

**GAO**

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Telecommunications and the Internet

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**DIGITAL TELEVISION  
TRANSITION**

**Preliminary Information on  
Progress of the DTV  
Transition**

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Physical Infrastructure





Highlights of [GAO-08-191T](#), a testimony before the House Subcommittee on Telecommunications and the Internet

## Why GAO Did This Study

On February 17, 2009, federal law requires all full-power television stations in the United States to cease analog broadcasting, enabling the government to reclaim valuable spectrum that broadcasters currently use for analog broadcasts. This change, often referred to as the digital television (DTV) transition, requires action by broadcasters and consumers to ensure broadcast television signals are still available and viewable. Federal law also requires the National Telecommunications and Information Administration (NTIA) to create a program that subsidizes consumers' purchases of digital-to-analog converter boxes. This testimony provides preliminary information on (1) the progress made by federal entities, and others, to facilitate the transition, (2) the progress made in educating consumers about the transition, (3) the progress made in implementing the converter box subsidy program, (4) technical issues surrounding the transition, and (5) future GAO work on the progress of the DTV transition. GAO interviewed officials with the Federal Communications Commission (FCC) and NTIA. Further, GAO interviewed a wide variety of industry and other stakeholders involved with the transition, including members of the DTV Transition Coalition—a group of public and private stakeholders, and experts on strategic communications. GAO discussed this testimony with FCC and NTIA officials and incorporated their comments.

To view the full product, including the scope and methodology, click on [GAO-08-191T](#). For more information, contact Mark L. Goldstein at (202) 512-2834 or [goldsteinm@gao.gov](mailto:goldsteinm@gao.gov).

## DIGITAL TELEVISION TRANSITION

### Preliminary Information on Progress of the DTV Transition

#### What GAO Found

FCC and NTIA, in conjunction with other stakeholders, have taken steps to facilitate the DTV transition. For example, FCC has conducted periodic reviews to report on transition progress, and NTIA has issued a contract for administering the converter box subsidy program. In addition, private sector industries have also begun preparing for the transition. Despite public-private sector interaction designed to help facilitate the transition, we found that no comprehensive plan exists for the DTV transition. Without such a plan, meaningful guidance for coordinating responsibilities and measuring progress might not be available to the private or public sector.

Several federal and private stakeholders have begun consumer education campaigns. FCC and NTIA have developed informational materials and begun direct outreach to consumer groups. In addition, private industry stakeholders created the DTV Transition Coalition and are voluntarily conducting outreach efforts. However, these efforts are in the planning stages and challenges remain. An expert panel that GAO convened identified potential challenges and key practices for a consumer education campaign.

NTIA has made progress in implementing the converter box subsidy program, but the program's outcome depends on the voluntary participation of retailers and manufacturers. Retailers we contacted expressed concerns about the possibility of a redemption system that would affect their point-of-sale systems and stated they would need more information on IBM's technical solution before they could assess the impact on their systems and whether it would affect their participation. With limited or delayed retailer participation, consumers might face difficulties in redeeming their coupons for eligible converter boxes.

Most television stations already transmit a digital signal, but technical and coordination issues, such as antenna replacement and tower construction, may present challenges for broadcasters. In addition, cable and satellite television providers must coordinate with broadcasters to ensure that they can continue to receive and transmit the digital broadcast signals. Further, certain stations that retransmit the television signals, known as translator stations, are not required to cease analog broadcasting. These stations may choose to retransmit a digital signal, or they may convert the digital signal to analog and continue to broadcast in analog after February 2009.

We plan on reporting on the progress of the DTV transition, including the status of consumer education and awareness about the DTV transition, IBM and NTIA's administration of the converter box subsidy program, and industry technical preparations throughout the upcoming transition period. We will continue to monitor government and industry consumer education efforts and plan to analyze the efforts compared with key practices for consumer outreach. In addition, we plan to survey broadcasters on the technical issues that must be addressed prior to the DTV transition date.

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Mr. Chairman and Members of the Subcommittee:

I am pleased to be here today to report on our work on the progress made in the nation's transition to digital television (DTV). We have a detailed report on public and private sector efforts underway to implement the transition that will be issued in November 2007. The findings that I am reporting to the Subcommittee today are based on our draft report and are therefore preliminary.

A primary goal of the DTV transition is for the federal government to reclaim spectrum<sup>1</sup> that broadcasters currently use to provide analog television signals. The spectrum that the federal government will reclaim at the end of the transition is considered highly valuable because of its particular technical properties. In all, the DTV transition will free up 108 megahertz (MHz) of spectrum. The Federal Communications Commission (FCC) has reallocated 24 MHz of the spectrum that will be recovered for public safety purposes, which became a higher priority following the terrorist attacks of September 11, 2001. FCC will auction the remaining spectrum for commercial purposes, with the resulting proceeds allocated for, among other things, reducing the federal deficit.

