



United States Government Accountability Office  
Washington, D.C. 20548

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September 6, 2005

The Honorable Joe Barton  
Chairman  
The Honorable John D. Dingell  
Ranking Minority Member  
Committee on Energy and Commerce  
House of Representatives

The Honorable Fred Upton  
Chairman  
The Honorable Edward J. Markey  
Ranking Minority Member  
Subcommittee on Telecommunications  
and the Internet  
Committee on Energy and Commerce  
House of Representatives

Subject: *Digital Television Transition: Issues Related to an Information Campaign Regarding the Transition*

The United States is currently undergoing a transition from analog to digital broadcast television. This transition offers the promise of more television programming options, interactive television, and high-definition television. An additional goal of the digital television (DTV) transition is for the federal government to reclaim radiofrequencies—or spectrum—that broadcasters currently use to transmit analog television signals. Because of the virtual explosion of wireless applications in recent years, there is considerable concern that future spectrum needs—both for commercial as well as government purposes—will not be met. The spectrum that will be cleared at the end of the DTV transition is considered to be highly valuable spectrum because of its particular technical properties. In all, the DTV transition will clear 108 megahertz (MHz) of spectrum, which is a fairly significant amount. In the 1997 Balanced Budget Act, the Congress directed the Federal Communications Commission (FCC) to reallocate 24 MHz of the reclaimed spectrum to public safety uses. Since the terrorist attacks of September 11, 2001, there has been a greater sense of urgency to free spectrum for public safety purposes. The remaining returned spectrum will be auctioned for use in advanced wireless services, such as wireless

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high-speed Internet access.<sup>1</sup> The return of the radiofrequency spectrum at the end of the transition will thus provide many benefits to society by easing the spectrum scarcity facing public safety first-responders, engendering economic growth and consumer value from spectrum redeployed to wireless services, and affording revenues to the federal government from the proceeds of a spectrum auction.

Due to your interest in the DTV transition, we testified before the House Subcommittee on Telecommunications and the Internet, Committee on Energy and Commerce, on May 26, 2005; February 17, 2005; and July 21, 2004, and on issues related to the DTV transition.<sup>2</sup> Additionally, you asked us to report on the information Americans need to know about the DTV transition. As such, this report specifically focuses on information campaign issues that we have not previously discussed. We are providing (1) stakeholder views on Americans' knowledge of the DTV transition, (2) stakeholder views on how government and industry might most effectively communicate critical DTV information, and (3) information on efforts by Germany and the United Kingdom to inform their citizens about the DTV transitions taking place in those countries. See enclosures I, II, and III for our recent testimonies related to the DTV transition.

In preparing this report, we obtained information from a variety of stakeholders, including companies in several key industry segments, government officials, telecommunications experts, and representatives from industry trade and consumer groups. We interviewed these stakeholders because of their knowledge and involvement with the DTV transition and the varying perspectives they may have had. There may be other views on information issues related to the DTV transition that are not represented by the stakeholders we contacted. Specifically, we interviewed 45 stakeholders, including 9 consumer electronics manufacturers, 4 electronics retailers, 7 broadcasters, 5 television station owners, 2 cable television providers, and 1 satellite provider. We also met with FCC staff and several individuals who are considered experts in the

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<sup>1</sup>Some of this spectrum—24 MHz—has already been auctioned.

<sup>2</sup>GAO, *Digital Broadcast Television Transition: Several Challenges Could Arise in Administering a Subsidy Program for DTV Equipment*, [GAO-05-623T](#) (Washington, D.C.: May 26, 2005); *Digital Broadcast Television Transition: Estimated Cost of Supporting Set-Top Boxes to Help Advance the DTV Transition*, [GAO-05-258T](#) (Washington, D.C.: Feb. 17, 2005); and *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).

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telecommunications industry. The industry trade and consumer groups we contacted include AARP, the American Cable Association, the Association of Public Safety Communications Officials, the Association of Public Television Stations, the Cellular Telecommunications and Internet Association, Cable Television Laboratories Incorporated, the Consumer Electronics Association, the Consumer Federation of America, the Minority Media and Telecommunications Council, the National Association of Broadcasters, the National Cable & Telecommunications Association, and the Satellite Broadcasting and Communications Association.

We conducted our work between August 2004 and August 2005 in accordance with generally accepted government auditing standards.

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## Background

With traditional analog technology, television pictures and sounds are converted into “waveform” electrical signals for transmission through the radiofrequency spectrum.<sup>3</sup> These analog signals fade with distance, so consumers living further from a television tower will experience pictures that are distorted or full of “snow.” With digital technology, pictures and sounds are converted into a stream of digits consisting of zeros and ones. Although digital signals also fade over distance, because each bit of information is either a zero or a one, a digital television set or receiver can adjust for minor weaknesses in the signal to recreate the zeros and ones as originally transmitted. Thus, pictures and sound generally retain their high quality unless significant fading of the signal occurs, at which point the transmission cannot be corrected and there is no picture at all.

Digital technology uses the radiofrequency spectrum more efficiently than analog technology and, as a result, provides greater flexibility in terms of the television content that television stations can provide. Television stations can transmit a single analog signal in the 6 MHz of radio spectrum allocated to each television station. In contrast, with digital technology, television stations can use that 6 MHz of spectrum to simultaneously transmit multiple signals in standard definition digital format, a concept known as “multicasting.” The television station could use the full 6 MHz of spectrum to provide high-definition television, which provides roughly

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<sup>3</sup>The radiofrequency spectrum is the part of the natural spectrum of electromagnetic radiation lying between the frequency limits of 9 kilohertz and 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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twice as many lines of resolution and thus creates a television picture that is much sharper than traditional analog television service.<sup>4</sup> To facilitate the transition from analog to digital television, the Congress and FCC provided each full-powered television station (both commercial and public) with an additional 6 MHz of radiofrequency spectrum so that stations could transmit both an analog and digital television signal; that is, each local television station now has 12 MHz of spectrum, 6 MHz for their analog signal and 6 MHz for their digital signal. Once the transition is complete, broadcast stations will operate solely in digital and must return the 6 MHz of additional spectrum to the government.

There are over 1,700 commercial and noncommercial (such as public) television stations in the United States. Commercial television stations produce local programming, such as local news, and may get their remaining programming content through an affiliation with one of the top seven television broadcast networks (ABC, CBS, Fox, NBC, PAX, UPN, and WB). Other commercial television stations are independent. Public television stations operate as nonprofit, community-based organizations. While public stations produce local programming, many stations are affiliated with and receive programming from the Public Broadcasting Service.

Households can view television signals through three primary means. First, a household can rely on over-the-air television and receive the television signals directly from television stations through a rooftop antenna or antennae attached to the television sets in their home. Second, a household can receive television signals from cable companies, which deliver the signals from cable facilities to subscribers' homes via a localized network

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<sup>4</sup>Current analog television sets display about 480 lines of resolution; high-definition television sets display up to 1,080 lines of resolution and are often "widescreen" format, similar to movie theater screens. High-definition sets offer improved picture and audio quality.

