

Statement on

Effect of NextWave's Participation in the C-block Auction on Antigone and Devco

Submitted by

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Introduction

I have been asked by Antigone Communications Limited Partnership ("Antigone") and PCS Devco, Inc. ("Devco") to comment on the impact that NextWave Telecom, Inc. ("NextWave") had on the outcome of C-block Broadband PCS Auction. This statement assumes that, as found by the FCC staff at ¶85 of its February 14, 1997 *Memorandum Opinion and Order*, \$75 million of NextWave's equity at the time was foreign and in excess of the statutory foreign ownership benchmark, out of \$225 million that NextWave needed for its first post-auction down payment. Specifically, I will address two questions:

- What would the likely outcome have been in the C-block auction if NextWave had been excluded from participating, because of its unlawful foreign equity? In particular, would Antigone and Devco have won licenses but for the participation of NextWave?
- What would the likely outcome have been if NextWave's participation had been reduced by one-third (the amount of the unlawful foreign equity)? In particular, would Antigone and Devco have won licenses but for NextWave's high level of participation, which was one-third funded by unlawful foreign equity?

I am commenting as an auction expert. For the last fourteen years, I have conducted research on auctions. I have written over twenty articles on auction theory and practice, which appear in major scholarly journals. Since December 1993, my teaching, research, and consulting has focused on spectrum and related auctions, especially the FCC spectrum auctions. I served as the auction strategist for two companies (PageNet and Pocket Communications) that were major participants in FCC spectrum auctions, and advised a third (MCI) that eventually decided not to participate. For over one year, I advised the FCC on auction design and implementation. My recent auction related activities are documented in the attached abbreviated vita.

My comments are based on my extensive experience with all of the FCC's simultaneous multiple round auctions, especially the C-block auction in question. In my role as auction strategist for Pocket Communications (formerly DCR Communications), I analyzed the C-block auction on a round-by-round basis, and submitted a written strategic report following each day of the auction. Over the five-month duration, I became intimately familiar with the strategies and behavior of the bidders in the C-block auction. My analysis reflects this extensive first-hand experience. In addition, the analysis is based on the publicly available bidding data (see the auction page at the FCC's web site, www.fcc.gov) and other public information. All specific numbers are taken from the FCC's auction tracking software for the C-block auction.

Based on my analysis, I conclude that:

- NextWave's participation in the C-block auction had a substantial effect on prices. I estimate that without NextWave the auction would have ended with prices about 25% lower.
- With prices 25% lower, both Antigone and Devco would have won licenses. From their bidding, I estimate that Antigone would have won at least 2.0 million pops, and Devco would have won at least 0.4 million pops.
- If NextWave participated in the auction but at a level reduced by one-third, I estimate that prices would be about 8% lower. Based on a detailed analysis of NextWave's and Antigone's bidding, I estimate that Antigone would have won 1.6 million pops.
- Hence, both Antigone and Devco were injured by NextWave's violation of the statutory foreign ownership rules.

In what follows, I present the analysis that leads to these conclusions.

NextWave's Impact on Auction Prices

To assess NextWave's impact on auction prices, it is necessary first to understand the special features of the simultaneous multiple round auction, and the special features of the C-block auction in particular.

Special Features of Simultaneous Multiple Round Auction

In an ascending-bid auction for a single item, the item sells for the value of the last bidder to drop out. This marginal bidder determines the price and bidders that drop out earlier have no effect on the price, except perhaps how they indirectly affect the marginal bidder's beliefs about value. In a single item auction, it is only the marginal bidder that is harmed by the presence of the winning bidder.

The Wireless Bureau's decision has used this reasoning to assert that only the marginal bidder (the last to drop out in a market) is harmed by the winning bidder in that market. This is true only if there are no substitution possibilities among markets. In the FCC's simultaneous multiple round auctions, the assumption of no substitution possibilities among markets is incorrect. Indeed, it is precisely these substitution possibilities that motivated the FCC to adopt this auction form. The key feature of a simultaneous multiple round auction is that bidders can easily shift among licenses as prices change. Hence, they can take advantage of arbitrage opportunities and shift their bidding to licenses that are better values. In this way, the auction determines market prices for the spectrum licenses. There is ample evidence that the FCC auctions have been a success in this respect, especially in auctions where there is vigorous competition (Cramton 1996).