The Digital Television Transition and Public Safety Act of 2005 mandates the cessation of analog television broadcast signals on February 17, 2009. After that date, households who view television on analog sets solely through the reception of over-the-air signals must take action to ensure that they have the necessary equipment, such as a digital-to-analog converter box, or subscription video service to be able to view the digital broadcast signals. If they do not take such action, they will lose the ability to view the digital signals on their analog sets; i.e., they will not be able to watch television programs. The act also directed the National Telecommunications and Information Administration (NTIA) to establish a \$1.5 billion program through which households can obtain coupons for the purchase of digital-to-analog converter boxes. NTIA issued a final rule that adopted regulations to implement the converter box subsidy program, and in August 2007, selected IBM Corporation (IBM) to administer the

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<sup>1</sup>The radiofrequency spectrum is the part of the natural spectrum of electromagnetic radiation lying below 300 gigahertz. It is the medium that makes possible wireless communications, including cellular and paging services, radio and television broadcasting, radar, and satellite-based services.

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program. Beginning January 1, 2008, households can request up to two \$40 coupons toward the purchase of eligible<sup>2</sup> digital-to-analog converter boxes.

Although it is unclear what percentage of households who rely exclusively on over-the-air broadcasts have analog sets, potentially millions of those households stand to be left without any television service unless they take action. To help the public understand the DTV transition and the various options they have, consumer education and awareness programs are underway and additional programs are being planned.

My testimony today will focus on progress made in the DTV transition. In particular, I will discuss (1) the progress made by federal entities, in conjunction with other stakeholders, in facilitating the transition, (2) the progress made in educating consumers about the transition and any related challenges, (3) the progress made in implementing a subsidy program for converter boxes and any related challenges, (4) the technical issues facing the broadcast industry in meeting the transition, and (5) future work on the progress of the DTV transition that we plan to undertake.

To meet these objectives, we reviewed government documents and interviewed officials with FCC and NTIA, the steering committee members of the Digital Television Transition Coalition, as well as a wide variety of industry and other private stakeholders, such as broadcasters, satellite television providers, cable companies, manufacturers, retailers, industry associations, and consumer advocacy groups. Further, we consulted strategic communications experts representing public, private, and academic organizations to identify potential challenges that might obstruct consumer education efforts, as well as key practices for consumer outreach campaigns. We reviewed FCC and NTIA rules and proposed rule-makings related to the digital television transition, and the comments they received in response to the proposed rule-makings. Finally, we reviewed NTIA's request for proposals for administering the converter box subsidy program, and related contract documents. We performed our review from January 2007 through October 2007 in accordance with generally accepted government auditing standards. We discussed this testimony with FCC and NTIA officials and incorporated their comments where appropriate.

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<sup>2</sup>NTIA established technical and performance specifications that converter boxes must meet to be eligible for the coupon program.

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## In summary:

- FCC and NTIA, in conjunction with other stakeholders, have taken steps to facilitate the DTV transition. For example, FCC has conducted periodic reviews to report on transition progress, and NTIA has issued a contract for administering the converter box subsidy program. In addition, private sector industries have also begun preparing for the transition. Despite public-private sector interaction designed to help facilitate the transition, we found that no comprehensive plan exists for the DTV transition. Without such a plan, meaningful guidance for coordinating responsibilities and measuring progress might not be available to the private or public sector.
- Several federal and private stakeholders have begun consumer education campaigns, with both independent and coordinated efforts underway. FCC and NTIA have developed informational materials and begun direct outreach to consumer groups. In addition, private industry stakeholders created the DTV Transition Coalition and are voluntarily conducting outreach efforts. However, these efforts are in the planning stages, and challenges remain. An expert panel that we convened identified potential challenges and key practices for a consumer education campaign, such as defining goals and objectives and establishing metrics to measure success.
- NTIA has made progress in implementing the converter box subsidy program, but the program's outcome depends on the voluntary participation of retailers and manufacturers. Retailers we contacted expressed concerns about the possibility of a redemption system that would affect their point-of-sale systems and stated they would need more information on IBM's technical solution before they could assess the impact on their systems and whether it would affect their participation. With limited or delayed retailer participation, consumers might face difficulties in redeeming their coupons for eligible converter boxes.
- Although most television stations already transmit a digital signal, technical and coordination issues, such as antenna replacement and tower construction, may present challenges for broadcasters in preparing for the DTV transition. In addition, cable and satellite television providers must coordinate with broadcasters to ensure that they can continue to receive and transmit the digital broadcast signals after the transition. Further, select stations that retransmit television signals, known as translator stations, are not required to cease analog

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broadcasting.<sup>3</sup> These stations may choose to retransmit a digital signal, or they may convert the digital signal to analog and continue to broadcast in analog after February 2009.

- We plan on reporting on the progress of the DTV transition, including public and private efforts in facilitating the transition, the status of consumer education and awareness about the DTV transition, IBM and NTIA's administration of the converter box subsidy program, and industry technical preparations throughout the upcoming transition period. For example, we will continue to monitor consumer education programs and plan to conduct a series of consumer surveys throughout the year prior to the transition date. The surveys we conduct will be aimed at determining the population that will be affected by the DTV transition and public awareness of the transition. Throughout the transition process, we will continue to monitor government and industry consumer education efforts and analyze the efforts compared with key practices for consumer outreach. In addition, we plan to survey broadcasters on the technical issues that must be addressed prior to the DTV transition date.