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of cable lines.<sup>5</sup> Third, households can receive television signals from a direct broadcast satellite company.<sup>6</sup>

As we have previously reported, households with analog television sets that rely solely on over-the-air signals must take action to be able to view digital broadcast signals after the DTV transition is complete.<sup>7</sup> 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 that they can be viewed on an existing analog set;<sup>8</sup> or (3) subscribing to a cable or satellite service to eliminate the need to acquire a digital-to-analog converter box. Without some form of public information campaign, these households might not be aware of the impending changes related to the DTV transition and the actions they need to take.

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## Many Stakeholders Believed That American Households Do Not Fully Understand the DTV Transition

In 2002, we reported that consumer knowledge about the DTV transition and its implications was low.<sup>9</sup> In fact, a survey we conducted found that 83 percent of respondents had never heard of or were only somewhat aware of the transition. Therefore, in November 2002, we recommended that FCC explore options to raise public awareness about the DTV transition and the

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<sup>5</sup>The facility where cable operators originate and distribute cable service in a geographic area is referred to as a “headend.” Cable operators receive and package television signals from a variety of television stations and networks and distribute the signals over coaxial wires emanating from the headend and terminating at subscribers’ residences.

<sup>6</sup>In the markets in which satellite companies provide so-called “local-into-local service,” local television stations’ signals are transmitted to satellites orbiting above the equator, and then are provided to subscribers in the local market through satellite retransmissions.

<sup>7</sup>GAO-05-258T.

<sup>8</sup>Viewers with digital-to-analog converter boxes would not actually see the broadcast digital signal in a digital format. They would be viewing that signal after it has been converted, by the converter box, to be compatible with their existing analog television set.

<sup>9</sup>GAO, *Telecommunications: Additional Federal Efforts Could Help Advance Digital Television Transition*, GAO-03-7 (Washington, D.C.: Nov. 8, 2002).

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impact it will have on the public.<sup>10</sup> FCC developed a Web site ([www.dtv.gov](http://www.dtv.gov)) to provide consumer information on the DTV transition. This Web site provides information about DTV news, terms, and regulatory information, as well as a listing of digital and high-definition television programming and a consumer's guide for digital television sets. FCC told us it has also developed several consumer publications on DTV, in English and Spanish, and co-authored a "tip sheet" with the Consumer Electronics Association and the Consumer Electronics Retailers Coalition that is being distributed through major consumer electronics retail stores and Web sites. FCC said its staff has met with a number of organizations about possible joint DTV consumer education efforts, including AARP, the Alliance for Public Technology, Hispanic Technology and Telecommunications Partnership, and the Federal Citizen Information Center. Additionally, FCC told us they have participated in several widely attended consumer events, such as the National Council of La Raza annual conference and AARP's "National Event & Expo," to assess DTV consumer information needs and to disseminate current information about the transition. According to FCC, its Consumer Center also provides DTV information through a toll-free line and by e-mail and postal mail. Consumers also may subscribe to FCC's Consumer Information Registry to receive updates about the DTV transition. Additionally, some retailers we contacted told us they have made efforts to provide information about the DTV transition. For example, one retailer said his business advises customers about the DTV transition and the implications it will have on analog television. A manufacturer we contacted said that the Consumer Electronics Association is doing a great deal to educate consumers.

Despite these efforts, several of the stakeholders we interviewed believed that consumers are still confused and do not understand the DTV transition. For example, one broadcaster we spoke with stated that consumers do not understand the difference between the DTV transition and high-definition television, and that few people are even aware that the transition is taking place. Further, a retailer told us that many consumers do not understand that after the transition, analog signals will no longer be used to transmit television signals; rather, he said those consumers believe that they will always have a choice between viewing analog and digital signals, similar to the manner in which they can choose between digital and film cameras. This retailer also said that because analog television sets are

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<sup>10</sup>GAO-03-7.

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priced much lower than digital sets, consumers with no knowledge of the DTV transition or when it will occur are not eager to adopt DTV equipment.

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## Stakeholders Viewed Advertisements as the Most Effective Means to Communicate DTV Information

Of the 35 stakeholders who responded to our question about the most effective mechanism to inform the public about the DTV transition, 22 believed that public service announcements, such as television advertisements, should be the primary form of communication. For example, a retailer told us that television would be the most effective mechanism because it is the medium that most people use. A trade group representative said that, in his opinion, using public service announcements on television would reach at least 60 percent of the people. Several of the stakeholders who were in favor of television advertisements also believed that the information campaign should be coupled with other forms of advertisement. For example, a broadcaster told us that in addition to television advertisements, other items such as books, pamphlets, and information packets should be made available at retail locations and other places of interest. A trade group representative said that a variety of advertising mechanisms should be used, including commercials and newspaper advertisements.

Some stakeholders believed that other approaches could be used to inform the public about the DTV transition. For example, a number of broadcasters we interviewed stated that an effective approach to inform consumers would be to place labels on analog televisions at retail locations stating that the analog sets would not be able to receive digital broadcast signals after the transition is complete without being connected to some device or service. An electronics manufacturer told us that digital and high-definition television program information should be listed in newspapers, television guides, and the Internet to inform the public. A television station owner told us that a task force consisting of broadcasters, press, and government officials should be established with consumer education as the focal point.

Stakeholders who responded to our question on which entity should be responsible for implementing a public information campaign had differing opinions. Eleven stakeholders stated that broadcasters should be primarily responsible, 10 said that the government should have primary responsibility, and another 4 believed that all parties involved in the transition should play a role in educating the public on the DTV transition. For example, a television station owner told us that the campaign should be a partnership between the government, broadcasters, advertisers,

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manufacturers, and cable and satellite companies, but that the government should take the lead. A trade group representative told us that all groups should play a role, but that broadcasters should begin utilizing public service announcements immediately. One broadcaster told us that the government is responsible for informing the public, but that it should work with manufacturers, retailers, and broadcasters in doing so.

A majority of stakeholders who responded to our question about the appropriate timing for a public information campaign believed that the campaign should start as soon as possible. For example, an electronics retailer told us that the information campaign is already late and should begin immediately. A trade group representative said that the information campaign should begin as soon as possible to begin influencing the purchase of DTV equipment. Several of the responding stakeholders told us that the information campaign should be tied to a point in time before the actual transition date. For example, a representative of an electronics manufacturer stated that consumer education should begin 6 to 12 months prior to the end date of analog service because the consumer education would be “background noise” if it begins too early. A trade group representative also told us that the information campaign should begin at least 1 year before the transition date.

Several of the stakeholders we spoke with noted that a prerequisite for an effective information campaign is *certainty* as to when the transition will actually take place. In particular, some stakeholders told us that with certainty regarding the transition’s completion, they could take steps to more effectively raise the level of public awareness about the transition and its implications. Some stakeholders we spoke with also told us that it is important for any public information campaign to be consistent, stating that a unified effort by industry and government participants would be effective at reducing consumer confusion. For example, one retailer told us that the consumer confusion is driven by poor education, and that a unified message would be most effective to educate the public. Another consideration for an effective information campaign that was discussed with us is ensuring that information about the transition is communicated in multiple languages. Since many stakeholders suggested using television advertisements to inform the public, it might be beneficial to produce and broadcast these advertisements in Spanish. According to a broadcaster, a large percentage of Spanish-speaking households watch over-the-air television exclusively.

