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Spectrum Use and the Transition to Digital TV

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Summary

The United States, like most of the world, is moving to replace current television technology with a new, technically superior format generally referred to as digital television (DTV). As part of this transition, Congress is seeking to provide the impetus that would move television broadcasters out of 700 MHz spectrum currently in use for the old, analog technology — thereby ending these broadcasts. Channels at 700 MHz would subsequently be available for other uses. Both public safety communications networks and commercial advanced wireless service companies are eager to have access to frequencies already designated for their use but not released. Other frequencies in the 700MHz band — so far unallocated — could, for example, be assigned for additional public safety use, for licenses for advanced wireless services (auctionable for revenue to the Treasury), or for unlicensed (free) uses that might include wireless services such as Wi-Fi (wireless fidelity). Congress, therefore, is also considering aspects of spectrum policy as part of the transition process. In addition, Congress has passed a budget resolution (H.Con.Res. 95) that anticipates auctioning some of the cleared spectrum to provide $4.8 billion toward closing the budget gap, as part of Budget Resolution.

Bills introduced thus far in the 109th Congress dealing with the transition to digital television and spectrum use include H.R. 1646 (Representative Harman), S. 1268 (Senator McCain), and S. 1600 (Senator Snowe). This report will be updated.

The Scope of the Debate[1]

A band of radio frequency channels at 700 MHz[2] could be released for new uses by 2009. Broadcasters that are currently using these channels for analog-technology television are to vacate them as they switch to digital technology. By the end of FY2010, Congressional policymakers would like to allocate $4.8 billion in anticipated revenue

[1] Based on material presented in CRS Report RL32622, *Public Safety, Interoperability and the Shift to Digital Televison*.

[2] Wireless (radio frequency) spectrum is measured in cycles per second, or hertz (Hz). Standard abbreviations for measuring frequencies include kHz — kilohertz or thousands of hertz; MHz — megahertz, or millions of hertz; and GHz — gigahertz, or billions of hertz. Spectrum allocations are assigned within bands that are divided into bandwidths or channels.

from 700 MHz auctions, to apply toward meeting a Budget Resolution to reduce the federal deficit.[3] At issue is how to maximize the amount of 700 MHz spectrum available in a timely manner while minimizing the cost and inconvenience to TV-viewers and the television industry that might result from the switch to digital television (DTV). Advocates for an early date for the release of spectrum include the public safety community and companies that want to press forward with plans for commercial wireless services. Communications managers for public safety are waiting to build new networks on channels at 700 MHz that have been assigned to them but not vacated by broadcasters. Companies that have purchased the few channels made available for auction in 2002 would like to move forward with new services; this group is represented by The 700 MHz Advancement Coalition.[4] Another industry group urging the early release of spectrum is the High Tech DTV Coalition.[5] Members would like to use frequencies at 700 MHZ to deploy new technologies, such as WiMAX (Worldwide Interoperability for Microwave Access), that support high-speed Internet access and new services such as DTV to wireless devices.

Television broadcasters and consumer groups are also concerned about the timing of the DTV transition. Their position is that the crucial public policy concern is the protection of consumer access to free, over-the-air televison programs. For example, the Consumers Union and the Consumer Federation of America are urging Congress to identify "the level of compensation necessary to hold customers harmless from the congressionally mandated transition to digital television."[6] These groups are among those that are pressing for a subsidy to cover the purchase of converter boxes. The amount of subsidies, if any, and who would be eligible to receive them, have been the subject of significant debate.[7] Other groups with a stake in how the DTV transition is handled include cable and satellite television companies — that must upgrade or purchase equipment to handle the new technology, and electronics manufacturers and merchants — that must make and distribute digital tuners. Based on Congressional testimony,[8] certainty of a date for the transition is key; concerns about the timing of the transition are centered on the need for adequate lead times to prepare.

Setting a Hard Date

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[3] For the House Committee on Energy and Commerce, the commitment could be $14,734,000,000 for fiscal years 2006 through 2010; H. Con. Res 95, Concurrent Resolution on the Budget for Fiscal Year 2006, Title II, Sec. 201 (a) (2) (C). Reportedly the House would use $4.8 billion of spectrum auction revenue to help meet this goal, see, for example, "DTV Bill to be Subsumed in Budget Bill," Communications Daily, July 8, 2005.

[4] See [http://www.700MHz.org/]. Viewed July 13, 2005.

