

Subcommittee on Communications and Technology  
Legislative Hearing to Address Spectrum and Public Safety Issues:  
Responses to Additional Questions for the Record

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Mr. Chairman and members of the House Committee on Energy and Commerce:

My responses to the additional questions for the record follow.

**The Honorable Henry Waxman**

1. Mr. Calabrese stated in his testimony that the auction model proposed in Section 104 of the Republican discussion draft would likely inject uncertainty into the auction process and undoubtedly lower the score that CBO would put on what would be an unpredictably contingent auction. Do you agree?

Yes. Section 104 of the Republican discussion draft is extremely problematic. Although the auctioning of licensed spectrum is essential to identifying the best *private* use of the spectrum, it does not follow that unlicensed spectrum should be auctioned in competition with those seeking licensed spectrum. The economics of unlicensed and licensed spectrum are radically different. Unlicensed spectrum is for *shared* use by all. No party is excluded from its use. In contrast, licensed spectrum is reserved for the sole use of the licensee. Bidders for licensed spectrum are motivated to bid, since if they win they are granted exclusive use of the licensed spectrum. Bidders for unlicensed spectrum have little incentive to bid, since the rights of winners are the same as the rights of losers.

The bidders for unlicensed spectrum would face a huge free-rider problem that the bidders for licensed spectrum do not face. If bidders for unlicensed spectrum had to compete with bidders for licensed spectrum, as Section 104 requires, the licensed use would invariably win, even in circumstances where unlicensed use creates dramatically more social value.

The analogy with private (licensed) and public (unlicensed) land fits perfectly. Consider Yellowstone National Park. Suppose rather than setting aside Yellowstone for public use, it were auctioned and the

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<sup>1</sup> My specialty is the design of complex auction markets. Since 1993, I have contributed extensively to the development of spectrum auctions. I have advised ten governments on spectrum auctions, including the United States. I am currently advising the United Kingdom, Canada, Australia and Singapore. I have advised 35 bidders in major spectrum auctions around the world. I have written dozens of practical papers on spectrum auctions. This research is available at [www.cramton.umd.edu/papers/spectrum](http://www.cramton.umd.edu/papers/spectrum).

winner would determine whether it would be for public use or private use. Those bidding for private use would invariably win, even though the social value from public use is much greater.

The decision to set aside some spectrum for unlicensed use must necessarily be a regulatory decision, weighing the benefits of public and private use. Auctions cannot make this determination.

Unlicensed spectrum plays an essential role in fostering innovation and competition in communications. Section 104 would effectively eliminate additional unlicensed spectrum and thereby undermine this important mechanism for innovation and competition.

2. Mr. Calabrese stated in his testimony that spectrum speculators, not non-carrier firms, have the most incentive to purchase unlicensed bands especially for those bands of little interest to carriers. Do you agree?

Yes, because of the free-rider problem for those seeking the unlicensed use, the highest bids would invariably come from those seeking a private use of the spectrum, even if the spectrum is not of immediate interest to carriers. As a result, spectrum with a high social value in the unlicensed use would remain in private hands. This would undermine innovation and competition in communications.

3. Mr. Guttman-McCabe stated in his oral testimony that the open access conditions applied to the 700 MHz C Block led to lessened bidder interest and significantly reduced the amount of revenue received when compared with the adjacent A and B Blocks. Do you agree?

No. I have studied the 700 MHz auction extensively. Shortly before the due date of bidder applications, both AT&T and Verizon endorsed the open access provisions. It is extremely unlikely that the open access provisions played a role in the price difference. What costly steps has Verizon taken on the C block to conform to open access provisions that AT&T has not done on the B block? I doubt one can find any.

Prices differences are much better explained by the level of competition for the various blocks. In the 700 MHz auction, the C block had the least competition because of the large license size, which made it difficult for regional operators to compete on the C block. This left just AT&T and Verizon to compete on the C block, but AT&T decided early that it was better to avoid competition with Verizon and focus on the B block instead. Once AT&T made this decision it was difficult or impossible to reverse course given the auction rules.

It is now well-understood that large price differences are possible across blocks in a simultaneous multiple round auction when blocks are offered with different geographic partitions. See my paper, ["Spectrum Auction Design"](#) for details.

4. Commissioner McDowell of the FCC recently stated that that a carve-out for unlicensed white spaces spectrum would "add[] a positive and constructive chaos to the marketplace." Do you agree with the Commissioner's statement that unlicensed spectrum, and white spaces in particular, promotes competition?