In a simultaneous multiple round auction, a large bidder typically affects all bidders regardless of whether the other bidders are bidding in the large bidder's markets or whether the other bidders are marginal bidders in these markets. The reason is that the large bidder increases the prices on all the markets it bids on, which encourages other bidders to shift to other (cheaper) markets, which in turn raises the prices in these other markets. This feature was expressed by Dan Riker, President of Pocket Communications, at the conclusion of the C-block auction: "Our analysis was that if we tried to buy any other significant markets we'd be displacing someone who would use the money to do something someplace else, and it was going to be a continuous round-robin with the

prices going up, so we just said the hell with it, let's stop." (*PCS Week*, May 8, 1996, page 3.) As a result, to gauge the impact of a large bidder in a simultaneous multiple round auction, the appropriate methodology is to determine the aggregate demand curve for spectrum in the auction, as revealed by the bidding behavior. This approach is discussed and implemented in Cramton (1995) for the nationwide narrowband auction.

Special Features of C-block Auction

The C-block auction was the most competitive auction the FCC has held to date. In addition, most bidders had great flexibility in where they bid. Bidders did not have existing infrastructure that constrained them to particular markets. As a result, most bidders shifted among markets as prices changed, taking advantage of arbitrage opportunities. Hence, the C-block auction is best viewed as one that determined market prices for spectrum based on the aggregate demand curve for spectrum. (Of course, bidders took into account the substantial differences in market characteristics, which is why there was not a common price per pop in all markets.)

In each of the spectrum auctions, budget constraints played an important role in limiting bidding. This was especially the case in the C-block auction. As small bidders with limited capital, all bidders in the C-block auction were budget constrained. The FCC required a 5% down payment at the close of the auction, and another 5% down payment at time of award. Bidders differed in their definition of the budget constraint. It is my assessment that more conservative bidders limited their bidding to cover the 10% down payment; whereas, the less conservative bidders limited their bidding to cover just the initial 5% down payment. In either case, the amount of money a bidder had on hand was a key determinant of bidding strategy.

Another important feature was that, based upon the monetary showings in the bidders' FCC filings, the C-block qualification rules and the trade press, the money in the auction came almost entirely from outsiders, rather than each firm's control group. This feature had a major impact on behavior in the auction. For control groups without much of their own equity at stake, not winning licenses meant a loss of a good job; whereas, winning licenses not only preserved employment, but held open the possibility of substantial gains if the optimistic valuation assumptions materialized. For such bidders, the objective was to win as much spectrum as possible given the budget constraints.

If all bidders in the auction pursued an objective of "win as much spectrum as possible given a budget constraint," then it is a simple matter to calculate the effect of any one bidder. Prices are simply the total money available (i.e., the sum of the budget constraints) divided by the quantity of spectrum being auctioned. NextWave's absence would have reduced prices by 41%. There is ample evidence that many bidders in the C-block auction, including most of the large bidders, acted in this way. For example, *PCS Week* (May 8, 1996, page 3) reports, "According to Riker, [Pocket Communication's] original business plan, developed two years ago, predicted that the company would spend \$1.5 billion on the auctions, 'except we thought we'd get 60 million to 75 million pops for that money. Instead we got 33.5 million.'"

Some bidders were not able to pursue this strategy, because of restrictions the outside investors placed on bidding behavior. For example, US Airwaves' agreements with outside investors required their consent to continue bidding beyond specified prices. As a result, US Airwaves was forced to drop out early in the auction. Other large bidders with similar constraints also dropped out early. Examples include Personal Connect, AirLink, NorthCoast, and GO. The money these firms brought to the auction had no impact on

prices. Nonetheless, at least NorthCoast and GO would have affected prices if NextWave were not present.