[5] Formed April 2005. Members include Alcatel, Aloha Partners, AT&T, Dell, Cisco Systems, IBM, Intel, Microsoft, Qualcomm, Texas Instruments and a number of associations. Source: Press Kit, High Tech DTV Coalition, April 27, 2005.

[6] *Estimating Consumer Costs of a Federally-Mandated Digital TV Transition; consumer survey results*, Consumers Union and Consumer Federation of America, page 1.

[7] "House Leadership Concern over Subsidy Slows Barton DTV Bill," Communications Daily, June 16, 2005.

[8] "Digital Television Transition," Senate, Committee on Commerce, Science and Transportation, July 12, 2005.

Figure 1 provides a *hypothetical* time line, based on Senate testimony,[9] of possible start dates for different elements of the transition. The projected dates deal with technological as opposed to administrative hurdles. Some of the possible start dates for supplying converter boxes in quantity appear on the time line, for example, but the administrative decision by the FCC to choose a 2007 deadline for channel selection does not. Note that other experts might provide different dates for achievable milestones.

Most of the dates on the time line are based on the assumption that Congress will pass a bill that would be signed into law on October 1, 2005. This gives the hypothetical "go" that would start the transition process and the release of spectrum. The time line could extend as far out as June 2009, roughly the last possible date by which 700 MHz spectrum auction proceeds might be used to help close the budget deficit by the deadline established by H.Con.Res. 95. Note that the time line does not include specific hard dates for freeing spectrum. A hard date, or more than one hard date — if a "staggered rollout" is used[10] — would presumably occur within the time line.

Within the construct of the *hypothetical* time line below — administrative and cost issues aside — Congress could set a hard date as early as March 31, 2007 to end TV broadcasts on analog channels. Congress could also set a hard date for later than 2009 but the value of still-encumbered spectrum might be discounted by the market if the spectrum is auctioned too far in advance of its release. Another possibility would be to phase in the transition to DTV, freeing public safety channels and some of the adjacent commercial channels[11] (that could be auctioned) at an early date and the remainder in mid-2009, a later date that has been proposed in discussions.[12] As suggested in the testimony of one Senate witness,[13] this might mean that the per-unit cost of converters would be higher for the initial rollout, but the numbers eligible to receive converters might be lower in the long term.[14] Another approach under discussion would be a multi-phase transition and auction process. The first phase would entail the release of spectrum for areas where public safety

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[9] Oral testimony by panelists regarding time needed to meet certain requirements, Senate Hearing, July 12, 2004. This information was reconfirmed by telephone by CRS on July 13, 2005.

[10] As suggested in testimony of Michael Calabrese, Senate Hearing, July 12, 2005.

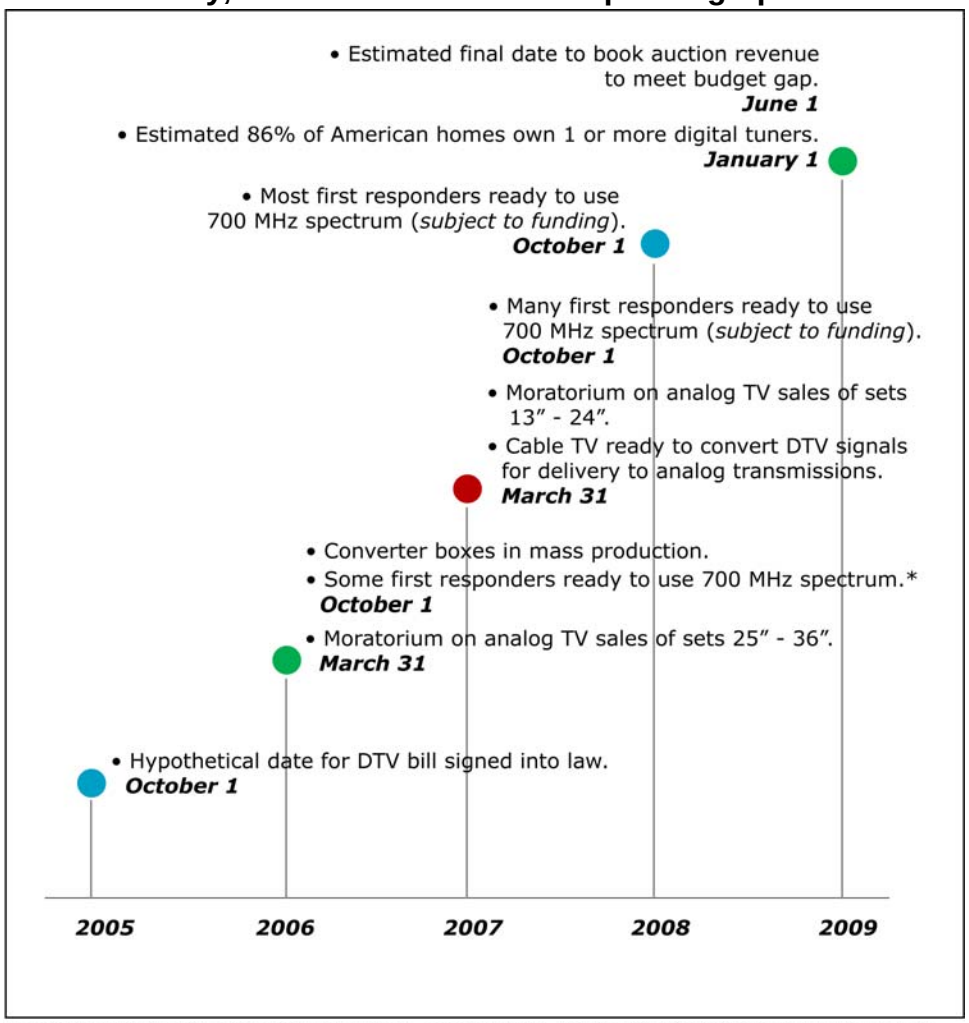
[11] Because of interference with transmissions, some commercial channels adjacent to the frequencies going to public safety would have to be cleared at the same time.

