I am supportive of white spaces, and I hope that the FCC will be successful in creating a guard band that is adequate for unlicensed and licensed uses. According to some estimates, the unlicensed ecosystem generates as much as \$50 to \$100 billion per year for the U.S. economy. How important do you think it is to maintain white spaces?

Answer. Unlicensed spectrum use has a powerful record of driving innovation, investment, and economic growth, and the record in the Incentive Auction proceeding

demonstrates significant support for unlicensed use. In the NPRM, the Commission proposed measures that, taken together, would make a substantial amount of spectrum available for unlicensed uses, including a significant portion that would be available on a uniform nationwide basis for the first time. Specifically, under the proposal:

- Television white spaces would continue to be available for unlicensed use in the repacked television band;
- Guard band spectrum in the 600 MHz band plan would be available for unlicensed use;
- Channel 37 would be available for such use; and
- Two channels currently designated for wireless microphone use would be made available for white space devices.

The Commission also noted that proposed measures to promote unlicensed spectrum use are limited by the bounds of the Commission's statutory authority. Staff continues to carefully review the record related to unlicensed use.

Question 5. In March 2010, the Federal Communications Commission (FCC) released its National Broadband Plan (NBP). I was hopeful that we could clear 120 MHz in the incentive auction, but now it looks like there will not be more than 84MHz cleared in most markets. What do you believe will happen to the band plan if less than 84MHz is made available for the incentive auction? It's important to me that we maintain room for innovative uses of spectrum, such as white spaces, for instance.

Answer. We will not know the actual amount of spectrum we will recover until we conduct the incentive auction, and we are not limiting our plans to recovering 84 MHz. The amount of spectrum we recover will depend on a range of factors, including broadcaster participation in the reverse auction, the proceeds generated by the forward auction, the 600 MHz band plan, our ability to repack stations that will remain on the air after the auction, and international coordination with Canada and Mexico. Commission staff is diligently working to recommend an auction design that will maximize the amount of 600 MHz spectrum repurposed for flexible licensed use, while also promoting unlicensed use.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. AMY KLOBUCHAR TO
GARY EPSTEIN

Question. Mr. Epstein, earlier this year, the DOJ weighed in with the FCC on the spectrum auction rules emphasizing the importance of competition in the wireless market and the need for smaller national networks currently lacking in low-band spectrum have a chance to acquire it. Chairman Wheeler has said that a major focus of his term will be promoting competition. In a recent speech he said, "We must protect competition where it exists. We must promote competition where it may not be fulsome." As Chairman of the Antitrust Subcommittee, I have seen how strong competition in the wireless industry has been a tremendous benefit to consumers. A competitive market is the best way to ensure that consumers will benefit from low prices and quality service and thus I'm pleased to see that the new Chairman is so focused on competition. Do the amount and quality of spectrum held by a wireless carrier impact its ability to compete? Is the FCC's current method of measuring competition adequate or is it in need of upgrading?

Answer. The longstanding directives of Section 309(j) of the Communications Act require that, with respect to spectrum auctions, the Commission "shall include safeguards to protect the public interest in the use of the spectrum," and seek to "promot[e] economic opportunity and competition and ensur[e] that new and innovative technologies are readily accessible to the American people by avoiding excessive concentration of licenses and by disseminating licenses among a wide variety of applicants . . ." The relationship between spectrum policy, competition and consumer choice was reinforced in a filing submitted to the Commission by the Antitrust Division of the Department of Justice in April 2013. Commission staff also recognizes that under Section 6404 of the Middle Class Tax Relief and Job Promotion Act of 2012, no qualified bidder may be excluded from the auction, but that Section 6404 affirms the Commission's authority "to adopt and enforce rules of general applicability, including rules concerning spectrum aggregation that promote competition."

The United States has a long and successful history of spectrum auctions that have promoted competition, facilitated profound benefits for consumers, and generated substantial revenue for the U.S. Treasury as a means of recovering for the public a portion of the value of the public spectrum resource. Commission staff is

committed to recommending to the Commission an auction that fully meets all statutory obligations and objectives, including freeing up a significant amount of spectrum for commercial use in a manner that promotes competition and drives our economy forward.

Commission staff is carefully reviewing the records in both the Mobile Spectrum Holdings proceeding and the Incentive Auction proceeding, including the record on the specific questions you raise, and has not yet presented a recommendation to the Commission.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. AMY KLOBUCHAR TO
JOAN MARSH

Question 1. Ms. Marsh, in your written testimony you wrote that “network deployment is based on network capacity needs, not coverage.” While I understand that this is in reference to the spectrum crunch that exists in more urban markets, I would also like to make sure that carriers continue to invest in those parts of America where cell coverage is not what we would expect in the 21st century. Is AT&T committed to making sure its investments and spectrum are effectively utilized to reach consumers, even in rural areas?