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## Background

The DTV transition will enable the government to allocate valuable spectrum from analog broadcast to public safety and other purposes. Further, digital transmission of television signals provides several advantages compared to analog transmission, such as enabling better quality picture and sound reception as well as using the radiofrequency spectrum more efficiently than analog transmission. With traditional analog technology, pictures and sounds are converted into "waveform" electrical signals for transmission through the radiofrequency spectrum, while digital technology converts these pictures and sounds into a stream of digits consisting of zeros and ones for transmission.

The Digital Television Transition and Public Safety Act of 2005 addresses the responsibilities of two federal agencies—FCC and NTIA—related to the DTV transition. The act directs FCC to require full-power television stations to cease analog broadcasting on February 17, 2009. While full-power television stations are required to terminate their analog signals, this deadline does not apply to translator television stations. Translator stations receive a signal from a television station and simultaneously

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<sup>3</sup>There are approximately 5,000 translator stations throughout the U.S., most of which operate in the mountainous western regions of the country.

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retransmit the signal on another channel. These stations are intended to provide service to areas where direct reception of full-service broadcast stations is unsatisfactory because of distance or terrain obstructions, such as in mountainous regions.

As we have previously reported, households with analog televisions that rely solely on over-the-air television signals received through a rooftop antenna or indoor antenna must take action to be able to view digital broadcast signals after the termination of analog broadcasts. Options available to these households include (1) purchasing a digital television set that includes a tuner capable of receiving, processing, and displaying a digital signal; (2) purchasing a digital-to-analog converter box, which converts the digital broadcast signals to analog so they can be viewed on an existing analog set; or (3) subscribing to a cable, satellite, or other service to eliminate the need to acquire a digital-to-analog converter box. The act also directed NTIA to establish a \$1.5 billion subsidy program through which households can obtain coupons toward the purchase of digital-to-analog converter boxes. The last day for consumers to request coupons is March 31, 2009, and coupons will be redeemed through July 9, 2009. As required by law, all coupons expire 90 days after issuance. Consumers can redeem their coupons at participating retailers (both “brick and mortar” and online) for eligible converter boxes.

To help inform consumers about the transition, in February 2007, eight private sector organizations launched the Digital Television Transition Coalition. These eight organizations are the Association for Maximum Service Television, Association of Public Television Stations, Consumer Electronics Association, Consumer Electronic Retailers Coalition, Leadership Conference on Civil Rights, LG Electronics, National Association of Broadcasters, and the National Cable and Telecommunications Association. These founding organizations comprise the Coalition’s steering committee and make decisions on behalf of the Coalition. To better represent the interests of at risk or underserved populations—such as the elderly—AARP later joined the steering committee. The Coalition’s mission is to ensure that no consumer is left without broadcast television due to a lack of information about the

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transition. Currently, the Coalition has over 160 member organizations comprised of business, trade, and industry groups, as well as FCC.<sup>4</sup>

Recent surveys conducted by industry trade associations indicate that consumer awareness of the digital transition is low. The Association for Public Television Stations reported in September 2007 that 51 percent of participants surveyed were unaware that the transition was taking place. Another study conducted by the National Association of Broadcasters focused on households that primarily receive their analog television signals over-the-air—and will therefore be most affected by the transition—and reported that 57 percent of those surveyed were not aware of the transition.

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## Federal Entities and Other Stakeholders are Facilitating the Transition, but Comprehensive Planning and Risk Management is Limited

FCC and NTIA, in conjunction with other stakeholders, have taken steps to facilitate the DTV transition. FCC has primary responsibility to regulate the television broadcast industry for the federal government and has taken a number of actions regarding the transition. For example, FCC has proposed and set deadlines to upgrade station equipment to send digital signals. In addition, FCC has conducted periodic reviews to report on transition progress and held a workshop for interested parties to discuss transition challenges and issues. NTIA has statutory responsibility for the converter box subsidy program, and it has issued a contract in preparation for that program's development. Private sector industries, including broadcasters, manufacturers, and retailers have also begun preparing for the transition. Despite public-private sector interaction designed to help facilitate the transition, we found that no comprehensive plan exists for the DTV transition. Among other things, a comprehensive plan can detail milestones and key goals, which provide meaningful guidance for assigning and coordinating responsibilities and deadlines and measuring progress. Such planning also includes assessing, managing, and mitigating risks, which can help organizations to identify potential problems before they occur and target limited resources. We have previously reported on the benefits of managing risks, including assisting other organizations involved in high stakes efforts similar to the DTV transition. For example, we credited one federal agency's success in weathering the potential for

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<sup>4</sup>While NTIA is not an official Coalition member, the agency has been participating in Coalition activities since its inception. The Coalition, as well as FCC and NTIA, have created Web sites providing information on the DTV transition and converter box subsidy program. These Web sites are available for viewing at the following addresses: [www.dtvtransition.org](http://www.dtvtransition.org) and [www.ntia.doc.gov/dtvcoupon/index.html](http://www.ntia.doc.gov/dtvcoupon/index.html).