[12] "Sen. Stevens Likely to Differ From House Leaders Subsidy," by Drew Clark, Technology Daily PM, July 12, 2005.

[13] Testimony of Michael Calabrese, Senate Hearing July 12, 2005.

[14] In testimony, Gary Grube, Senate Hearing July 12, 2005 identified 75 stations that were effectively blocking access to 700 MHz channels for public safety. This suggests that no more than 75 communities across the nation would be affected, although some of them, such as Los Angeles, are densely populated.

Figure 1. Hypothetical Time Line for Technological Milestones in DTV Transition Based on Start Date for Legislative Certainty, Not Hard Date for Relinquishing Spectrum



* Testimony of Mike Kennedy, Senate Hearing, July 12, 2005. Mr. Kennedy testified that there is already in place an imbedded base of interoperable radios working on 700 MHz and 800 MHz. On further inquiry, it was confirmed that states that have approved plans for using 700 MHz could obtain and install the remaining infrastructure (antennas, computers, etc.) within one budget cycle of approximately one year. Note that Washington, D.C. is using 700 MHz frequencies in a special program for emergency communications and interoperability.

Source: Based on Oral Testimony from Panelists, Senate Hearing, July 12, 2005.

has 700 MHZ plans approved and could therefore move promptly to put systems in place.[15] Some spectrum might be available for auction at that time. A second and possibly a third phase would release the remaining spectrum for designated uses and auction. Such an approach could increase or decrease revenue, depending on market demand and expectations; also, the FCC deducts the costs of administering auctions from gross sales revenue. For TV-viewers, there may be benefits in a managed conversion conducted at the local level instead of nationwide. Subsidy programs, as needed, could

[15] Regional plans and maps for public safety use of 700 MHz are available at [http://wireless.fcc.gov/publicsafety/700MHz/plans.html] and from state chairmen of the planning committees. Viewed July 15, 2005.

be developed to meet local needs. In the United Kingdom, a phased approach over a four-year period (2008-2012) has been favored,[16] with preliminary trials underway in several markets. The transition is to be handled by a private company, SwitchCo.[17]

Spectrum Allocation and Auctions

Although estimates vary, spectrum auctions of frequencies in the 700 MHz band have typically been projected to gross $20 billion to $30 billion.[18] Revenue potential is dependent on a number of factors, including timing of auctions and the date at which spectrum will be cleared and available. The Congressional Budget Office has reportedly set a benchmark estimate of $10 billion in revenue from auction of this spectrum.[19]

Many of the estimates for the amount of revenue raised from spectrum auctions assume that 60 MHz of prime spectrum will be auctioned, with all channels available. Other proposals have been made that would reduce the amount of spectrum auctioned, in which case the revenue, all things being equal, would presumably be less. Congress has asked the FCC to study the provision of additional spectrum for public safety, possibly from the 700MHz band.[20] There are also many who advocate that some portion of the freed spectrum be unlicensed.[21] These recommendations are based on policies that support public safety and accessible wireless technology, but such actions might substantially reduce the revenue that is predicted from freeing the analog broadcast channels. There are also proposals to use spectrum auctions to fund specific programs.[22]