Answer. Yes. Over the past five years (2008–2012), AT&T invested nearly \$98B into its wireless and wireline networks; investing more capital into the U.S. economy than any other public company. The investment in our wireless and wireline networks in 2013 was in the range of \$21B, with increased spending in wireless. In a September 2013 report, the Progressive Policy Institute (PPI) again ranked AT&T No. 1 on its list of U.S. “Investment Heroes.”¹ In addition, through its Project Velocity IP (Project VIP), AT&T plans to invest billions of dollars over the next three years (2013–2015) to significantly expand and enhance our wireless and wireline IP broadband networks. Project VIP is a major commitment to invest in the 21st Century communications infrastructure for the United States and bring high-speed IP broadband—wireless and wireline—to millions more Americans. Through this investment we plan to: expand our 4G LTE network to cover 300 million people by year-end 2014, more than 9 out of 10 Americans; expand our wired IP broadband network to approximately 75 percent of customer locations in our 22-state wireline service area by year-end 2015; deploy fiber to 1 million additional business customer locations in AT&T’s wireline service area by year-end 2015; bring high-speed IP Internet access via IP wireline broadband and/or 4G LTE to 99 percent of all customer locations within our 22-state wireline service area by year-end 2015; and increase the density of our wireless network through the deployment of small cell technology (40,000+), macro cells (10,000+) and additional distributed antenna systems (1000+). This densification will further improve network quality and increase spectrum efficiency.

Question 1a. Is AT&T supportive of build-out requirements as a rule for the auction?

Answer. Yes. 47 USC 309(j)(3) already requires the Federal Communications Commission, in designing auction rules, to promote the “development and rapid deployment of new technologies, products and services for the benefit of the public, including those residing in rural areas.” Subparagraph 4 encourages the Commission to “include performance requirements . . . to ensure prompt delivery of service to rural areas.” This evidently is intended to encourage the Commission, through performance requirements, auction rules or otherwise, to ensure that whoever buys a license that includes “hard to serve, unserved or underserved areas” would deploy there. Build out requirements on spectrum auction winners ensure that spectrum is utilized quickly and efficiently or is relinquished so that other entities may make use of it.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARK WARNER TO
JOAN MARSH

Question 1. In their December 2012 Broadcast Television Spectrum Incentive Auction Notice of Proposed Rulemaking (NPRM), the Federal Communications Commis-

¹U.S. Investment Heroes of 2013: The Companies Betting on America’s Future, September 2013, http://www.progressivepolicy.org/wp-content/uploads/2013/09/2013.09-Carew-Mandel_US-Investment-Heroes-of-2013.pdf. AT&T ranked No. 1 in the PPI list issued in July 2012. Investment Heroes: Who’s Betting on America’s Future?, July 2012, http://progressivepolicy.org/wp-content/uploads/2012/07/07.2012-Mandel_Carew_Investment-Heroes_Whos-Betting-on-Americas-Future.pdf.

sion (FCC) sought comment on the use of spectrum aggregation limits in the forward auction. There is a wide range of opinions on this issue. What is the most equitable way for the FCC to administer a spectrum screen? Should the FCC require carriers to divest comparable spectrum below 1 GHz in order to meet limits? Why or why not?

Answer. In 2001, as mobile data services were being launched, the Commission adopted a forward-looking spectrum policy framework that has facilitated the growth of one of the most successful and competitive marketplaces in the world. Recognizing that competitive bidding and freely-functioning secondary markets allow spectrum to flow to its highest-valued uses, the Commission abandoned rigid, “bright-line” spectrum aggregation caps and replaced them with a safe harbor screen and flexible, case-by-case consideration of proposals to exceed the screen. This basic framework—as originally conceived—strikes the appropriate balance between regulatory certainty (by assuring licensees that spectrum accumulations within the safe harbor will be approved) and regulatory flexibility (by ensuring that the Commission’s rules do not punish success and innovation and can accommodate any spectrum assignment that does not pose any true risk of foreclosing competition).

The benefits of this balanced, consumer-focused policy are obvious and dramatic. The U.S. wireless marketplace is the most dynamic and innovative in the world. As a result, at present, only a few simple adjustments are required to achieve “the most equitable way for the [Commission] to administer its spectrum screen”, including in the context of the incentive auction.

First, the Commission should update the screen to include all of the available spectrum that is “suitable” for mobile wireless services. Most prominently, the Commission should correct the most glaring omission by including the entire 194 MHz of BRS and EBS spectrum held mostly by Sprint, rather than the mere 55.5 MHz the Commission has included to date.

Second, the Commission should reaffirm that the “safe harbor” provided by the screen is truly safe—*i.e.*, that the Commission will not entertain spectrum aggregation-related challenges to any proposed spectrum acquisition that does not exceed the safe harbor level. The Commission should also make clear that its case-by-case analysis of proposals to exceed the safe harbor level in any market will remain tightly focused on whether the spectrum available to competitors and potential competitors remains sufficient to enable robust facilities-based competition to continue. This process should not result in “conditions” that have no link to any legitimate spectrum aggregation concern.