Yes. As I mentioned above, unlicensed spectrum plays a vital role in fostering innovation and competition in communications. Unlicensed use allows alternative business plans that are distinctly different from those of licensed operators. The experience with Wi-Fi is a good case in point. Wi-Fi has enabled a variety of communications and greatly expanded the power of major wireless devices. We certainly need a mix of unlicensed and licensed use to achieve the greatest social value. Setting aside some TV white spaces for unlicensed use will add an important opportunity for innovation and competition in communications.

The Wi-Fi spectrum does not have serious congestion problems because it is low power. The efficient allocation of spectrum should have some high-speed low power unlicensed spectrum for location-specific use (home, office, coffee shop) and high-power licensed spectrum for wide area mobile use. The two types of spectrum are complementary in the sense that the value of each is enhanced when the other is present.

A mixed regime of licensed and unlicensed use would not only be the most efficient allocation of spectrum, but it likely would increase auction revenue. First, the availability of the unlicensed spectrum would increase the utility of the licensed spectrum because licensees would have effective access to both bands as exemplified by how smartphones and tablets use both bands today. Second, having less licensed spectrum available would increase scarcity during the auction and thereby raise prices.

#### **The Honorable Bob Latta**

1. Can you expound a bit upon how the reverse auction will work under the incentive auction provisions of this bill? How do you think this will affect the revenue that the auction might produce - do you have an estimate for that?

The reverse auction identifies those TV broadcasters who are most willing to either give up or reduce their over-the-air broadcast rights. In particular the reverse auction determines for each region and each level of clearing, the price that must be paid to TV broadcasters in order to voluntarily clear the specified number of stations in the region. This information, together with the repacking algorithms and the information from the forward auction, jointly determine the supply and demand curves for mobile broadband spectrum. Given this information, the FCC can then make a regulatory decision about the best quantity to transact.

Without the information from both the reverse and forward auctions as well as the repacking possibilities, it is not possible to precisely estimate either the welfare gains or the revenue gains from the auction. Nonetheless, the recent explosion in demand for mobile broadband fueled by the latest smartphones, tablets, and laptops suggests that the welfare gains would be a multiple of \$10 billion dollars. This is difficult to translate into auction revenues, which depend on the shape of the supply and demand curves and lumpiness in quantity choices that are dictated by technologies.

One thing is certain: the auction will be revenue positive. There is no possibility that the payment to TV broadcasters would exceed the amount received from mobile operators.

### **The Honorable Cliff Stearns**

1. If the FCC auctioned all of the spectrum it reclaimed, on a voluntary basis, in the TV band, how much revenue do you think could be generated?

The incentive auction is better thought of as a simultaneous determination of the supply and demand curves for contiguous blocks of spectrum. This simultaneous determination is how the FCC can guarantee that the auction is revenue positive and that the quantity that is transferred to mobile broadband is consistent with the needs of mobile operators.

Because of equipment economies of scale and the requirements of the emerging technology (LTE), it likely makes sense for the quantity that is transferred to mobile broadband to accommodate the same whole number of 2x10 MHz blocks in each region of the country. This allows a consistent band plan across the nation, which is important in creating interoperable devices that work across all blocks throughout the country. This lumpiness on the demand side will create a positive spread between what the mobile operators pay and what the TV broadcasters receive. The auction revenues depend on that spread. A precise estimate cannot be made. However, a reasonable guess is that the spread would generate many billions of dollars in auction revenues.

### **The Honorable Charles F. Bass**

1. I noticed in your testimony a footnote addressing the great difference between the FCC and CMS in the design and effectiveness of their auctions. As this committee has jurisdiction over parts of Medicare, and we all should share in the goal of improving the efficacy and efficiency of this program, what lessons can CMS learn in auction design?

There are important lessons for both CMS and for Congress in comparing the FCC experience with auctions and CMS' experience.

CMS can look to the FCC spectrum auctions as an example of an effective auction program. Key to the FCC's success was the early involvement of auction experts in the auction design process. This involvement of experts led to an innovative and successful auction program that has been adopted around the world.

Designing successful auction markets is far from trivial. It is essential to get the early involvement of auction experts to work in collaboration with industry experts and the government to develop the best market. Without this involvement, the auction program is much more vulnerable to failure. The CMS experience with Medicare auctions for durable medical equipment is a good example. The program is badly flawed and doomed to failure, if CMS does not take major steps to improve its design.

For Congress, the lesson is that different agencies have different capabilities with respect to the design and implementation of auction markets. The FCC is among the best and CMS is among the worst. As a result, Congress can give the FCC a great deal of freedom in designing and implementing incentive auctions. It is sufficient to outline the broad principles and objectives of the approach and let the FCC, together with experts and the industry work out the details. In contrast, CMS, at least currently, requires

much more direction from Congress on how to design and implement an effective auction program for Medicare supplies.

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