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Legislation introduced in the Senate and a House staff draft of legislation contains requirements for consumer education related to the DTV transition.<sup>11</sup> In particular, the legislation requires labels to be placed on analog television sets informing consumers that the televisions will not be able to receive digital broadcast signals after the transition is complete, unless it is connected to a digital tuner; digital-to-analog converter box; or cable, satellite, or other multichannel video service. The bills also require FCC to educate consumers about the deadline when analog signals will be terminated and about the options consumers have to continue to receive broadcast programming. The House staff draft of legislation requires (1) television broadcasters to air public service announcements and (2) cable and satellite providers to include a notice of the DTV transition in billing statements.

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## Two Other Countries Have Been Engaged in Extensive Public Information Campaigns to Inform Their Citizens about Their DTV Transitions

We found that Germany and the United Kingdom undertook extensive public information campaigns regarding their DTV transitions. As we reported in July 2004,<sup>12</sup> the Berlin authorities and broadcasters provided considerable information to the public, the media, and retailers about what the transition would entail, what consumers needed to do, how they would benefit by transitioning to digital television, and where to get assistance if there was confusion about what equipment was necessary or if there were problems with equipment or reception. This effort was planned and coordinated among many parties, resources were dedicated to the information campaign, and nearly everyone we spoke with told us it was a critical factor to the rapid DTV transition in Berlin. We also were told that a short consumer education period was best for informing households about the DTV transition; in Berlin, the consumer education effort lasted approximately 4 weeks and cost approximately 800,000 Euro (\$984,160).<sup>13</sup>

In preparation for their DTV transition, the United Kingdom (1) developed an action plan that identified a series of events that needed to occur to ensure the transition was completed and (2) formed various strategic groups charged with raising public awareness and knowledge of the DTV

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<sup>11</sup>Senate bill S. 1268; House staff draft entitled, Digital Television Transition Act of 2005.

<sup>12</sup>[GAO-04-926T](#).

<sup>13</sup>This amount does not include the value of commercial time that broadcasters devoted to the DTV transition. We used the July 13, 2004, exchange rate of 1.2302 to convert Euros into U.S. dollars, which was current at the time our previous report was issued.

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transition. Membership in these groups consisted of government and consumer group representatives, broadcasters, manufacturers, and industry experts. These groups developed a specific project plan to raise awareness and educate the public through information campaigns, research on DTV market conditions, training of stakeholders, and product labeling. Additionally, a not-for-profit company has been tasked to lead a major communication campaign to educate the public about the DTV transition and ensure everyone knows what is happening, what they need to do, and when they need to take action. The not-for-profit company will coordinate with television manufacturers, retailers, consumer groups, and others to ensure that the transition is properly implemented.

In both Germany and the United Kingdom, the countries have devoted resources to determine what people understood about the DTV transition. During our work on the DTV transition in Berlin, German broadcasters told us that studies were conducted to determine citizens' experiences with the transition and to determine what was confusing to them as they transitioned to digital. The United Kingdom also undertook research to evaluate the human effects of the transition, specifically with regards to how this would affect the elderly and disabled members of their society. They tested the individuals' experiences in transition to digital television in two villages, and subsequently used questionnaires and interviews with members from the trial areas to measure changes in attitudes on a larger scale before and after digital installation.

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## Agency Comments

We provided FCC with a draft of this report for their review and comment. On August 8, 2005, we met with the Chair of FCC's Digital Television Task Force and other FCC staff within the Media Bureau and the Consumer and Governmental Affairs Bureau to discuss the report. FCC officials provided information regarding the Commission's efforts to educate consumers about DTV and suggested technical corrections, which we incorporated into the report as appropriate.

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We are sending copies of this report to interested congressional committees; the Chairman, FCC; and other interested parties. The report is available at no charge on GAO's Web site at <http://www.gao.gov>. If you have any questions concerning this report, please contact me on (202) 512-2834 or [goldsteinm@gao.gov](mailto:goldsteinm@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report.

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Key contributors to this report were Amy Abramowitz, Michael Clements, Andy Clinton, Simon Galed, Eric Hudson, Bert Japikse, and Sally Moino.

A handwritten signature in black ink, appearing to read 'M. Goldstein', with a long horizontal stroke extending to the right.

Mark L. Goldstein  
Director, Physical Infrastructure Issues

Enclosures - 3

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# Enclosure I: GAO May 26, 2005, Testimony (GAO-05-623T)

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**GAO**

For Release on Delivery  
Expected at 11:30 a.m. EDT  
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United States Government Accountability Office

Testimony

Before the Subcommittee on  
Telecommunications and the Internet,  
Committee on Energy and Commerce,  
House of Representatives

## DIGITAL BROADCAST TELEVISION TRANSITION

### Several Challenges Could Arise in Administering a Subsidy Program for DTV Equipment

Statement of Mark L. Goldstein, Director  
Physical Infrastructure Issues



GAO-05-623T

  
**Highlights**

Highlights of GAO-05-623T, a testimony before the Subcommittee on Telecommunications and the Internet, Committee on Energy and Commerce, House of Representatives

### Why GAO Did This Study

The digital television (DTV) transition offers the promise of enhanced television. At the end of the transition, radiofrequency spectrum currently used for analog broadcast television will be used for other wireless services and for critical public safety services. To spur the digital transition while preventing any loss of television service to households, some industry participants and experts have suggested that the government subsidize DTV equipment to enable households to view digital broadcast signals. This testimony provides information on (1) some challenges to administering a subsidy program for DTV equipment, (2) some administrative options for implementing a DTV subsidy, (3) examples of government programs that make use of rebates or vouchers to provide subsidies, and (4) other efforts necessary for the completion of the DTV transition.

We discussed administrative challenges to and options for a DTV subsidy with federal and state government officials, electronics manufacturers and retailers, and experts in product promotion. As in our previous work, we take no position on whether a subsidy should be implemented or not, or whether, if a subsidy program is established, it should be implemented in any particular way. While policies other than a subsidy might help promote the DTV transition, any other such approaches were not part of this investigation.

[www.gao.gov/cgi-bin/getrpt?GAO-05-623T](http://www.gao.gov/cgi-bin/getrpt?GAO-05-623T).

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

May 26, 2005

## DIGITAL BROADCAST TELEVISION TRANSITION

### Several Challenges Could Arise in Administering a Subsidy Program for DTV Equipment

#### What GAO Found

We found that several administrative challenges might arise in implementing a subsidy for DTV equipment. One of several key challenges we identified would be determining those eligible to receive a subsidy. If the subsidy were restricted to low-income households or to households that rely exclusively on over-the-air television, methods to identify these households would need to be developed and may prove to be challenging. Another key challenge would be ensuring that eligible recipients understand the availability of a subsidy, how they could obtain it, and what equipment would be subsidized. Effectively communicating this information will likely first require that information about the DTV transition itself is successfully communicated to the public.

Several administrative options could be used to provide a government subsidy to help households obtain DTV equipment, including a refundable tax credit, government distribution of equipment, a voucher program, and a rebate program. The suitability of any of these methods depends on aspects of the subsidy's design, such as which entity is most appropriate to administer the subsidy and who would be eligible to receive the benefit.