The Commission’s case-by-case analyses should also be informed by the reality that today’s screen, which is set at about one-third of suitable and available spectrum, is almost certainly too low and discourages transactions that would promote the public interest by putting spectrum to its best and most valuable uses. The Commission’s screen threshold of roughly one third of the available spectrum dates back to a time when the wireless industry was nascent and there were only two facilities-based competitors in each market. Under those circumstances, the Commission was concerned that it would be relatively easy for the incumbent carriers to obtain new spectrum that became available and thereby prevent new entry. But there is no basis upon which the Commission could rationally equate the risk of foreclosure today to the risk of foreclosure at the time of the initial PCS auctions. In today’s far more competitive wireless marketplace, a foreclosure strategy would be virtually impossible to implement. There are multiple facilities-based competitors with substantial spectrum holdings. Those competitors, large and small, compete aggressively for new spectrum when it is available at auction or in secondary markets. Moreover, the high cost of new spectrum, coupled with strict Commission build-out requirements, ensures that, even if it were theoretically possible to cripple competition through spectrum acquisitions, it would be prohibitively expensive to do so. In this environment, it is simply not realistic to assume that any holding of more than a third of the available spectrum in any market may create a risk of market foreclosure.

One step the Commission should definitely not take is to micromanage a carrier’s spectrum divestiture choices upon a finding that such a divestiture is necessary under the case-by-case screen analysis. In particular, the Commission should not require carriers to divest comparable spectrum below 1 GHz. As described in detail in response to Question 1b below, there is no meaningful distinction between spectrum above 1 GHz and spectrum below 1 GHz for competitive purposes. More generally, the Commission has long recognized that the acquiring carrier should be permitted discretion to address competitive concerns by divesting sufficient spectrum to bring its holdings in the affected markets below the level determined to be excessive. Allowing the licensee maximum discretion to dispose of “excess” spectrum in the secondary market is by far the most efficient way to ensure that the spectrum

will be allocated to its highest valued use; but those public interest benefits can be obtained only if the Commission does not place artificial limits on the provider's discretion. So long as the divestiture solves the spectrum aggregation concern at issue, there is no basis for the Commission to become involved in deciding the particular band(s) of spectrum that the licensee must divest to come into compliance. Allowing providers to rationalize their spectrum holdings improves spectral efficiency and benefits large and small providers alike, and the Commission's spectrum aggregation policies should not prevent carriers from "trading up" through auction or secondary market purchases to spectrum that is a better fit for their networks or business plans.

Question 1a. Given the fact that it is less expensive to build networks using lower-band spectrum, should the FCC consider these costs in its evaluation of competition? Why or why not?

Answer. In its evaluation of competition in a particular market, the Commission should not consider in isolation whether it is less expensive to build networks using lower-band spectrum. While it is true that, all else being equal, signals can propagate farther over low band spectrum, there is no inherent network quality advantage in using low frequency spectrum versus high frequency spectrum. As a matter of both physics and engineering, a provider can achieve the same coverage with either type of spectrum; it is merely a question of how the provider builds out its network. Likewise, all providers can address in-building penetration challenges with high frequency spectrum by increasing network density and deploying femtocells, picocells, Wi-Fi offload, and other means. To be sure, denser networks cost more to build, *but to the extent high band spectrum entails higher build out costs, the spectrum itself will sell for lower prices in the marketplace. This is critical because the cost of provisioning a service includes spectrum acquisition costs as well as network build out costs.*

Beyond that, and in all events, it is no longer the case that low band spectrum permits significantly lower build out costs than high band spectrum. To the contrary, the explosive growth of mobile broadband services has dramatically diminished differences in the real world costs of building out low band and high band spectrum, and that trend will only accelerate in the coming years. As a result of this dramatic growth, the industry faces what former FCC Chairman Julius Genachowski referred to as a "looming spectrum crisis," under which the principal challenge facing wireless providers today is meeting rapidly escalating demand for bandwidth. What that means is that in today's broadband world, unlike the voice world of yesterday, network deployments are driven by network capacity needs, not coverage. Regardless of whether a carrier is using high band or low band spectrum, it must build dense networks in all but the most rural areas where network congestion is not an existing or looming challenge. And to optimize building penetration, they must deploy small cells as well. Indeed, the superior propagation of low band spectrum leads to certain relative disadvantages in the form of increased interference between cells, particularly in densely populated cities.

Question 1b. Has the FCC considered applying a market-by-market review of spectrum assets limited to major markets, since these are the areas which have the greatest demand for spectrum? Why or why not?