Likely Prices without NextWave or with a Smaller NextWave

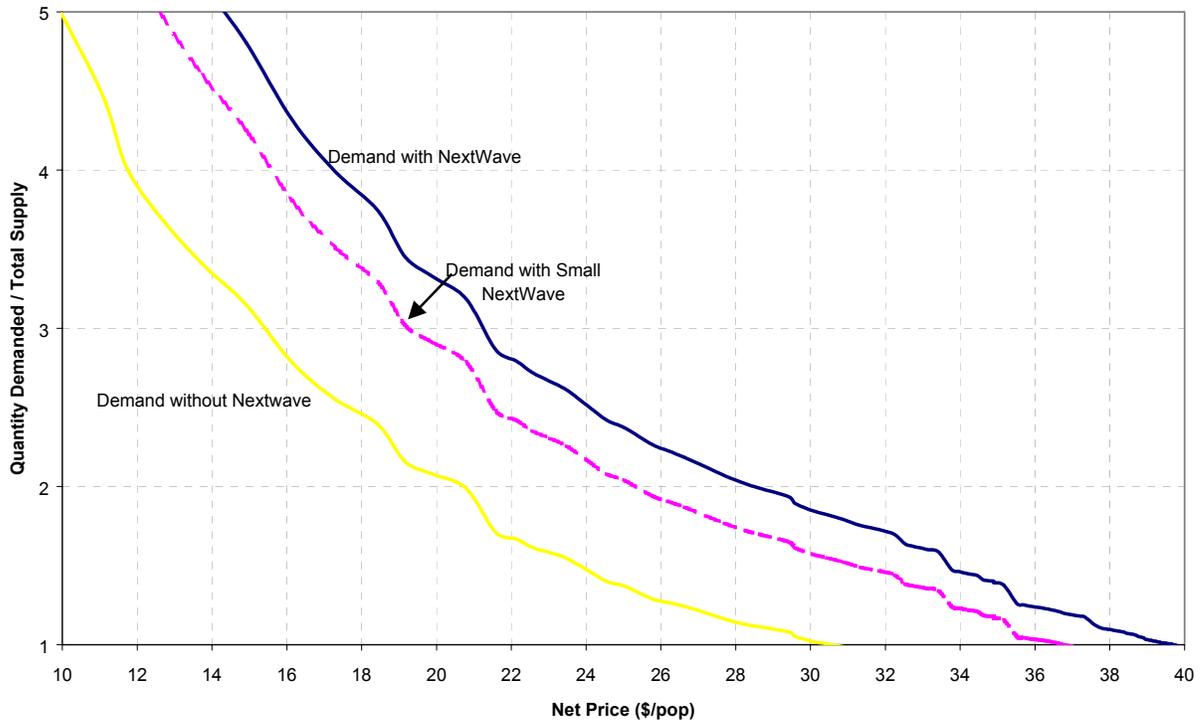
To determine the impact of NextWave on prices, recognizing the diversity of bidding strategies, it is necessary to construct the demand curve for spectrum, as revealed by the bids throughout the auction. I follow the methodology in Cramton (1995). For each of the 255 bidders, I determine the willingness to spend at each of 183 price levels, corresponding to each round in the auction. A bidder's willingness to spend at a particular price level is taken as the *maximum* amount of money the bidder had on the table at all price levels equal to or above the particular price level. This assumption imposes a reasonable restriction on bidder preferences: if a bidder is willing to spend \$60 million at a high price level, the same bidder would be willing to spend \$60 million at all *lower* price levels (and purchase more spectrum for the same money). A bidder's willingness to spend at each price level is easily translated into the bidder's demand curve by computing how much spectrum the budget buys at each price level. Then the aggregate demand curve for spectrum is computed by summing up the individual demand curves for each bidder.

Figure 1 gives the resulting demand curve for spectrum in the C-block auction. The solid line that is farthest to the right is the demand curve in the actual auction (including NextWave). At a price of \$39.88 per pop (net of bidding credit), the quantity of spectrum is exactly equal to the total supply (quantity demanded / total supply = 1) and the auction ends. This occurred in round 184, when no bidder was willing to bid on any license. The demand curve shows that, even at a price of \$28, about twice as much spectrum was demanded as was available.

At first glance, one might think that to calculate the demand curve without NextWave, one would simply subtract NextWave's individual demand curve from the aggregate demand curve. This, however, is not the case. The individual demand curves of the other bidders must be adjusted to reflect the stronger incentive for reducing demand when NextWave is not present. The motivation for this demand reduction is analyzed in Ausubel and Cramton (1996). In short, large bidders in a multi-object auction have an incentive to reduce their demands in order to keep prices from rising further. The incentives for demand reduction are stronger for larger bidders, since by cutting back they are able to keep prices low on a larger quantity of spectrum. For the large bidders I have advised in spectrum auctions, demand reduction was the primary strategic issue.