Various government programs make use of rebates or vouchers to subsidize consumers' purchase of products. We reviewed three rebate and three voucher programs that might provide insight for the development of a DTV subsidy and found that differences existed between these types of programs. We observed that eligibility for the voucher programs was specifically defined and the benefits were targeted to low-income individuals, whereas eligibility for the rebate programs was not based on income. Overall, however, we found these programs differed with respect to what might be undertaken for a DTV subsidy.

In addition to the administrative challenges of a subsidy program, there are other aspects of the DTV transition that are ongoing and will take time to complete or may pose their own challenges. For example, the channel election process, which will determine each television station's channel placement for its digital signal, will not be final until sometime in 2007, according to the Federal Communications Commission. Another issue that might arise relates to antennas used to receive digital broadcast signals. Although many stakeholders believe that antennas used for analog reception will work well for digital signals, we were also told that reception of digital signals may vary on the basis of a household's geography and other factors.

United States Government Accountability Office

Mr. Chairman and Members of the Subcommittee:

I am pleased to be here today to report on our work on the challenges to and the administrative options for implementing a subsidy program for consumers to purchase digital television (DTV) equipment. As you know, the return of radiofrequency spectrum used for analog broadcast television at the end of the DTV transition will provide many benefits to society, such as easing the spectrum scarcity facing public safety first responders, engendering economic growth and consumer value from spectrum redeployed to wireless services, and affording the federal government revenues from the proceeds of a spectrum auction. Under the law, the transition's end is, in part, dictated by consumers' adoption of digital television equipment. While the purchase of digital televisions is steadily increasing, it nevertheless appears unlikely that a sufficient proportion of households will have digital television equipment in place by the end of 2006—the date originally set by Congress as a goal for the transition's end.

Households viewing television solely through the reception of over-the-air signals must take action to ensure that they have the necessary equipment to be able to view digital broadcast signals before the transition occurs and analog broadcast signals are shut off. If they do not take such action, they will lose television service. Consequently, the DTV transition imposes costs on some American households, assuming those households purchase equipment capable of receiving digital television signals to avoid the loss of television service. In February we reported to this Subcommittee that of the roughly 21 million households in the United States that rely exclusively on over-the-air television, nearly half have incomes under \$30,000. Cable and satellite subscribers might also, at some point, need to upgrade their equipment—and thus incur costs related to the DTV transition—in order to be able to continue to receive broadcasters' digital signals through their subscription providers.

In order to spur households' adoption of the digital equipment necessary for the transition, some have suggested that the government provide a subsidy to certain households to purchase a device, known as a set-top box, that can receive digital broadcast television signals and convert them into analog signals so that they can be displayed on existing analog television sets. This device—which several manufacturers have stated

could sell for as little as \$50<sup>1</sup> once they are produced in high volume—would enable the household to view digital broadcast signals without purchasing a digital television set.<sup>2</sup> To the extent a subsidy facilitates the DTV transition, it might be advantageous for several reasons, such as (1) promoting a more rapid reclamation of valuable radiofrequency spectrum for other uses, which could spur economic growth and improve public safety, (2) possibly increasing government revenues from spectrum auctions by ensuring that companies that bid on spectrum can more quickly and with greater assuredness claim unencumbered spectrum, and (3) minimizing any loss in television service that households might suffer because they have not yet obtained necessary equipment for receiving digital broadcasts. At the same time, policymakers might consider these benefits in relation to other contexts in which policy decisions of the federal government have imposed costs and burdens on Americans *without* compensation. We believe while it is difficult to measure the specific benefits and costs of undertaking a specific DTV subsidy program, it is also difficult to evaluate the suitability of subsidizing the costs imposed by this particular government policy relative to other policies that have also imposed costs on citizens.

While there may be other policy options to spur the DTV transition, my testimony today only will focus on the use of a DTV equipment subsidy program. In particular, I will discuss the challenges to and several administrative options for a possible subsidy program. As we developed this work, no specific option for administering a DTV subsidy was formed, and as such, our work focused on the possible challenges to a hypothetical program. As in our previous work, we take no position on whether a subsidy should be implemented or not, or whether, if a subsidy program is established, it should be implemented in any particular way.

In February we testified before this Subcommittee and provided estimates of the cost of a subsidy for set-top boxes using data on household television characteristics and expected set-top box costs. Today we will discuss (1) some challenges to administering a subsidy program for DTV equipment, (2) some administrative options for implementing a DTV

<sup>1</sup>Set-top boxes that have enhanced features, such as digital video recorders and output of high definition signals, would be more costly.

<sup>2</sup>Viewers using such a set-top box would not actually be viewing the channels digitally, but would be viewing the broadcasters' digital signals after they have been downconverted to analog.

subsidy, (3) examples of government programs that make use of rebates and vouchers to provide subsidies, and (4) some other efforts necessary for the completion of the DTV transition. In addition to information provided in this testimony, we will provide a more detailed study on these and other issues related to the DTV transition for the Committee later this year.

To address the issues we will discuss today, we interviewed federal and state government officials who have experience in providing assistance to individuals or households through various subsidy programs. The agencies we contacted include the Department of the Treasury, the Department of Agriculture's Food and Nutrition Service, the Department of Health and Human Services, and state social service agencies from Alabama, Illinois, Maryland, and Texas. These states were chosen to represent varied demographic and geographic characteristics. We also spoke with companies in several key industry segments including nine electronics manufacturers, four electronics retailers, and a rebate fulfillment house (a company that processes rebates for manufacturers and retailers). Additionally, we interviewed a rebate and retail promotion expert, an academic who has studied consumer rebate redemption behavior, and representatives from the Promotion Marketing Association. We also contacted a company that provides identification and credential verification services. For general information about the DTV transition, we spoke with seven broadcasters, three cable and satellite companies, and five television station owners. We also had several meetings with Federal Communications Commission (FCC) staff and various industry trade groups, such as the National Cable & Telecommunications Association, the Satellite Broadcasting and Communications Association, the Consumer Electronics Association, the National Association of Broadcasters, and the American Cable Association. We obtained information on government programs that used rebates or vouchers from program administrators and other sources. We contacted the National Telecommunications and Information Administration (NTIA) to ask questions about their views on the administration of a DTV subsidy program, but an agency official stated that they had no official comment.

We conducted our work from August 2004 to May 2005 in accordance with generally accepted government auditing standards. We discussed this testimony with FCC officials to obtain their comments. FCC provided technical corrections that we incorporated where appropriate.