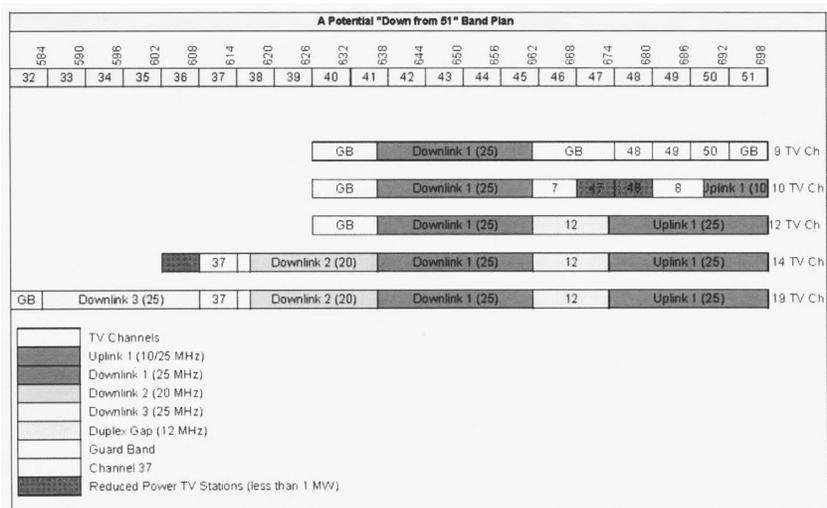
Answer. To AT&T's knowledge, the Commission has not considered applying a market-by-market review of spectrum assets limited to major markets. Perhaps this is because application of the spectrum screen analysis already includes, among many other factors, assessment of the degree of demand for spectrum in the market at issue.

Question 2. In March 2010, the Federal Communications Commission (FCC) released its National Broadband Plan (NBP). I was hopeful that we could clear 120 MHz in the incentive auction, but now it looks like there will not be more than 84MHz cleared in most markets. What do you believe will happen to the band plan if less than 84MHz is made available for the incentive auction? It's important to me that we maintain room for innovative uses of spectrum, such as white spaces, for instance.

Answer. AT&T remains hopeful that the incentive auction will result in the repurposing to commercial wireless use of at least 84 MHz of spectrum, especially in non-border areas. Even if it does not, however, there will likely be significant spectrum available in the duplex gap and/or guard bands for innovative unlicensed uses, as long as such uses do not harmfully interfere with licensed uses. For example, AT&T has submitted to the Commission an exemplar "2x25" band plan (reproduced below) addressing clearing scenarios ranging from as much as 114 MHz to as little as 54 MHz. In every scenario, a material amount of spectrum in a duplex gap and/or guard bands is potentially available for unlicensed use, assuming no

harmful interference. (See Comments of AT&T, Inc., GN Docket No. 12-268 (filed June 14, 2013)). The same is true of a “2x35” band plan submitted jointly by T-Mobile and Verizon that AT&T has conditionally endorsed if certain circumstances exist. (Letter from Joan Marsh, AT&T, to Ruth Milkman and Gary Epstein, FCC, GN Docket No. 12-268 (Ex parte Oct. 21, 2013)).

Of course, the Commission will be guided by the statutory directive that guard bands (of which a duplex gap is a form) be “no larger than is technically reasonable to prevent harmful interference between licensed services.” Spectrum Act § 6407(b). Moreover, regardless of what happens in the 600 MHz band, substantial white spaces will likely remain in the 500 MHz band, because (i) only the upper parts of the TV broadcast band are likely to be repurposed, and (ii) the distances that separate broadcasters for interference mitigation purposes must remain large.



RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. MARK WARNER TO HAL J. SINGER, PH.D.

Question. In March 2010, the Federal Communications Commission (FCC) released its National Broadband Plan (NBP). I was hopeful that we could clear 120 MHz in the incentive auction, but now it looks like there will not be more than 84MHz cleared in most markets. What do you believe will happen to the band plan if less than 84MHz is made available for the incentive auction? It's important to me that we maintain room for innovative uses of spectrum, such as white spaces, for instance.

Answer. At the FCC's recent conference on this subject, the Commission stated that in geographic areas where insufficient spectrum was cleared, they intended to first avoid clearing an uplink block. This would allow the auction to move forward and still maintain the integrity of the band plan overall. The feasibility of clearing certain amounts of spectrum in different geographic areas, while it is a subject under ongoing study both in the industry and by the FCC, will depend significantly on how eager broadcasters are to show up to the auction.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARK WARNER TO STEVEN K. BERRY

Question 1. In their December 2012 Broadcast Television Spectrum Incentive Auction Notice of Proposed Rulemaking (NPRM), the Federal Communications Commission (FCC) sought comment on the use of spectrum aggregation limits in the forward auction. There is a wide range of opinions on this issue. What is the most equitable way for the FCC to administer a spectrum screen? Should the FCC require carriers to divest comparable spectrum below 1 GHz in order to meet limits? Why or why not?