A significant factor in valuing spectrum is the size of the market served. Usually this value is expressed in terms of dollars per MHz-Population. Using this methodology, a value of $1.65 per MHz-Population, for example, yields a potential value of $28 billion for 60 MHz of spectrum at 700 MHz. Dollar per MHz-Population estimates for upcoming auctions are derived from results of earlier auctions for similar spectrum. This estimated value is then typically increased or decreased depending on assumptions about a number of variables. The different weight that analysts give to the impact of hard-to-

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[16] Report of the Digital Television Project, press statement by the Secretary of State for Culture, Media and Sport, March 23, 2005 at [http://www.digitaltelevision.gov.uk/publications/pub_dtv_project_report.html]. Viewed August 3, 2005.

[17] Details about DTV planning in the UK are available at the Digital Television Project website at [http://www.digitaltelevision.gov.uk/dtv_project/project_details_home.html]. Viewed August 3, 2005.

[18] "Analysis of an Accelerated Digital Television Transition," page 6.

[19] "Estimates Vary on Value of Spectrum," by Drew Clark, Technology Daily, August 2, 2005.

[20] P.L. 108-458, Title VII, Subtitle E, Sec. 7502 (a). Due December 2005.

[21] For example, Gene Kimmelman of the Consumers Union has reportedly confirmed that consumer groups "would not support the establishment of a firm deadline unless Congress funds converter boxes and makes spectrum available for unlicensed service and new entrants." Source: "Consumer Groups Urge Protection for 70M TV Viewers," Telecommunications Reports, July 15, 2005.

[22] For additional information, see CRS Report RS21508, *Spectrum Management and Special Funds*.

measure market conditions largely explains the wide range of valuations predicted for 700 MHz auctions. For example, poor economic conditions may depress all markets and put downward pressure on prices for spectrum, just as an exuberant market — eager to implement new technology — may place an unusually high value on obtaining new licenses. The usability of spectrum is an important factor as well. There is a disincentive to invest in a non-performing asset, such as spectrum that is blocked by other users, or spectrum that doesn't serve an immediate market because new technology isn't ready for deployment. In the case of spectrum at 700 MHz, the general opinion is that there is significant risk that the spectrum will remain encumbered, despite hard dates, thereby tying up resources indefinitely and hampering investment in new communications technologies and services. As presently configured, 874 licenses in 60 MHz would be available for auction. Of these, 280 licenses are considered encumbered by television broadcast stations.[23] A majority of analysts believe that selling these frequencies, most of which serve lucrative markets, before they have been cleared or are irrevocably scheduled to be cleared will lower the value in an auction.[24]

No matter what the timing of the auctions, it appears that any subsidy program that is likely to be authorized would have to be funded before the spectrum is cleared.[25] If auction funds are used to pay for subsidizing the transition, that money would probably only be available if the spectrum is sold while still encumbered. In preparing to fund a transition program (distributing converter boxes, or other measures), Congress could follow the precedent set by the Spectrum Enhancement Act (P.L. 108-494) and specify that spectrum sales must raise sufficient funds to cover projected costs and obligations associated with any transition plan.[26]

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[23] 700 MHz Advancement Coalition at [http://www.700MHz.org/700_MHz_band.htm]. Viewed July 13, 2005.

[24] As an example of this reasoning, the Congressional Budget Office estimated that companies bidding for encumbered spectrum in the 1710-1755 MHz band (auction now tentatively scheduled for June 2006) would "discount their bids by about $2 billion to $3 billion because of the uncertainty associated with the time and cost of relocating federal and commercial users." (House Report 108-137 - Commercial Spectrum Enhancement Act.) Note that this formula cannot be directly applied to spectrum at 700 MHz because of significantly different market conditions, a different climate of certainty, and different levels of actual encumbrance.

[25] S. 1268, for example, would require the auction process to be concluded at least six months before the hard date for clearing spectrum.

[26] The Commercial Spectrum Enhancement Act creates a trust fund to hold auction proceeds that will then be disbursed to government agencies to cover the costs of vacating the auctioned spectrum; see CRS Report RS21508, *Spectrum Management and Special Funds*. Another recent example of band clearing and relocation is exemplified by the FCC agreement with Sprint Nextel; see CRS Report RL32408, *Spectrum Policy: Public Safety and Wireless Communications Interference*. In this instance, Sprint Nextel has taken on the obligation of paying for at least some of the costs of relocation. Following this model, broadcasters could be required to contribute to a transition fund based on the value of new spectrum received in trade.