In summary:

- We found that several administrative challenges might arise in implementing a subsidy for DTV equipment. Key issues we identified include challenges related to making determinations about (1) which federal entity would administer a subsidy program, (2) whether a rulemaking process would be necessary to fully determine and stipulate how the subsidy program will be structured, (3) who would be eligible to receive a subsidy, (4) what equipment would be covered, (5) how information about the subsidy would be communicated to consumers and industry, and (6) what measures, if any, would be taken to limit fraud. Some of these issues could be particularly difficult to address. For example:
  - If the subsidy were only available to low-income households, a possible method of identifying these households would be to use receipt of some other low-income assistance—such as food stamps—to identify those eligible for the DTV subsidy. A drawback to this approach, however, is that agencies overseeing such programs may not be allowed to release lists of their recipients to others. If the subsidy is only provided to households that rely exclusively on over-the-air television, the identification of these households may be difficult because no list of such households exists, and information on the inverse—those households that subscribe to cable or satellite service—is dispersed across hundreds of providers in the country, and these providers may also face limitations on the release of their subscribers' lists to others.
  - Another key challenge would be to make sure that eligible recipients understand that a subsidy is available to them, how they can obtain it, which equipment the subsidy can be used for, and where they can obtain the equipment. Effectively communicating this information would likely first require that information about the broader DTV transition is effectively communicated to the public. Three years ago we found that many Americans did not have an awareness of the DTV transition. Recently, the Consumer Electronics Association reported that knowledge of DTV is increasing. Our interviews with several retailers and manufacturers, indicated, however, that while consumers are more familiar with the concept of high-definition television, many

are still confused or unaware that at some point in the future analog television will cease operation and analog televisions sets will not be able to receive digital over-the-air television signals.

- Several administrative options could be used to provide a government subsidy to help households obtain DTV equipment. The four options for administering a DTV subsidy that we reviewed are a refundable tax credit, government distribution of equipment, a voucher program, and a rebate program. We found that the suitability of any of these methods depends on aspects of the subsidy's design, such as which entity is most appropriate to administer the subsidy and who would be eligible to receive the benefit. For example, if the DTV subsidy were only available to low-income households, a voucher might be a possible method to deliver the subsidy. Alternatively, if the subsidy is more widely available, a rebate might be a good delivery mechanism.
- Various government programs make use of rebates or vouchers to subsidize consumers' purchase of products. We reviewed three local government rebate programs that provide incentives for furthering environmental policy goals and three voucher programs, including one state program that subsidizes equipment for deaf and hard of hearing individuals and two federal programs that provide assistance to needy households to purchase food. For the programs we reviewed, we found differences existed between the rebates and vouchers programs that might provide insight for the development of DTV subsidy. Regarding eligibility determinations, we observed that eligibility for the voucher programs was specifically defined and the benefits were targeted to low-income individuals, whereas eligibility for the rebate programs was not based on income. Overall, however, we found these programs differed with respect to what might be undertaken for a DTV subsidy. Further, choosing not to participate in any of the programs we reviewed would not cause a household to lose any existing service or functionality. In contrast, if a household relying exclusively on over-the-air television chose not to take advantage of a DTV subsidy for which it is qualified, and then did not obtain the necessary equipment to receive broadcast digital signals, the household would lose access to broadcast television signals when the transition occurs.
- If a subsidy program is implemented, it will pose many challenges for the implementing agency and industry. However, there are other aspects of the DTV transition not related to the implementation of possible subsidy program that are ongoing and will take time to complete or may pose their own challenges. For example, the channel election process, which will determine the channel placement for each television station's digital

signal, is ongoing. Because a proposed rulemaking will follow the end of this selection process (scheduled to be completed in August 2006), all stations' final selections will not be set until sometime in 2007, according to an FCC official. Another example of an issue that may arise as the DTV transition progresses relates to antennas used to receive digital broadcast signals. While many stakeholders we interviewed told us that antennas used for analog over-the-air reception should work well for the digital broadcast signal, a few stakeholders (including an antenna manufacturer, a broadcaster, and a retailer) told us that reception will depend on geographic and topographic factors and that some people may need new antennas or adjustment of existing antennas.

## Background

The United States is currently undergoing a transition from analog to digital broadcast television. 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. 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.

A primary goal of the DTV transition is for the federal government to reclaim spectrum that broadcasters currently use to provide analog television signals. The radiofrequency spectrum is a medium that enables many forms of wireless communications, such as mobile telephone, paging, broadcast television and radio, private radio systems, and satellite services. Because of the virtual explosion of wireless applications in recent years, there is considerable concern that future spectrum needs—both for commercial as well as for varied government purposes—will not be met. The spectrum that will be cleared at the end of the DTV transition is considered highly valuable spectrum—sometimes called "beachfront spectrum"—because of its particular technical properties. In all, the DTV transition will clear 108 MHz of spectrum—a fairly significant amount. In the Balanced Budget Act of 1997, the Congress directed FCC to reallocate 24 MHz of the reclaimed spectrum to public safety uses. Since the terrorist attacks of September 11, 2001, there has been a greater sense of urgency to free spectrum for public safety purposes. The remaining returned

spectrum will be auctioned for use in advanced wireless services, such as wireless high-speed Internet access.<sup>3</sup>

To implement the DTV transition, television stations must provide a digital signal, which requires them to upgrade their transmission facilities, such as transmission lines, antennas, and digital transmitters and encoders. Depending on each individual station's tower configuration, the digital conversion may require new towers or upgrades to existing towers. Most television stations throughout the country are now providing a digital broadcast signal in addition to their analog signal. After 2006, the transition will end in each market—that is, analog broadcast signals will no longer be provided—when at least 85 percent of households in a given market have the ability to receive digital broadcast signals.

### Several Challenges Might Arise That Require Consideration in Administering a Subsidy Program for DTV Equipment

During the course of our review, we identified several administrative challenges to implementing a subsidy for DTV equipment. For example, prior to implementing a subsidy program, various determinations need to be made, including (1) which federal entity will administer a subsidy program, (2) whether a rulemaking process is necessary to fully determine and stipulate how the subsidy program will be structured, (3) who will be eligible to receive a subsidy, (4) what equipment will be covered, (5) how information about the subsidy will be communicated to consumers and industry, and (6) what measures, if any, will be taken to limit fraud.

### It is Unclear What Entity Would Be Best Suited to Administer the Subsidy Program

One challenge to the DTV subsidy that we identified is determining which entity should administer the subsidy program. An industry representative told us that the implementing agency should have some level of telecommunications expertise in order to be able to set appropriate standards for the equipment being subsidized and to effectively educate consumers about the DTV transition. In our opinion, policymakers might also consider if the entity has experience administering a household assistance program.

Based on our discussions with government officials, it appears that no single entity has the combined technical knowledge and subsidy administration expertise that might be necessary to successfully

<sup>3</sup>In addition to the 24 MHz that is allocated to public safety, another 24 MHz has already been auctioned.

implement a DTV subsidy. For example, while FCC and NTIA have telecommunications knowledge and are responsible for managing the use of the radiofrequency spectrum, neither has experience administering a federal subsidy program of this kind. We asked these agencies about their ability, based on their experience, to administer a DTV subsidy. NTIA had no official comment. FCC officials told us they believe the Commission could have some role, such as defining which equipment would be eligible for the subsidy, but did not believe FCC was best suited to administer the entire subsidy program. Further, an FCC official said it might be advantageous for the administering entity to leverage the expertise of state government agencies to assist with delivering the subsidy to low-income households.