Answer. CCA has called for completing the Mobile Spectrum Holdings proceeding currently pending before the FCC in order to provide certainty to the industry. This generally applicable rule will ensure that all carriers have access to the finite spectrum needed to serve consumers' increasing demand for mobile broadband services. In updating the spectrum screen, the FCC should:

- Replace the current, single-trigger approach with separate thresholds for identifying competitive harms, including (1) spectrum below 1 GHz in local markets, (2) aggregate spectrum holdings in local markets, and (3) aggregate spectrum on a nationwide basis;
- Adopt clear rules including or removing spectrum from the screen going forward; and,
- Establish a rebuttable presumption that transactions exceeding the screen thresholds are contrary to the public interest and placing the burden of proof that the transaction would benefit competition and the public interest on the applicant.

Where the screen is exceeded and the burden of proof that the transaction would benefit competition and the public interest has not been met in a transaction, divestitures of comparable spectrum may be an appropriate remedy; however, the applicant should not be allowed to use the divestiture process to foreclose competitors from accessing needed spectrum resources. In the context of spectrum auctions, there should be clear, ex ante rules regarding spectrum aggregation that allow carriers of all sizes a meaningful opportunity to bid for spectrum; no carrier should be allowed to aggregate all spectrum available at auction. Divestitures should include spectrum below 1 GHz, particularly when transactions or auctions involve spectrum below 1 GHz.

Question 1a. Given the fact that it is less expensive to build networks using lower-band spectrum, should the FCC consider these costs in its evaluation of competition? Why or why not?

Answer. Due to its unique propagation characteristics, which have particular advantages for rural coverage and in-building penetration, special consideration should be given to transactions and auctions involving spectrum below 1 GHz. While it is less expensive to build-out coverage using lower-band spectrum, particularly in rural areas, it is also important to note that absent low-band spectrum it may not be economical for a carrier to efficiently compete in a market.

Question 1b. Has the FCC considered applying a market-by-market review of spectrum assets limited to major markets, since these are the areas which have the greatest demand for spectrum? Why or why not?

Answer. The FCC should not consider limiting a market-by-market review of spectrum assets to major metropolitan markets, as the spectrum needed to continue to deploy mobile broadband services to meet consumers' demands exists nationwide. Indeed, the benefits of mobile broadband, particularly using low-band spectrum, may have an even greater impact on education, employment, and safety in rural areas.

Question 2. In March 2010, the Federal Communications Commission (FCC) released its National Broadband Plan (NBP). I was hopeful that we could clear 120 MHz in the incentive auction, but now it looks like there will not be more than 84MHz cleared in most markets. What do you believe will happen to the band plan if less than 84MHz is made available for the incentive auction? It's important to me that we maintain room for innovative uses of spectrum, such as white spaces, for instance.

Answer. Policymakers should continue efforts to ensure that as much spectrum as possible is reallocated through the incentive auction for mobile broadband use. In the unfortunate event that less than 84 MHz is made available through the incentive auction, Congress should consider if further policy efforts or incentives are necessary to ensure that finite spectrum resources are being used efficiently, including both licensed and unlicensed spectrum.

To ensure that as much spectrum is made available for auction nationwide, the FCC should use sufficiently small geographic license sizes, which provide opportunities for carriers of all sizes to participate and create a greater number of unencumbered licenses that can be available for auction. Using sufficiently small geographic license sizes, there will likely be more areas with greater amounts of cleared spectrum available in the incentive auction. Under this approach, even if 120 MHz is not available nationwide, the auctioneers are not left with a least common denominator amount of spectrum.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARK WARNER TO
PRESTON PADDEN

Question 1. In March 2010, the Federal Communications Commission (FCC) released its National Broadband Plan (NBP). I was hopeful that we could clear 120 MHz in the incentive auction, but now it looks like there will not be more than 84MHz cleared in most markets. What do you believe will happen to the band plan if less than 84MHz is made available for the incentive auction? It's important to me that we maintain room for innovative uses of spectrum, such as white spaces, for instance.

Question 2. Do you have a sense of how much spectrum will be freed up in major markets, based on what you have been hearing from the broadcasters you work with?

Answer. Our Coalition continues to believe that reallocation of 120 MHz from broadcasting to wireless broadband is a critical public interest goal. Given the skyrocketing consumer demand for wireless services, and the dearth of other sources of spectrum, it would be unthinkable for the FCC to settle for anything less than reallocating 120 MHz in the Incentive Auction.

Our Coalition also believes that 120 MHz is achievable if the FCC permits market pricing to determine broadcaster participation. As a test, one Member of our Coalition has undertaken a rigorous and detailed repacking analysis of the television stations in the Los Angeles market and was able to clear 120 MHz for reallocation. This analysis took into consideration the "daisy chain" effect in adjacent markets.

If the FCC interferes with market pricing and limits the payments to particular stations based on some administrative scheme, then the FCC will fail to attract a critical mass of broadcasters and the auction will fail. The FCC can fulfill all of its financial obligations, including funding FirstNet, if the FCC meets the market price expectations of willing broadcast spectrum sellers and clears 120 MHz. On the other hand, if the FCC tries to interject administrative pricing in a mistaken effort to achieve some pre-determined "spread" between the forward and reverse auctions, the result will be failure.