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critical computer system failures during the Year 2000 Computer Conversion (Y2K), in part, due to reducing risks to facilities, systems, programs, and services during the critical rollover period.

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## Progress in Consumer Education on the DTV Transition Has Been Made, but Widespread Implementation Is Not Yet Underway

FCC and NTIA, along with industry and other private stakeholders, have made progress in educating consumers about the DTV transition. For example, FCC and NTIA have developed informational materials on the transition and begun outreaching directly to consumer and stakeholder groups. Both agencies are also involved with the Digital Television Transition Coalition, a group representing over 160 business, trade, grass roots, and other organizations whose purpose is to provide consumers with information about the transition. Private industry stakeholders are voluntarily taking the lead on planning public service announcements, developing Web sites, and garnering media coverage on the transition. While federal and private stakeholders have taken these initial steps, the initiative is still largely in the planning stages and widespread efforts have yet to be implemented. Further, because of the number of public and private sector entities involved in consumer education efforts for the transition and the timing, coordination and content of the messages they produce, consumers might become confused over what steps, if any, are necessary to avoid disruptions to their television viewing after the transition date.

To identify the difficulties and challenges to consumer education and outreach, we convened an expert panel to discuss consumer education issues applicable to the DTV transition, including potential challenges that may obstruct efforts and the key planning components of a consumer education campaign that will help to overcome some of those challenges. Expert panel members as well as other private and public sector officials highlighted several challenges, as follows:

*Prioritizing limited resources.* With limited time and financial resources, it is likely to be a challenge for stakeholders to determine how best to allocate those resources within the campaign—for example, whether to target a smaller audience over a set period of time, versus targeting a broader audience over a shorter period of time.

*Educating consumers who do not necessarily need to take action.* Many of the outreach efforts will be focused on educating consumers on what to do to keep their television sets from going dark after the termination of analog broadcasts. However, a large proportion of U.S. households will not need to do anything—for example, because they have cable or satellite

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television service that will enable their analog set to continue to display programming. Because many messages focus on the actions that households that rely on over-the-air analog broadcasting need to take, consumers unaffected by the transition may become confused and purchase equipment they do not need. In our past work looking at a similar digital transition in Germany, we have described this potential confusion to cable and satellite households as a challenge of educating consumers about the transition.<sup>5</sup>

*Reaching underserved populations.* Conveying the message to underserved populations—for example, senior citizens, the disabled, those residing in rural areas, or non-English speaking households will provide an added challenge. For example, many groups outreaching to consumers about the transition are doing so on Web sites, which may not be available to people who lack Internet access or are less technically savvy. Another challenge is providing information in a wide variety of formats, such as in different languages for non-English speaking consumers and in text, video, voice, and Braille for the disabled. Overall, a challenge of consumer education is that those households that need to take action may be the least likely to be aware of the transition.

*Aligning stakeholders.* Panel members and other industry representatives also noted the challenge of aligning stakeholders—some of whom are natural competitors—to work together. In our past work, we have reported that federal agencies engaged in collaborative efforts—such as the transition—need to create the means to monitor and evaluate their efforts to enable them to identify areas for improvement. Reporting on these activities can help key decision makers within the agencies, as well as clients and stakeholders, to obtain feedback for improving both policy and operational effectiveness.<sup>6</sup>

In addition to highlighting potential challenges, the expert panelists identified the following key practices as important to planning a consumer education campaign that will motivate consumers to take the steps needed

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<sup>5</sup>GAO, *Telecommunications: German DTV Transition Differs from U.S. Transition in Many Respects, but Certain Key Challenges Are Similar*, [GAO-04-926T](#) (Washington D.C.: July 21, 2004).

<sup>6</sup>GAO, *Results-Oriented Government: Practices That Can Help Enhance and Sustain Collaboration among Federal Agencies*, [GAO-06-15](#) (Washington, D.C.: October 21, 2005).

to avoid television viewing disruptions, as well as help to alleviate identified challenges along the way:

**Table 1: Key Practices for Consumer Education Planning**

<b>Key Practice</b>	<b>Description</b>
<b>Define goals and objectives</b>	Define the goals of the communications campaign, e.g., to increase awareness or motivate a change in behavior. Define the objectives that will help the campaign meet those goals.
<b>Analyze the situation</b>	Analyze the situation, including any competing voices or messages, related market conditions, and key dates or timing constraints. Review relevant past experiences and examples to identify applicable “lessons learned” that may help to guide efforts.
<b>Identify stakeholders</b>	Identify and engage all the key stakeholders who will be involved in communications efforts. Clarify the roles and responsibilities of each stakeholder, including which entity or entities will lead overall efforts.
<b>Identify resources</b>	Identify available short- and long-term budgetary and other resources.
<b>Research target audiences</b>	Conduct audience research, such as dividing the audience into smaller groups of people who have relevant needs, preferences and characteristics, as well as measuring audience awareness, beliefs, competing behaviors, and motivators. Also, identify any potential audience-specific obstacles, such as access to information.
<b>Develop consistent, clear messages</b>	Determine what messages to develop based on budget, goals, and audience research findings. Develop clear and consistent audience messages; test and refine them.
<b>Identify credible messenger(s)</b>	Identify who will be delivering the messages and ensure that the source is credible with audiences.
<b>Design media mix</b>	Plan the media mix to optimize earned media (such as news stories or opinion editorials) and paid media (such as broadcast, print, or Internet advertising). Identify through which methods (e.g., advertising in newsprint ads), how often (e.g., weekly or monthly) and over what duration (e.g., 1 year) messages will reach audiences.
<b>Establish metrics to measure success</b>	Establish both process and outcome metrics to measure success in achieving objectives of the outreach campaign. Process metrics ensure the quality, quantity, and timeliness of the contractor’s work. Outcome metrics evaluate how well the campaign influenced the attitudes and behaviors of the target audience(s) that it set out to influence.

Source: GAO analysis of expert panel discussion

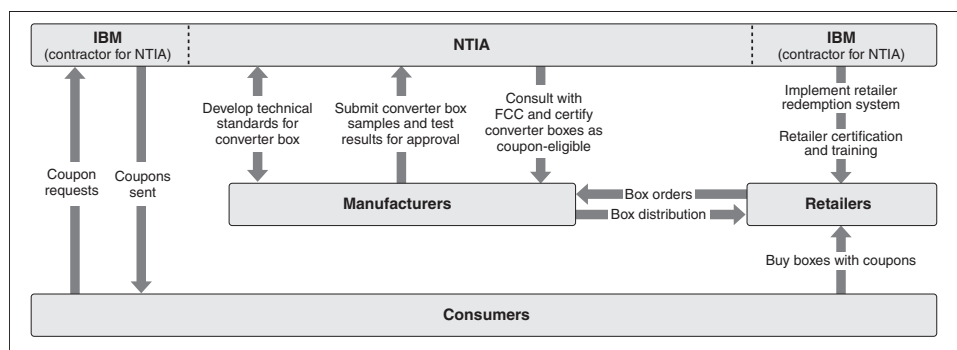
While still too early to evaluate the Coalition’s consumer education efforts, the Coalition has employed strategies consistent with the key practices identified by the expert panel. For example, the Coalition has identified stakeholders and conducted focus groups to test and refine its consumer messages. However, at the time of our report, it remains unclear whether public-private sector interaction can ensure a consistent message to prevent confusion or unnecessary purchases on the part of consumers. Moreover, the absence of comprehensive planning to assess and mitigate risks associated with the transition, including outreach efforts, may

increase the potential for at risk populations not adequately preparing for the transition.

## NTIA Has Taken Steps to Implement a Subsidy Program for Converter Boxes, but Challenges Remain

NTIA has made progress in implementing the converter box subsidy program, including soliciting stakeholder comments, meeting with industry participants, and selecting IBM in August 2007 to administer the program. The subsidy program's outcomes depend on the coordination and participation of NTIA, IBM, converter box manufacturers, retailers, and consumers. Manufacturers and retailers are voluntarily participating in the program, as NTIA does not have the authority to require their participation. IBM will develop the technical solution for the program, which includes determining how consumers will request, receive, and redeem coupons, and how this will affect retailers' current point-of-sale systems.<sup>7</sup> NTIA and IBM will also be conducting consumer outreach specific to the program. Figure 1 depicts the necessary, interrelated actions for the subsidy program.

**Figure 1: Coordination of Groups Involved in the Subsidy Program**



Source: GAO.

As shown in figure 2, consumers can begin applying for converter box coupons starting January 1, 2008, with NTIA requiring full distribution of coupons to begin by April 1, 2008. IBM plans to distribute a limited number

<sup>7</sup>Point of sale systems record purchases, payments, returns, and exchanges, as well as send the individual transactions to the company's internal inventory and accounting systems. They can also include an external component of 'in real time' communication with financial institutions, merchant banks, or other sources to identify the validity of the method of payment and authorize utilization of that method (credit card, debit card, gift card, check, etc).

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of coupons from January through March 31, 2008 as part of its test solution. Consequently, some consumers that request coupons in January might have to wait months to receive their coupons. Complicating matters is uncertainty regarding retailer participation and readiness. At the time of our review, several retailers we contacted expressed concerns about the possibility of a redemption system that would affect their point-of-sale systems, noting that modifying these systems can be time-consuming, resource-intensive, and expensive, and can affect their other financial systems. Retailer representatives told us they will need more information about the contractor's technical solution before they could assess the impact on their systems and whether it would affect their participation. Further, they said that March or April of 2008—3 to 4 months after consumers can begin requesting coupons—is a more likely time frame for retailers to be ready to participate in the program. The extent to which point-of-sale system modifications will be necessary and the potential impact on retailers will remain unknown until IBM presents its technical solution. With limited or delayed retailer participation, consumers might face difficulties in redeeming their coupons for eligible converter boxes during the designated time period. Some manufacturer, advocacy, and retailer representatives we contacted expressed concern about consumers' ability to find participating retailers that are able to redeem coupons and have converter boxes in stock. The final rule does not require remedies if certain geographic areas lack participating retailers and NTIA does not have the explicit authority to require that participating retailers maintain a certain level of inventory. Thus, it is uncertain whether consumers with coupons will be able to locate a participating retailer with converter boxes in stock.