We also asked two agencies that have experience administering federal assistance programs, the Department of Health and Human Services and the Department of Agriculture's Food and Nutrition Service, about their ability to implement a DTV subsidy.<sup>4</sup> Although these agencies have experience with subsidy programs, they do not have expertise in telecommunications. Officials from the Department of Health and Human Services told us the agency would not be well suited to administer a DTV subsidy because their programs, such as Temporary Assistance for Needy Families, are narrowly defined—a household must have children to be eligible for Temporary Assistance for Needy Families—and would not offer broad enough coverage for a DTV subsidy. Similarly, officials from the Food and Nutrition Service said they did not believe their agency would be the best entity to administer the subsidy. However, after we asked whether the state agencies that administer food stamps could provide a DTV subsidy to their recipients, Food and Nutrition Service officials said that this might be possible under certain conditions, but that an agreement would most likely have to be reached with each state and, in their view, the states should be paid for the costs they incur in doing so.

When we contacted four state health and human services agencies that administer various assistance programs on behalf of the federal government, such as food stamps, all four indicated that it might be possible for the states to provide the DTV subsidy to the low-income individuals who already receive assistance from one or more programs

<sup>4</sup>The Department of Health and Human Services administers a number of programs, including Temporary Assistance for Needy Families. The Food and Nutrition Service also administers various programs, including the nation's Food Stamp Program and the Special Supplemental Nutrition Program for Women, Infants, and Children, better known as WIC.

they administer. However, they told us there would be costs associated with implementing a subsidy program, such as staff time, programming costs, postage, and envelopes. One state we contacted estimated that it would cost approximately \$552,000 to mail vouchers to the approximately 1.5 million households that receive food stamps, Medicaid, and Temporary Assistance for Needy Families within the state. However, two states told us that if the program ran over a period of time it would be difficult to track which households already received the DTV subsidy as people go on and off of assistance over time, so some households could receive duplicate benefits. Further, three of the four states told us that such a program would be burdensome on their limited staff resources.

#### Implementing a Subsidy Program May Require a Rulemaking Process

A rulemaking process might be required to implement a DTV subsidy, and if so, this would likely have implications for how quickly a subsidy program could be established. While legislation could broadly define the parameters of the subsidy program and may even prescribe specific elements of the programs' structure and administration, it is not uncommon for a federal agency to determine that a rulemaking process is necessary to more fully detail how a program will be implemented. Through a rulemaking, the agency would finalize the rules of the program that were not specifically addressed in the legislation. FCC told us that if the legislation is very specific a rulemaking process may not be necessary for a DTV subsidy. However, FCC did note that rulemakings have been used in the past after legislation enacted new programs. For example, rulemaking processes have been undertaken several times to make adjustments to the Lifeline Assistance Program since it was established in 1985.<sup>5</sup>

The rulemaking process generally takes time because it requires a wide range of procedural, consultative, and analytical actions on the part the agencies. Sometimes agencies take years to develop final rules. Among other things, the rulemaking process generally requires agencies to (1) publish a notice of proposed rulemaking in the Federal Register; (2) allow interested parties an opportunity to participate in the rulemaking process by providing written data, views, or arguments; (3) review the comments received and make any changes to the rule that it believes are necessary to respond to those comments; and (4) publish the final rule at least 30 days

<sup>5</sup>The Lifeline program, created in 1985, provides a discount on local telephone bills for certain low-income customers so that basic local phone service is more affordable.

before it becomes effective. Further, the Office of Management and Budget reviews significant proposed and final rules initiated by executive branch agencies other than independent regulatory agencies before those rules are published in the Federal Register.<sup>6</sup> A former official from the Department of Health and Human Services told us that industry participants, interest groups, or other stakeholders can challenge a proposed rulemaking, which can delay the process further. He said that in order to avoid such challenges, it is essential to have the key stakeholders involved early in the process. That is, if the key stakeholders have the opportunity to provide input prior to the development of the rulemaking and are satisfied that their concerns are addressed, they will be less likely to file a challenge to the proposed rulemaking.

Eligibility Criteria Pose  
Challenges to the  
Administration of a DTV  
Subsidy Program

Determining who would be eligible to receive the subsidy could present an administrative challenge to developing a subsidy program. If the government decides not to provide a DTV subsidy to all households, it would need to establish criteria to determine who is eligible. For example, a means test could be imposed to restrict eligibility to low-income households determined to be in financial need of the subsidy. The subsidy could also be limited to only those households relying on over-the-air television signals, on the grounds that these households are likely to be the most adversely affected by the DTV transition.

*Eligibility for Low-Income Households:* If it is determined that a DTV subsidy will only be made available to low-income households, a means test of some kind would need to be used to identify the appropriate target households. Officials from the Department of Health and Human Services told us that using the income-based eligibility criteria of existing social service programs to define eligibility for a DTV subsidy program would be the most efficient way to employ a means test. That is, by using the *receipt* of an existing program benefit that is means tested, a new program could be effectively implemented without developing a means test specifically for that program. However, we were also told that one of the drawbacks to using these existing programs is that not all who are eligible for any particular program actually choose to apply for and receive benefits. This would mean that by only providing a DTV subsidy to those already receiving other assistance, some people who would be eligible for the

<sup>6</sup>The Office of Management and Budget does not review rules of independent regulatory agencies, such as FCC.

subsidy based on their underlying income would not qualify for the subsidy because they have chosen not to receive another form of assistance. Officials from the Food and Nutrition Service told us that for the Food Stamp Program, approximately 54 percent of those who would be eligible for the program receive the benefit nationwide. It was thus suggested to us that if recipient lists from social assistance programs were used in developing eligibility determinations for a DTV subsidy, it might be beneficial to use more than one program. By combining the participants of several programs, a DTV subsidy for low-income households would target a higher percentage of needy households than if only one program was used to establish eligibility. For example, FCC told us that the Lifeline Assistance Program uses receipt of any of *seven* social assistance programs, including food stamps and Medicaid, as an eligibility requirement.<sup>7</sup>

Privacy concerns could, however, be a limitation of using existing social welfare programs to develop eligibility for a DTV subsidy because the agencies administering these programs may be prohibited from providing the list of recipients to any outside entity. Under current law for example, food stamp recipient information might not be available to other federal agencies or to any private party or outside entity that might be involved in the administering the subsidy. Another limitation in using these data is that there is continuous change in recipient rolls because of people entering and leaving the program. Those implementing a DTV subsidy program would need to take into account the volatility of recipient rolls in deciding how this information could be used.

*Eligibility for Over-the-Air Households:* Some stakeholders we contacted indicated that a DTV subsidy should be focused on or limited to only those households that rely exclusively on over-the-air television. Because no list of these households exists, limiting a subsidy in this manner will require determining who the over-the-air households are—a task that could pose administrative challenges. One possible approach to identifying over-the-air households is to first identify cable and satellite<sup>8</sup> subscribers. A

<sup>7</sup>Consumers can receive assistance if they participate in Medicaid, the Food Stamp Program, Supplemental Security Income, Federal Public Housing Assistance (Section 8), the Low Income Home Energy Assistance Program, the National School Lunch Program's free lunch program, or Temporary Assistance for Needy Families.

<sup>8</sup>For satellite subscribers, we are referring to those that subscribe to a direct broadcast satellite (DBS) service, such as DIRECTV or DISH Network.

combined list of all cable and satellite subscribers could be used as a mechanism to check whether those applying for a DTV subsidy are not qualified for the subsidy.

