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The Digital TV Transition: A Chance to Enhance Public Safety and Improve Spectrum Auctions

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In 1996, Congress gave American broadcasters spectrum for digital television. Congress imposed a nominal deadline of December 2006 when broadcasters would cease analog transmissions and relinquish spectrum. However, this deadline applies only where 85% of households have televisions that can receive digital signals. That goal seems as far away today as it did in 1996, leaving American television trapped in a costly limbo. Broadcasters operate both analog and digital systems, and occupy vast amounts of precious spectrum. Meanwhile, few TV viewers see a difference. Consensus has recently emerged in Congress to push the transition forward, although opinions differ on specifics.

The transition could bring needed spectrum to public safety, licensed carriers, and unlicensed wireless devices. It was painfully clear after the 9/11 terrorist attacks and many other incidents that improving America's public safety communications would save lives [1,2]. 24 MHz of TV spectrum have already been allocated for public safety. Many in Congress also want to auction TV spectrum. This raises money, and benefits auction-winners and their customers.

This paper addresses some controversial aspects of the transition. First, it argues that some spectrum should be reserved for a nationwide broadband public-safety system. Second, Congress should not delay the transition. Third, spectrum auction-winners should make annual rather than one-time payments. This protects against unnecessary delays, and promotes efficiency and competition.

Congress' Role as Catalyst

The digital TV transition stalled because nobody wants to move first. Unless forced, broadcasters have little incentive to produce or transmit digital content until many consumers have digital TVs. Consumers have little incentive to buy digital TVs until all content is available digitally, and digital TVs are inexpensive. Manufacturers will not produce inexpensive digital TVs until many consumers buy digital. Many in Congress have correctly concluded that a fixed transition date can break this impasse. The most popular dates are December 2008 and April 2009, but some Senators want earlier dates.

The transition will not affect cable TV viewers, but today's televisions need converters to receive over-the-air digital broadcasts. Using spectrum auction proceeds, Congress will probably give consumers vouchers toward the purchase of converters. It's reasonable that auction-winners pay most converter costs. However, if consumers pay nothing, many would demand converters unnecessarily for TVs with cable connections. Thus, advocates of large vouchers should put contingencies into the law in case converter prices fall below voucher values.

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Setting the (Wrong) Date

Why wait until 2009? The common justification was stated by a Senate Commerce Committee spokeswoman: “as far as raising money from spectrum sales, the later the date, the better.” [3] The Senators’ desire to reduce the American budget deficit is laudable, but even if one ignores important non-economic concerns like public safety, the costs of delay are enormous. Manipulating availability of a scarce resource can increase revenues, as the Organization of Petroleum Exporting Countries (OPEC) demonstrated when it created the debilitating oil shortage of the 1970s. Similarly, Congress could increase revenues by unnecessarily delaying spectrum availability in some circumstances, or making spectrum available too early [4] in others. However, while cartels like OPEC can disregard economic devastation to consumers, Congress should care about citizens.

Idle spectrum can waste billions of dollars [5,6]. A company bids a specific amount for spectrum only when the profit that spectrum would bring exceeds the profit available by investing elsewhere. Thus, bids reflect projected profits. Bids do not reflect benefits to consumers when new services such as 3G cellular become available, or old services become more plentiful and therefore less expensive. After all, new spectrum allows cellular carriers to greatly increase capacity without erecting costly towers. Some economists believe benefits to cellular consumers (consumer surplus) exceed carrier profits by an order of magnitude or more [6,7]. Thus, each dollar of auction revenue signifies over \$10 in consumers benefits. If winning bids reflect projected 10-year profits, each year of delay deprives consumers of benefits comparable to *total* auction revenues - an appallingly inefficient hidden tax.

Even if Congress cares only about filling government coffers, delaying this particular auction is probably counterproductive. Given the Congressional Budget Office’s (CBO) estimated \$10 billion in auction revenues, each year’s delay may generate hundreds of millions of dollars at most. Receiving money sooner is like getting an interest-free loan. If applied to the national debt at 4.8% interest, auction revenues of \$10 billion next year are equivalent to \$9.5 billion today. Moreover, putting spectrum in use creates economic activity which generates taxes that are ignored when focusing on auction revenues. In 2004, cellular carriers paid \$5.7 billion in federal sales tax and universal service fund contributions (plus \$11.5 billion in state and local taxes) [8]. Billions more went for social security and federal income taxes on the wages of over 500 thousand employees [8]. This large increase in spectrum would increase these federal revenues.