It is important to note that the FCC will be buying spectrum in only a (currently unknown) limited number of markets. In most markets, the FCC will be able to clear 120 MHz merely by repacking the existing TV stations. In that majority of markets, the forward auction revenues to the FCC will be essentially free. These "free" revenues are the leverage that will enable the FCC to meet the price expectations of broadcasters where the FCC does need to buy spectrum and still fulfill the FCC's other financial obligations.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. AMY KLOBUCHAR TO
RICK KAPLAN

Question 1. Mr. Kaplan, as broadcasters continue to discuss their participation in the auction to help free up spectrum for mobile wireless, what do you think should be included as "eligible expenses" for funds from the TV broadcaster reallocation fund?

Answer. Senator Klobuchar, thank you for this important question and your leadership through this complex process. The Spectrum Act includes two key requirements that inform consideration of which expenses should be included as eligible for reimbursement. First, the Spectrum Act requires that broadcasters not electing to participate in the spectrum auction are to be held harmless for costs reasonably related to repacking and channel reassignment. Second, the Spectrum Act requires that service to the same coverage areas and populations of viewers be preserved to the greatest extent possible following repacking. Taken together, these provisions require that broadcasters be reimbursed for all reasonable repacking expenses necessary to allow them to continue to serve essentially the same coverage area and population they served prior to repacking.

Precisely what costs will be required to ensure that a particular station is able to serve the same coverage area and population following repacking will depend on numerous factors specific to that station. Many stations have highly customized transmission facilities tailored to take a number of variables into account—such as tower location, location of population centers, spectrum congestion, climate and other considerations. Thus, relocation expenses resist generalization and categorization. With this caveat, the following is an illustrative, non-exhaustive list of expenses that should be eligible for reimbursement from the fund.

Transmission-related expenses

- New transmitter or retune existing transmitter
- New auxiliary transmitter or retune existing auxiliary transmitter (where existing auxiliary facility is licensed)
- New antenna or modify existing antenna
- New auxiliary antenna (where existing auxiliary facility is licensed)
- New mask and other filters
- New combiner (for stations sharing feed line or antenna)
- New exciter
- New transmission line or wave guide
- Temporary antenna
- Temporary transmitter
- Temporary transmission line
- Temporary electrical power
- New controllers and other equipment associated with above when existing equipment is not compatible with new equipment
- Equipment to change translator input channels
- Proof of performance testing
- Removal and disposal of old and/or temporary equipment
- Installation for all of above, including third party and internal labor costs (*e.g.*, personnel time spent on modifications and accounting/cost reconciliation, overtime, etc.)

Tower and other facilities-related expenses

- New tower or existing tower upgrade or modifications to main and/or backup towers
- New building or modifications to existing building to house new transmitter and other equipment
- Land (for new tower or new facility)
- Contractual liability to current tower landlord if new tower is necessary
- Contractual liability to other site users when they are directly impacted (*e.g.*, service interruptions, temporary facilities, shared antenna)
- Difference in tower rent
- New power plant equipment, including extension of electricity to new site
- New HVAC equipment
- New STL and ICR to new site
- Moving costs to haul equipment to new site
- Removal and disposal of waste

Professional, legal, and other fees

- Engineering fees (for designing new facility; for tower loading evaluation; for site surveys; for building modifications)
- Fees for tower and RF compliance testing
- Expenses and fees associated with obtaining FAA clearance for a new or modified tower proposal
- Permitting fees
- Legal and expert fees (for applications; for zoning, environmental, and historical preservation compliance issues; for real estate (acquisition or leasehold); for tax advice on how new/replacement equipment is taxed)
- FCC filing fees for construction permits and new licenses (if not waived by FCC)

Ancillary expenses necessitated by repacking process

- Microwave, fiber, or other delivery expenses to ensure delivery to cable headends or satellite local receive facilities that are reached by existing facilities but are not by new facilities or that are necessary on a temporary basis to bridge any gap in full power operations (*e.g.*, extended periods of silence)
- Replacement of wireless microphones, interruptible foldback (IFB), and headsets that are displaced from now unused TV channels

- Additional or “bridge” insurance
- Expenses associated with educating viewers about rescanning
- Expenses associated with possible medical telemetry interference notifications
- Tax consequences (*e.g.*, depreciation schedules rendered inaccurate)

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. MARK WARNER TO
RICK KAPLAN

Question. In March 2010, the Federal Communications Commission (FCC) released its National Broadband Plan (NBP). I was hopeful that we could clear 120 MHz in the incentive auction, but now it looks like there will not be more than 84MHz cleared in most markets. What do you believe will happen to the band plan if less than 84MHz is made available for the incentive auction? It's important to me that we maintain room for innovative uses of spectrum, such as white spaces, for instance.

Answer. There are a number of productive band plan variations should the Commission recover less than 84 megahertz of spectrum across the country in the voluntary broadcast spectrum incentive auction. The goal of these band plans should be to maximize licensed paired spectrum, as that plan is most desirable for the vast majority of potential bidders in the auction.