The process of combining cable and satellite subscriber information into a comprehensive list could be a highly challenging task. First, cable industry officials we interviewed expressed concern over providing their subscriber lists to a government agency or another entity. Cable officials told us that under current law, they could not turn over subscriber information to the government without prior permission from subscribers unless they were under a court order.<sup>9</sup> Cable industry officials also told us that any change in current legislation would need to include liability protection for cable and satellite companies because their subscriber lists—which include personal information provided to these companies from subscribers—would be outside their control. An industry official said that even more stringent safeguards would need to be in place if the information were provided to an outside entity—such as a contractor—rather than to a government agency. One cable company official stated that even if the law were changed to allow the company to provide its subscriber lists, it would be placed in the awkward situation of having to inform their subscribers that their names were provided to the government to help administer a subsidy that the cable subscribers are not eligible to receive. The cable company official also stated that subscribers would be sensitive to their information being used in this manner, especially in light of recent security issues related to personal information.

A second challenge to developing a national list of all cable and satellite subscribers is the difficulty of merging this information across all cable and satellite companies. Currently, there are over 1,100 cable and satellite companies operating throughout the country, with a total of nearly 90 million subscribers. Information from these companies, which is maintained in various formats, would have to be collected and combined into a comprehensive list of subscribers. Cable industry officials stated that the process of merging and maintaining a list of nearly 90 million subscribers would not be an easy undertaking. For example, one cable industry official estimated that the process of working through all the technical logistics for establishing a list could take 6 to 12 months. Additionally, cable industry officials stated that there is significant “churn” (i.e., the number of people moving on and off subscriber lists) in the

<sup>9</sup>47 U.S.C. §§ 338(i) and 551.

industry. For example, one cable company official stated that churn can be as high as 10 percent of subscribers from month to month. Another cable industry official told us that a significant level of resources would be needed to keep such a combined subscriber list up to date.

Another possible, albeit difficult, way to determine who the over-the-air households are would be to send queries to cable and satellite providers to ask if particular people who have applied for the DTV subsidy are, in fact, already subscribing to cable or satellite. For cable customers, a database would need to be developed to direct the queries to the applicable provider. According to FCC, the Commission maintains a master data base with information on all franchised cable areas—of which there are over 30,000. The most identifiable geographic information in that database is the name of county where each cable franchise is located. If an applicant for the DTV subsidy provided a county of residence, a query could be sent to all the franchised cable areas in that county. However, an FCC official told us that in many counties there are multiple cable franchises operating. Moreover, the FCC official stated that even though there is a contact name for each franchise area, in many cases, the contact was someone at a corporate headquarters of the cable company. Thus, we believe that to contact the local cable franchise directly, the database would need to be further developed to include information—perhaps an e-mail address at the local franchise level—to which the query could be sent. This process could be time consuming for both the entity processing the subsidy applications and the cable providers. On the satellite side, we believe querying the satellite providers might not be too difficult because there are only two primary providers. However, people may object to their personal information being sent to the satellite providers as well as the cable providers in their area. Another option might be to use information maintained by companies that perform subscriber billing for cable and satellite companies. We were told that about six large billing companies provide billing services for a substantial majority of the cable and satellite companies. Representatives from a company that provides identification and credential verification services told us they could verify that individuals applying for a DTV subsidy do not subscribe to a cable or satellite service by checking the applicant's address against the addresses maintained by the cable and satellite providers' billing companies. To protect the privacy of subsidy applicants, the identification and verification services company told us such queries should be based on an individual's address rather than name or Social Security number. Company officials also told us that it would likely take a few months to develop this checking process.

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Congress and  
Implementing Agency  
Must Determine What  
Specific Equipment Would  
Be Subsidized

One of the administrative elements of a subsidy program that would likely need to be determined is exactly what equipment will be subsidized. In making this determination, policymakers might consider both policy issues as well as issues related to the ability of the program to be implemented and managed.

From a policy perspective, several of the manufacturers and retailers we contacted told us that they believe it would be most beneficial to consumers if the program did not put highly specific limits on the type of equipment they could buy with the subsidy. In particular, some stakeholders generally believed that eligible consumers should not only be allowed to apply the subsidy toward a basic set-top box, but should also be allowed to apply that amount toward enhanced set-top boxes (those with upgraded features or functions) or digital televisions capable of receiving and displaying digital broadcast signals. Several stakeholders noted that any product that enables consumers to receive digital broadcast signals does the job of ensuring that there is no loss in television service when the transition occurs. Moreover, some said a wide application of the subsidy provides consumers the most choice and promotes the adoption of digital television. An opposing view is that a subsidy should only be designed to ensure that there is no loss of television service when the DTV transition is completed, and therefore the subsidy should only be applicable to a set-top box.

From the perspective of administering the program, determining what items the subsidy can be applied towards is critical for communicating to manufacturers, retailers, and consumers a key parameter of the program. Some stakeholders noted that either the Congress or the administering agency would need to identify the products that would be subsidized so that manufacturers produce the appropriate equipment. If the intent is to subsidize only simple set-top boxes, FCC officials told us that the subsidy would cover boxes that have only *analog outputs*. If the Congress or the implementing agency determines that the subsidy will be more broadly applicable, the particular parameters of the program would need to be communicated to the manufacturing industry so that their business plans can proceed.

There would also likely be some process by which *specific items* meeting the parameters of the subsidy program are approved and flagged as eligible for the subsidy. Manufacturers need certainty about what items are approved for the subsidy if they are to place a rebate coupon on or inside of the equipment boxes, along with any related information. Specific identification of subsidized items will also be important for

retailers as they make inventory decisions and train staff about how to guide consumers' purchasing decisions. Also, if retailers are asked to play a part in the administration of the program, such as by accepting vouchers or printing rebate coupons at the time of sale, it will be critical for them to have validation of items that are eligible for the subsidy. And, clearly, consumers need to understand which items they can purchase using the subsidy.

Some industry representatives we contacted also expressed concern about the interface between industry and the government in the design of the subsidy program. In particular, industry representatives said that the government should work with industry as the subsidy program is developed to ensure that the program is designed in a manner that will provide incentives for manufacturers and retailers to participate. Additionally, some companies noted that the government would need to provide industry with information on the expected scope of the program in order to avoid shortages of equipment at retail. In general, some companies told us that industry should be involved in the development of the program to help ensure that it is designed and implemented efficiently.

**A Successful Subsidy Program Will Require an Effective Information Campaign about the DTV Transition and Subsidy**

To successfully implement a DTV subsidy program, eligible recipients will need to understand that a subsidy is available, how to obtain it, which equipment the subsidy can be used for, and where they can obtain the equipment. Thus the agency responsible for implementing the program would need to undertake a communication campaign. At the same time, it could be difficult to provide information about the parameters of the subsidy program if there is not a general understanding about the broader DTV transition. As such, it appears that an information campaign regarding the availability of a subsidy for DTV equipment might need to be coordinated with a more general information campaign about the transition and its ramifications for American households.