In constructing the demand curve without NextWave, I make the following assumption about demand reduction. I assume that the ten largest bidders as of round 40 reduce demand by between one-third and one-quarter (one-third for the largest, falling to one-quarter for the smallest of the top-ten) when NextWave is not present. I believe this is the most reasonable assumption. Even if this were a slight overestimate of the demand reduction for some of these ten bidders, I am assuming no demand reduction for the remaining 245 bidders, which is surely an underestimate. On balance, I find this to be a reasonable and conservative assumption. The resulting demand curve without NextWave is the left-most solid line in Figure 1. Most importantly, notice that the quantity demanded equals the quantity supplied at a price of \$30 per pop. This is a 25% reduction from the closing price with NextWave of \$39.88. (If one does not account for the demand reduction caused by NextWave's absence, the closing price would be \$33.60, a 16% drop from the actual auction.)

Figure 1. Demand for Spectrum in C-block Auction with and without NextWave



What if NextWave was still in the auction, but at a level reduced by one-third? In this case, I assume that the top-ten largest bidders reduce demand by between one-ninth and one-twelfth. This yields the dashed-line demand curve in Figure 1. In this case, the auction would end at a price of \$36.50, an 8% drop from the actual auction. However, as discussed below, this drop in prices would not occur uniformly across all markets. Rather, virtually all of the drop would occur in the small to medium-size markets that were targeted by Antigone and Devco.

Effect of Lower Prices on Auction Winnings of Antigone and Devco

The effects of lower prices on Antigone and Devco (or for any other bidder for that matter) are calculated from the individual demand curves for these bidders, as constructed in the prior section. Devco's demand curve has a single step. At a price level of \$32.72 per pop, Devco was willing to spend \$12.4 million (0.4 million pops). Antigone's demand curve has three steps. At a price level of \$30.05, Antigone was willing to spend \$60.1 million (2.0 million pops); at a price level of \$31.90, Antigone was willing to spend \$30.5 million (1.0 million pops); at a price level of \$35.16, Antigone was willing to spend \$25.0 million (0.7 million pops).

Antigone and Devco Winnings without NextWave

From these individual demand curves, we can determine the likely winnings of Antigone and Devco without NextWave in the auction. In this case, the auction ends at a price of \$30 per pop (25% lower). Antigone spends \$60.1 million for 2.0 million pops, and Devco spends \$12.4 million for 0.4 million pops. Even if NextWave's absence did not prompt any additional demand reduction, the auction would end at \$33.60 per pop, and Antigone would still spend \$25 million for 0.7 million pops. The spectrum quantities above assume that Antigone and Devco purchase licenses at prices per pop that are equal to the pop-

weighted average in the auction. Indeed, Antigone and Devco's bidding indicate preferences for the smaller markets, which had prices well below the pop-weighted auction average. Hence, the purchases of Antigone and Devco (in pops) are all underestimates.

Antigone and Devco Winnings with a Smaller NextWave

With NextWave reduced in scale by one-third to comply with foreign ownership restrictions, prices would fall to \$36.50, 8% less than in the actual auction. Based on the individual demand curves derived from the bidding behavior of Antigone and Devco, one might conclude that neither firm would be willing to purchase spectrum at these prices. However, this assumes that the spectrum is a homogeneous good and the bidders did not concentrate their bidding on particular types of markets. A detailed look at the bidding reveals that Antigone was pursuing a bidding strategy that was quite different from the strategy followed by NextWave and most of the other large bidders. These differences in strategy make it likely that Antigone would have won at least three Florida licenses in the case of a smaller NextWave.

Antigone's strategy was to go after several of the smaller markets. This strategy was consistent with the successful strategy pursued by several Antigone principals in cellular of developing markets that other firms thought were too small to be profitable. Although Antigone had a great deal of flexibility, bidding on 55 markets, by round 30 Antigone had settled down to just 8 markets. Tables 1 to 3 present all the bidding in these markets after Antigone placed its last bid in each market. (Table 4 presents all the bids in the single market Devco was still active in after round 30. From this table, I find it unlikely that Devco would have won any licenses with a small NextWave. However, it may be that Devco dropped out of the bidding early, because it correctly anticipated that prices would escalate too high as a result of NextWave's aggressive bidding. Hence, I cannot rule out the possibility that Devco would have won licenses with a small NextWave.)