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## Broadcasters Face Technical and Coordination Issues

According to FCC, as of April 2007, approximately 93 percent of television broadcast stations were transmitting a digital signal.<sup>8</sup> FCC reports that nearly 1,200 of these stations already transmitting a digital signal have been authorized to continue to operate on their current digital channel after February 17, 2009. FCC states that these stations will have a relatively simple transition to their final post-transition digital operation. Additionally, FCC states that approximately 750 of these stations may now already be or are very close to being ready for their post-transition operations and will simply have to turn off their analog signal. For example, managers representing 6 television broadcast stations that we interviewed said they will face no major transition issues before February 17, 2009, and will only have to turn off their analog signal.

However, as discussed below, stations may encounter challenges in completing their digital transition such as, (1) antenna and equipment replacement or relocation, (2) tower construction, (3) channel relocation, and (4) coordination with Canadian and Mexican governments.

*Issues with antenna and equipment replacement or relocation.* One of the major tasks that many television stations have to complete to build out their post-transition digital facilities is to install a digital antenna on the top of the broadcast tower, where the analog antenna resides. According to a broadcast industry official, many stations need to have their digital antenna at the top of the tower in order to fully replicate the area that their analog service covers. The broadcast industry official stated that stations have two options in placing their digital antenna at the top of the broadcast tower: (1) install the digital antenna to the top now, and buy a new side mounted analog antenna, which would ensure that the analog signal continues until it is switched off and that the digital signal would be at full power; or (2) keep the analog antenna at the top of the tower until it is turned off on February 17, 2009, then install the digital antenna at the top of the tower. The industry official stated that both options, however, present problems for broadcast stations. He said for the first option, stations may have to purchase a new analog antenna, which will only be used for a few months, and as a result of the analog antenna being side mounted, stations' analog broadcast coverage area would be reduced by 2 percent to 9 percent of the viewing market. Stations agreed that they could

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<sup>8</sup>As of April 2, 2007, 1,603 of the approximate 1,722 licensed television stations broadcast a digital signal. Of the stations broadcasting a digital signal, 1,136 represent commercial licensed stations.

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potentially have to reduce their analog service prior to the transition date. For example, the owner of a station in Minnesota commented that it may not be possible to complete the construction of its digital facilities without significantly disrupting its analog operation as well as its digital operations. The owner said the power of its analog signal would have to be significantly reduced before February 17, 2009, affecting a large number of its viewers. For the second option, problems include the digital signal not being at full power until later in the year, and getting the necessary authority to do this from FCC. Further, broadcast stations have commented that the design, manufacture, and installation of new antennas can take months to complete. For example, a company that owns five television stations commented that it can take up to 6 months to design, order, receive and install a new antenna.

Even when stations do have their digital facilities fully operational, they might not broadcast their digital signal to the exact coverage area that their analog signal covered.<sup>9</sup> For example, representatives from a commercial television station told us that in order for the station to replicate its analog service contour, it had to reduce coverage for part of its digital contour. As a result, the station representatives said that the digital signal will reach 15,000 fewer people, and that while many of these homes will have cable and satellite to still receive the station's signal, some will not. As shown in figure 3, the digital signal coverage of a station can differ from its analog signal coverage. Consequently, homes residing in the light shaded areas relying on over-the-air signals might not be able to receive the digital broadcast signals.

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<sup>9</sup> This could occur due to changes, among other things, in channel number or antenna type, location, and height.



**Figure 3: Example of a Station's Digital Signal Coverage Compared to Analog Signal Coverage**



Source: FCC.

FCC has acknowledged that a reduction or termination of analog service may be necessary if maintaining full analog coverage hinders the construction and operation of digital facilities. FCC officials told us that some loss of analog service is part of a tradeoff needed to ensure the entire transition is as smooth as possible. FCC officials also said it is difficult to replicate an existing signal contour, and is almost impossible to exactly replicate a pattern. FCC stated that it is not always in the best interest of the public to have a digital signal fully replicate the analog signal because a digital signal can cause serious interference to nearby stations. Further, FCC said that, in some instances, while contour shifting may result in some viewers losing a station's signal, other homes might gain the signal of a station. For example, FCC said contour shifting might disenfranchise 500 people in one area, but cover a new area with 10,000 people.