One of the most potentially problematic aspects of the auction under almost any band plan is its threat to white spaces. As broadcasters are repacked across the country, white spaces will inevitably disappear. This presents a great challenge for the FCC, since it pushed hard for a workable white spaces regime just a few years ago, but now faces the real possibility of destroying their worth in the broadcast band through repacking. The best way to limit the damage to white spaces is to focus on creating a nationwide band plan and not one that transfers more spectrum from white spaces to commercial wireless operations in rural areas.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARK WARNER TO
HAROLD FELD

Question 1. In their December 2012 Broadcast Television Spectrum Incentive Auction Notice of Proposed Rulemaking (NPRM), the Federal Communications Commission (FCC) sought comment on the use of spectrum aggregation limits in the forward auction. There is a wide range of opinions on this issue. What is the most equitable way for the FCC to administer a spectrum screen? Should the FCC require carriers to divest comparable spectrum below 1 GHz in order to meet limits? Why or why not?

Answer. Public Knowledge submitted comments to the FCC in its pending proceeding reevaluating the spectrum screen urging the FCC to adopt an across the board screen that weights spectrum based on frequency and market. A copy of the comments, and the supporting comments of Professor Jon Peha of Carnegie Mellon University, is attached.

To summarize, Public Knowledge proposes that the FCC's spectrum screen takes into account that physical reality that low-band spectrum has the best set of physical characteristics in terms of propagation characteristics for mobile broadband. Thus, the screen would weigh more heavily low-band spectrum under 1 GHz. As the frequency increases, the spectrum screen would decrease the weight assigned to frequency holdings the higher frequency. Spectrum between 1 GHz and 2 GHz would thus count more toward the screen than spectrum between 2 GHz and 3 GHz, reflecting the higher energy cost, poorer penetration characteristics, and other factors that make this spectrum less useful and more expensive to deploy.

In addition, Public Knowledge proposes that the FCC recognize that in rural markets the problem is not generally a shortage of spectrum but that lower population density means a lower rate of return on higher investment. The FCC should therefore weight the screen to reflect this reality by having a higher screen in urban areas (to promote competition among the many carriers trying to offer service) and a lower screen in rural areas (to lower the cost to the few carriers providing rural service by permitting greater aggregation of rural low-band spectrum).

Finally, Public Knowledge proposes a specific penalty to discourage warehousing spectrum by increasing the weight for unused spectrum over time. With regard to divestiture, Public Knowledge believes that providers should divest spectrum if they exceed the screen. Companies that exceed the screen as a result of auction wins should be required to divest spectrum post-auction before the FCC issues a license for the new spectrum.

Question 1a. Given the fact that it is less expensive to build networks using lower-band spectrum, should the FCC consider these costs in its evaluation of competition? Why or why not?

Answer. The Commission absolutely must consider the realities of spectrum deployment when evaluating competition policies. We rely upon competition to replace regulation as the means of protecting consumers in the marketplace. For competition to discipline the largest players in the market, the competitive threat *must be real*.

If the largest providers can either deprive competitors of needed spectrum, then there is no competitive threat. The lack of spectrum means that competing carriers can only grow so far before their quality of service degrades based on spectrum congestion.

Dominant carriers can achieve the same effect by driving up the cost of spectrum to a point where competitors cannot offer service profitably, or cannot afford to undercut the price offered by dominant carriers. This is not a function of the “true” value of the spectrum, but a result of the fact that spectrum is licensed by the Federal Government. Unlike almost any other resource, licensed spectrum is a true “zero sum” game, making it possible for dominant carriers to foreclose competitors or artificially drive up cost.

Because low band spectrum is (a) unique in its physical characteristics that lower the cost of deployment, (b) held almost entirely by two dominant carriers and (c) limited to a small, set number of licenses, it is logical for AT&T and Verizon to attempt to foreclose rivals from acquiring it. The FCC must take this reality into account.

Question 1b. Has the FCC considered applying a market-by-market review of spectrum assets limited to major markets, since these are the areas which have the greatest demand for spectrum? Why or why not?

Answer. The FCC does not currently distinguish between major urban markets and other areas where demand for spectrum is not as great. This is problematic, especially as licenses come in a variety of geographic areas and there is no clear method for resolving questions of overlap in an acquisition. As a result, a carrier may exceed the screen in parts of a market post-acquisition without needing to divest.

Question 2. In March 2010, the Federal Communications Commission (FCC) released its National Broadband Plan (NBP). I was hopeful that we could clear 120 MHz in the incentive auction, but now it looks like there will not be more than 84 MHz cleared in most markets. What do you believe will happen to the band plan if less than 84 MHz is made available for the incentive auction? It’s important to me that we maintain room for innovative uses of spectrum, such as white spaces, for instance.