In contrast, based upon a review of NextWave's actual bids and the trade press, NextWave's strategy was to win as many top-40 markets as possible. NextWave believed that these top-40 markets were key to creating a nationwide presence. Once this presence was secure, NextWave felt that it would be able to create alliances with the winners of the smaller markets neighboring the major markets. However, NextWave was severely budget constrained. In a letter to the Securities & Exchange Commission, on 3 February 1997, NextWave states, "the Company did not even have enough contingent Series B subscriptions to meet the FCC's 5% deposit requirement until shortly before the close of the C-block Auction." Despite the short cash, NextWave pursued this top-40 market strategy, so there is little reason to think that it would have changed this strategy with a one-third cut in budget. Rather NextWave would have refrained from bidding on the smaller markets, which it only began to bid on once its top markets were secure.

Table 5 shows the sum of NextWave's high bids, together with the sum of the high pops, for rounds 31 to 60. These rounds were selected, since it was during this critical period (during all of which Antigone was eligible to bid) that NextWave would have hit the two-thirds budget constraint. Tables 6 and 7 give all of NextWave's bids from rounds 31 to 60. From these tables, we see that NextWave did not start bidding on Antigone's smaller markets (and other markets directly substitutable for Antigone's smaller markets) until after NextWave exceeded its "two-thirds" budget. As a result, Antigone would not have faced competition from NextWave in the small Florida markets. Moreover, the other large bidders (DCR, GO, GWI, PCS2000, and BDPCS) would have been extremely unlikely to

enter these markets, because a small NextWave would have left open some more desirable (i.e., larger) markets for these bidders.

Table 8 summarizes the activity on the 8 markets that Antigone bid on after round 30. It lists Antigone's final bid in each market and the round in which it was placed. It also lists the winning bid, the winning bidder, and the round in which the winning bid was placed. Finally, it lists the other bidders that bid in each market after Antigone's final bid. The markets are sorted based on my estimate of the likelihood that Antigone would have won the market if NextWave were two-thirds its actual size. I find it quite likely that Antigone would win the first three Florida markets: Ft. Pierce, Melbourne, and West Palm Beach. In each of these markets, Antigone stayed in until the price reached a level close to the final price. Moreover, in each case, a few large bidders caused the subsequent price rise. These large bidders would not have entered these markets, because with a small NextWave there would have been other more attractive markets available. The next two markets (Kansas City and Sarasota) Antigone might win with a small NextWave, but the other competition was sufficiently great and Antigone's interest was sufficiently weak that I do not believe it is likely that Antigone would have won these markets. In the final three markets (Las Vegas, Indianapolis, and Santa Barbara), I believe that it is unlikely that Antigone would have won these markets. In each case the competition was intense for these markets, even with a smaller NextWave.

Conclusion

I find that NextWave's participation in the C-block auction had a substantial impact on auction prices. Without NextWave, the C-block auction would have ended with prices about 25% below the actual prices. These lower prices would have meant that both Antigone and Devco would have significant winnings. In particular, I estimate that Antigone would have won at least 2.0 million pops and Devco would have won at least 0.4 million pops.

I find that if NextWave did participate in the C-block auction, but at a level reduced by one-third, so that they would conform with the foreign ownership rules during the auction, then prices in the C-block auction would have been about 8% lower. Based on a detailed analysis of NextWave's and Antigone's bidding, I estimate that Antigone would have won three markets covering 1.6 million pops in this case.

I find the argument that Antigone and Devco were not harmed by NextWave's participation, because they were not the second highest bidder in any of the markets that NextWave won, to be totally without merit. Such an argument only applies in an ascending-bid auction for a single item. The C-block auction was not a single-item auction. Rather, I find that both Antigone and Devco were substantially injured by the high auction prices that resulted from NextWave's high level of participation -- funded by its unlawful foreign equity.

I declare under penalty of perjury that all statements of fact made herein and not subject to official notice are true and correct, and that all opinions set forth herein are true and correct to the best of my belief and knowledge.

Executed this 11th day of March 1997.

References

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