*Issues with tower construction.* According to FCC, a station that must change its DTV tower locations may face considerable challenges,

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especially if the station must construct a new tower. FCC states that such stations must consider whether there are any existing towers that can be used or if a new tower must be constructed. FCC states that because of the lead times involved in purchasing or leasing land with appropriate federal government clearances, local and state zoning requirements, and varying timelines for designing the new tower, ordering equipment, delivery of equipment, and construction-related issues, stations must begin planning as soon as possible in order to transition by the deadline. According to a major television broadcast network, equipment manufacturing constraints and the limited number of tower crews and other key equipment installation resources available between now and the transition date will impede stations' movement to final digital channels by February 17, 2009. Additionally, any work on towers could be hampered by weather conditions for towers located in northern climates and on higher elevations. Television stations commented that working on towers in the winter months can be problematic, if not impossible. For example, a major broadcast network commented that many station transmitting sites are not readily accessible during the winter, especially to cranes and other heavy equipment necessary for tower rigging and equipment installation. In fact, the broadcaster commented that snow and ice make some of its towers accessible only by a special vehicle from October until March.

*Issues with channel relocation.* According to FCC, approximately 600 stations will have to move to a different channel once the transition is complete. Some of these stations are broadcasting on a temporary digital channel and plan to relocate this digital channel back to their current analog channel. For example, one station we visited has its digital signal on channel 16 but plans to relocate the digital signal to channel 9, which is the station's current analog channel and the channel number people recognize for that station. Other stations will have to move to a completely new channel once the transition is complete. According to a broadcast industry association representative, television stations moving to another channel will face some technical challenges. For example, the broadcast representative stated that stations moving to another channel could cause interference for their neighboring channels if they move too early or if the neighboring channel moves too late. He estimated that there could be interference issues for up to 300 stations and stressed the need for coordination to minimize interference issues. Additionally, some stations broadcasting an analog signal do not have a paired digital channel and

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plan to “flash cut” to their digital channel by February 17, 2009.<sup>10</sup> According to FCC, “flash cutting” may present challenges since it will involve stations ending their analog television operations and beginning their digital television operations on their current analog channel and, in some cases, will require that a station change to a new channel to be fully operational.

*Coordination issues with Canadian and Mexican governments.* Another challenge for some stations located along the northern and southern borders of the United States is reaching agreements with Canadian and Mexican governments on the coverage of their digital signals that cross the border. According to FCC, some stations may still have unresolved coordination issues with Canadian and Mexican governments. Stations have commented that coordination issues with Canadian and Mexican governments might affect their ability to finalize their digital operations. For example, a company that operates several stations near the Canadian border commented that uncertainty about the stations’ final digital signal coverage are preventing it from ordering equipment, scheduling tower crews and making necessary changes to its transmitter buildings. The company stated that if coordination issues cannot be resolved, the stations would face significant additional costs in constructing their digital facilities and could result in two of its stations discontinuing operations as full power stations and rather, operate as low power stations. Another station located near the Mexican border commented that the station’s digital channel allotment could result in the Mexican government delaying or denying any request for coordination due to concerns about interference with a station on the Mexican side of the border. The station commented that any delay in coordination would result in the station not having sufficient time to construct its digital facilities. FCC officials told us that they are in discussions with Canadian and Mexican governments to resolve any coordination issues and expect the discussions to be completed by January 2008. However, FCC has commented that if there are situations where international coordination cannot be obtained, stations might have to broadcast to a smaller coverage area.

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<sup>10</sup>According to FCC, “flash-cut” refers to the situation where a station gives up its pre-transition digital channel and transitions to digital service using its analog channel or a newly allotted channel.

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## Cable and Satellite Television Providers Must Coordinate with Broadcasters to Ensure They Continue to Receive Broadcast Signals

Cable and satellite television providers face fewer challenges than broadcasters with the DTV transition, however, there are technical issues that need to be resolved to ensure they can provide digital broadcast signals to their subscribers. For cable, FCC recently indicated its intent to require cable to either carry both a digital and analog signal, often referred to as a “dual carriage” requirement, or carry only the digital signal provided all subscribers can view the signal.<sup>11</sup> FCC further indicated its intent to require that high definition broadcast signals continue to be carried in high definition format. According to FCC, this will ensure all cable subscribers are able to view broadcast signals on their current televisions –whether analog or digital. We heard from cable providers that there are key technical challenges needing to be resolved prior to the transition. As previously noted, the technical and coordination issues facing the broadcasters can vary from station to station, with some stations moving to a new channel or changing the coverage area of their broadcast signal. As a result, cable providers told us there is uncertainty whether their cable head-ends will continue to receive the broadcast signals.<sup>12</sup> For example, if a broadcaster’s digital coverage area differs from its analog coverage area, there is a possibility the cable head-end would no longer be able to receive that signal. A cable provider told us that it might need to reposition its antennas or otherwise update its head-ends so that it can continue to receive the broadcast signals. Further, the cable provider said this issue could be particularly problematic in smaller markets where head-ends rely on over-the-air broadcast to pull in the broadcast signals. Consequently, cable providers will have to coordinate with local broadcasters to ensure cable continues to receive local broadcast feeds. In particular, we heard that cable providers need the coverage areas, or signal contour maps, from broadcast stations as soon as possible to help them identify problem areas.