The best argument for delay is to purchase fewer converters. Americans bought roughly twenty million TVs in 2004. If they replace five million existing TVs next year that would otherwise require \$60 converters (because they are not connected to cable networks), then one year of delay saves only \$300 million.

Improving Spectrum Auctions

Proposals to withhold TV spectrum are symptomatic of a larger problem. Today, auction-winners make one payment. Instead, an auction-winner should make annual payments equal to its winning bid, as proposed in [4].

This policy better aligns the objective of using spectrum effectively with the objective of balancing the federal budget. Delaying auctions would raise money only when an earlier auction disrupts ongoing activities. Also, auctions would yield an ongoing revenue stream, ending the dangerous and unsustainable practice of using one-time windfalls to cover annual expenditures. Finally, this change

reduces today's unfortunate bias against unlicensed spectrum. Unlicensed bands generate significant economic activity by enabling applications like wifi and cordless phones, but no large one-time payments.

This policy also promotes spectrum efficiency and fair competition. Annual spectrum payments promote efficiency by encouraging license-holders who no longer derive much value from the spectrum to surrender licenses [4]. This spectrum can be put to better use. Reducing initial license costs allows more small businesses to participate in auctions, thereby increasing competition. There is one challenge: spectrum must be reclaimed promptly after bankruptcies.

A Broadband Public Safety Network

Even with 24 MHz of additional spectrum, some people predict a public safety spectrum shortage by 2010. Politically fragmented regions generally fare even worse [9]. Nevertheless, much of today's public safety spectrum is wasted [2,9]. Similar inefficiencies are likely in any new allocation unless Congress acts. The biggest problem is that critical decisions are made by thousands of independent local public safety agencies, preventing adoption of efficient regional designs. This also greatly increases costs [9]. Moreover, valuable advanced services such as broadband data and location tracking [10] have been slow to emerge.

Congress should reserve at least 12 of public safety's 24 MHz for a nationwide wireless network that provides broadband services to all designated local, state, and federal public safety organizations. A system designed for national deployment with appropriate fault tolerance will be more spectrally efficient, more dependable, and far less expensive. There will be no interoperability problems. The technology should be based on open standards similar to those used commercially. The resulting competition will reduce equipment costs. Moreover, it will be easier to design mobile devices that can use public safety networks or commercial cellular systems - whatever is standing after a disaster.

Congress should fund infrastructure, while local governments purchase mobile devices. Congress could set aside any proceeds from the TV spectrum auction that exceed CBO's estimates. This will not affect budget projections, and it could generate sufficient funding.

If policy-makers conclude that 24 MHz will be insufficient for public safety, this is an opportunity to act. Rather than removing more spectrum from its current use and dedicating it to public safety, Congress could give public safety preemptive access to some of the spectrum that will be auctioned, but only during unusually serious emergencies [2]. Peak public safety needs are great, but needs are usually small [11]. Spectrum-sharing maximizes benefits to public safety while minimizing impact on others. A disadvantage is that sharing rules must be clearly defined before any auction; this would take time.

Conclusions

The digital TV transition brings extraordinary opportunities. Rarely does so much prime spectrum become available. Congress should insure this resource is used effectively. A nationwide broadband network for public safety will provide new capabilities, and be more spectrally efficient, more dependable, and less costly than today's chaotic assortment of local systems. Congress can achieve this by reserving spectrum, and allocating auction proceeds that exceed CBO projections.

The transition should occur as soon as possible. This benefits public safety, and consumers of wireless products and services. Moreover, attempts to balance the budget by sacrificing these benefits may backfire.

More importantly, we should learn from this delay debate. When reauthorizing the Federal Communication Commission's authority to auction spectrum, Congress should require auction-winners to pay annual fees instead of one-time payments. This benefits small businesses, and promotes spectrum efficiency. It also better aligns the objectives of managing spectrum with the objective of balancing budgets, reducing the chances of delaying future auctions unnecessarily.

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