Answer. It is critical to maintain sufficient spectrum for the TVWS. An auction that reclaims less than 84 MHz can successfully achieve this by using a 12 MHz duplex gap and a 10 MHz guardband between the surviving broadcast service and the new 600 MHz service. Such a guard band could also include Channel 37, the channel set aside for the Wireless Telemetry Medical Service (WMTS).

The auction will still succeed if it reclaims less than 84 MHz of spectrum. In any auction that yields sufficient reclaimed spectrum to succeed financially, careful planning can ensure access to the TV bands for unlicensed use. It is imperative that the FCC recognize the importance of this and structure the band plans accordingly. If insufficient spectrum is made available in urban areas for unlicensed use, then chip manufacturers cannot achieve the necessary economies of scale for rural broadband or innovative urban uses, such as deployment as part of the “Internet of things.”

Some have proposed that existing vacant TV channels in rural areas be auctioned off for supplementary downlink (SDL) regardless of the amount of spectrum reclaimed in urban markets. This would be a huge mistake. As noted above, the problem in rural areas is not generally a shortage of spectrum, but a shortage of providers. In rural areas, wireless ISPs (WISPs) using unlicensed spectrum—especially the TVWS—are providing this service. To deprive these WISPs of needed spectrum to auction SDL for trivial amounts to providers that do not need additional spectrum for rural deployment would rob rural areas of needed broadband services for no worthwhile return.

Question 3. The Middle Class Tax Relief and Job Creation Act of 2012 allows the Federal Communications Commission (FCC) to create new guard bands in the 600 MHz band for unlicensed use. I am supportive of white spaces, and I hope that the FCC will be successful in creating a guard band that is adequate for unlicensed and licensed uses. According to some estimates, the unlicensed ecosystem generates as

much as \$50 to \$100 billion per year for the U.S. economy. How important do you think it is to maintain white spaces?

Answer. Unlicensed in the TVWS represent a unique public resource and an enormous economic opportunity for the United States. Because of the unique characteristics of the spectrum, availability of unlicensed spectrum in the TV bands dramatically lowers the cost for providing broadband services. In rural areas, this translates to enhanced competition and deployment of quality broadband in unserved areas. In urban areas, this translates into a means to extend access to fiber through wireless ISPs and hot spots that permit deployment of low-cost or even free broadband access to those who cannot afford cable or other forms of high speed wireline broadband.

But more importantly, the TVWS represents the first generation of cognitive radio devices. No single application, even the possibility of vastly improved low-cost broadband, can adequately capture this value. First, the development of this “next generation” unlicensed spectrum technology provides new means of managing wireless networks that will maximize efficiency of all wireless networks by enabling “smart” radios to use available blocks of spectrum. As with previous innovations developed in the unlicensed space, these innovations will ultimately be adapted and incorporated into the licensed space to the benefit of all, creating a multiplier effect for the wireless economy as a whole.¹

Additionally, the wealth of devices and new uses that will develop using the superior propagation characteristics of the TVWS for specialized purposes will create hundreds of billions of dollars in revenue and economic surplus annually. A new study by Columbia School of Business Professor Raul Katz shows that the availability of unlicensed spectrum contributed over \$220 billion dollars to the U.S. economy in 2013, and directly contributed \$6.7 billion to U.S. GDP.² Access to the TVWS, because of the unique physical characteristics of this spectrum, can be expected to increase this value exponentially over time.

Finally, by enabling all Americans to directly access this valuable spectrum, preservation of the TVWS permits entry for all Americans rather than the handful of entities able to afford licenses at auction. This is particularly important for small businesses, rural communities, and women and minority owned businesses. Preserving the TV white spaces allows these traditionally marginalized businesses and communities to build their wireless future themselves, rather than wait passively as consumers for licensed providers to recognize their worth. The unlicensed TV spectrum makes the promise of American entrepreneurialism a reality to those who would otherwise stand excluded on the sidelines, and converts passive consumers into active creators. We should recognize this value, so wholly consistent with our values as Americans, despite the fact that it cannot be measured in mere dollars.

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¹It is important to understand that these innovations will take place in the unlicensed space rather than the licensed space because the open nature of the unlicensed space encourages “innovation without permission.” In economic terms, the lower transaction cost associated with developing devices and uses in the unlicensed space (because a would-be innovator does not need to find a willing licensee and negotiate for access) lowers barrier to entry and facilitates innovation in a way wholly different from that of licensed spectrum access. See Kevin Werbach and Aalok Mehta, “The Spectrum Opportunity: Sharing As the Solution To The Spectrum Crisis,” 8 Int’l J. of Communication 128 (2014) available at: <http://ijoc.org/index.php/ijoc/article/view/2239/1054> (copy attached).

²See Raul Katz, “Assessment of Economic Value of Unlicensed Spectrum In the United States,” available at: <http://www.wififorward.org/wp-content/uploads/2014/01/Value-of-Unlicensed-Spectrum-to-the-US-Economy-Full-Report.pdf> (copy attached).