The satellite television providers we talked to anticipate no technical issues that will impact their subscribers’ viewable broadcast signals following the transition date. However, similar to cable, satellite providers

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<sup>11</sup>The FCC rules were adopted on September 11, 2007, but as of October 15, 2007, the final ruling had yet to be published.

<sup>12</sup>Cable providers receive the local broadcast signals to their head-ends, while satellite providers receive the local broadcast signals at local receiver facilities. This signal can be received by the providers either over-the-air, across fiber, by microwave antenna, or other means. Over-the-air signals could be lost completely based on changes to the broadcast stations antenna placement or structure, but fiber and other means of receiving the broadcast signal may require changes in equipment.

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have concerns about broadcasters' coverage area changing such that the satellite receiving stations will fall out of the coverage area resulting in a lost or poorly received broadcast signal. Since satellite television operates on a national platform, the satellite providers will have to coordinate with all broadcast stations carried nationally.<sup>13</sup> To better coordinate and be better prepared for the DTV transition, both cable and satellite providers support broadcast stations making their transition plans public. Cable and satellite providers indicated advanced planning will allow them adequate time to make technical modifications to their systems, such as updating their receiving equipment and testing signal strength and reception.

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### Owners of Translator Stations Will Need to Take Action in Order for Viewers to Continue to Receive Translator Signals

Unlike full power broadcast television stations, the February 17, 2009 deadline to cease analog broadcasting does not apply to translator stations.<sup>14</sup> However, since translator stations retransmit signals from full power broadcast stations, owners of these stations will need to take action to ensure broadcast signals continue to reach viewers. Translator stations can either transition to digital or take the digital signal and convert it to analog before transmitting it to their viewers. Those stations transitioning to digital have two options; they can cease analog transmission and begin operation of new digital transmitting equipment on the same date, or they can operate a digital companion channel allowing them to deliver both analog and digital signals. One broadcast industry association representative said many translator stations will continue to transmit an analog signal beyond the full-power analog shutdown date. The representative told us that although many translators will likely have obtained the hardware to operate with the digital input signal by the transition date, some stations will not have the necessary equipment.

If a translator station decides to convert the digital signal to analog and retransmit the signal, there is a possibility they will not reach those viewers who have purchased set-top converter boxes. According to a broadcast industry association, there are some instances where translator stations serve communities that receive at least one full-power television

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<sup>13</sup>The two satellite television providers, EchoStar and DIRECTV, retransmit 1,500 local broadcast signals and 1,200 local broadcast signals, respectively.

<sup>14</sup>According to FCC, translator stations are often used to deliver the only over-the-air television service available in rural communities. Although some translator stations are owned by full-power stations, many are either owned or rely on support from a local government.

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station, which would necessitate those over-the-air viewers to obtain a converter box. Since these areas will continue receiving both digital and analog signals, there is concern that those people who buy a set-top converter box that does not have analog pass through will have to turn them off or have an external bypass arrangement to allow for over-the-air signals to pass through their analog sets.

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## Our Future Work Will Focus on the Progress of the DTV Transition

We have work planned to assess the progress of the DTV transition. To accomplish this, we will continue to monitor public and private sector efforts related to the transition, including consumer outreach, the converter box subsidy program, and technical issues. Specifically, we will review consumer education programs and plan to conduct a series of consumer surveys throughout the year prior to the transition date. The surveys we conduct will be aimed at determining the population that will be affected by the DTV transition and public awareness of the transition. In determining the affected population, we will look at the percent of the population relying on over-the-air broadcasts for their primary television, as well as the percent of the population with non-primary televisions being used to watch over-the-air television. Additionally, we will review the demographic characteristics of the affected population to determine what groups might be most disrupted by the transition. We will survey for public awareness of the DTV transition, and specific knowledge of the transition, such as when the transition will take place. We will seek to determine the level of public awareness of those who will be affected by the transition and awareness of the converter box subsidy program and other options for viewing digital signals after the transition. We plan to report on changes in consumer awareness over time by conducting surveys throughout the transition process. Furthermore, we will continue to monitor government and industry consumer education efforts and will analyze the efforts compared with key practices for consumer outreach. We will also monitor the outcome of FCC's notices of proposed rulemaking regarding the transition and collect details on IBM's consumer education plan as they become available. To monitor the implementation of the converter box subsidy program, we plan to continue reviewing the steps taken by NTIA and IBM in administering the subsidy program. In addition, we plan to survey broadcasters to obtain their perspectives on the technical issues that must be addressed prior to the DTV transition date.

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Mr. Chairman, this concludes my prepared statement. I would be happy to respond to any questions you or other Members of the Committee may have at this time.

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## Contacts and Acknowledgements

For questions regarding this testimony, please contact Mark L. Goldstein on (202) 512-2834 or [goldsteinm@gao.gov](mailto:goldsteinm@gao.gov). Individuals making key contributions to this testimony included Matthew Cail, Andy Clinton, Simon Galed, Eric Hudson, Bert Japikse, Crystal Jones, Aaron Kaminsky, Sally Moino, Andrew Stavisky, and Margaret Vo.

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