Three years ago we found that many Americans did not have significant awareness of the DTV transition, and we recommended that FCC explore options to raise public awareness about the transition and the impact it will have on consumers.<sup>10</sup> Since that time, FCC and industry have undertaken efforts to better inform the public about the transition. In

<sup>10</sup>See GAO, *Telecommunications: Additional Federal Efforts Could Help Advance Digital Television Transition*, GAO-03-7 (Washington, D.C.: Nov. 8, 2002).

March of this year, the Consumer Electronics Association, an association of electronics manufacturers, reported that consumers' understanding of digital television has improved. This association surveyed individuals and found that, compared to past years, there has been an increase in consumer familiarity and understanding of DTV, as well as an increase in the likelihood of over-the-air households to take action to avoid losing television service.

Based on our interviews with several stakeholders, it appears that despite these findings many consumers—particularly those who may be the most affected by the transition—may still be unaware or confused about the DTV transition. Several of the company representatives with whom we spoke told us that while consumers are more familiar with the concept of high-definition television, they are still unaware or confused about other aspects of the DTV transition. Some told us that few consumers understand that at some point analog television will cease operation and analog television sets will be unable to receive digital over-the-air signals. We were told that it is especially difficult to provide consumers with a better understanding of this in the absence of a hard transition date. Additionally, some populations might be difficult to reach because English may not be their primary language or because they only receive television over-the-air and have no business relationship with a subscription television provider that would likely provide them with information about the transition.

#### Minimizing Fraud Might Be a Consideration in the Development of a Subsidy Program

Depending on how a subsidy program is structured and implemented, there may be opportunities for people to defraud the government. For example, one official familiar with government subsidy programs noted that if everyone were eligible for the subsidy, the opportunities for fraud would decline. For this reason, the more restrictive the eligibility requirements, the greater may be the chances for fraud. In terms of reducing fraud, those familiar with rebates noted that the more requirements for rebate redemption—that is, the more documentation the consumer must provide to redeem the rebate—the fewer problems with fraud there are likely to be. However, we were also told that increased requirements would tend to reduce the number of people who attempt to redeem the rebate. An additional consideration regarding fraud is the cost of fraud mitigation. A former official from the Department of Health and Human Services told us that while minimizing fraud should be considered in developing a subsidy program, the cost-effectiveness of these efforts should also be measured. For example, we were told that administering

systems to mitigate and prevent fraud may be costly and may not be worthwhile, especially if the value of the subsidy is low.

### A Variety of Options Exist for Administering a DTV Subsidy, Each with Unique Challenges

While a government subsidy for consumers to purchase DTV equipment could be administered in several ways, each of the subsidy options we examined had advantages and disadvantages. Following is a description of and stakeholders' views on four DTV subsidy options: a refundable tax credit, government distribution of equipment, a voucher program, and a rebate program. As we noted above, we take no position on whether a subsidy should be implemented, or whether, if a subsidy program is established, it should be implemented in any particular way.

*Refundable Tax Credit Program:* One method that could be used to administer a subsidy program for DTV equipment would be a refundable tax credit, administered as part of the federal individual income tax. A refundable tax credit could be designed to provide qualifying taxpayers a refund greater than the amount of their tax liability before credits. Based on the manner in which tax credits work, we believe that a tax credit for DTV equipment would likely be structured such that consumers purchase an eligible set-top box, maintain required information on their purchase, and seek reimbursement for all or some portion of the cost from the federal government for the equipment when they file their federal income taxes. Based on discussions with an official from the Department of the Treasury, it does not appear that this method would be well suited for a DTV subsidy. The Treasury official told us that considerable administrative burdens would be imposed on the Internal Revenue Service (IRS) to administer a refundable tax credit for a one-time subsidy. This official noted that implementation of a new tax credit would require the IRS to change tax forms, as well as instructions, for the years that the program would be in operation. Changing tax forms imposes administrative costs, particularly if tax laws are changed after forms have been developed for a given tax year. Additionally, he noted that IRS Form 1040 is currently completely full, so that any new credit could require the form to be lengthened from two pages to three pages, which would be costly and burdensome. The official also noted that the availability of the tax credit may cause some individuals who otherwise would not file a tax form to do so, which would increase IRS administrative burdens. The Treasury official also noted that there could be compliance problems with a tax credit approach. Because of the small amount of the credit—likely about \$50—it would not be cost-effective for the IRS to assign resources to check compliance, thus it would be very difficult to minimize fraudulent

use of the credit. In fact, IRS has had difficulty assuring compliance for a refundable tax credit. In particular, for the Earned Income Tax Credit, IRS estimated that roughly 30 percent of the dollars claimed was erroneous.

We heard from stakeholders that a tax credit for DTV equipment might not be the most helpful to low-income Americans because individuals would have to purchase the equipment with their own money and file—possibly many months later—for a tax refund. Also, we were told some low-income Americans do not file tax returns. We believe the additional costs and burdens for such individuals to file taxes for the purpose of obtaining a tax credit may exceed the value of the credit.

*Government Distribution:* With government distribution, the government provides certain goods for needy citizens. One example of government distribution is the Emergency Food Assistance Program whereby the government provides food, such as dried fruit, non-fat dry milk, and peanut butter, to states for distribution to selected local agencies—usually food banks—which, in turn, distribute the food to soup kitchens and food pantries that serve the public directly.

For the DTV transition, the government could directly provide the necessary equipment to individuals, but we found there would be a number of challenges to implementing and administering such a program, and, based on discussions with state social service agencies, it appears that this would be an unwieldy way to administer a DTV subsidy. One challenge would be finding locations for distributing the equipment. We heard from several officials whose state agencies administer benefit programs that using local social services offices as a distribution point would not be feasible. These officials cited the lack of space and staff resources to store, secure, and distribute equipment as reasons why local offices could not be used to administer such a program. Further, stakeholders told us that government distribution does not take advantage of existing retail supply chains that already move large quantities of goods to stores throughout the country.

While a government distribution program would not require households to pay for equipment in advance of receiving the subsidy, which would be beneficial to low-income households, the program could present other challenges to those eligible to participate. For example, stakeholders we interviewed told us that a distribution program limits consumers' choices and provides no mechanism for consumers to obtain support if the equipment does not work properly. Additionally, officials from one state agency told us that people obtaining equipment at local offices would have

to wait in long lines, which could be problematic for those with physical limitations, such as the disabled and the elderly.

*Voucher Program:* Another mechanism to subsidize DTV equipment could be through a voucher program. A voucher—which is a coupon or electronic benefit card, similar to a credit card, which provides purchasing power for a restricted set of goods or services—could be provided to households that qualify for a DTV subsidy. The federal government has used vouchers to provide a variety of assistance to households, such as food stamps and housing subsidies. Also, vouchers have been used on a limited basis to provide benefits to consumers for the changeover of certain technology. For example, the Colorado Department of Human Services provided a voucher to individuals who qualified as hard of hearing to purchase text telephones and other specialized telecommunications equipment.

For a DTV equipment subsidy using a voucher system, various administrative steps would be necessary to design and implement an effective program. After decisions were made about the specific equipment to be covered, vouchers would need to be distributed to eligible households. Several of those we contacted noted that if the program is to be means tested, state agencies—such as those that administer the Food Stamp Program—might be able to mail vouchers to their existing recipients.<sup>11</sup> Additionally, with a voucher program, several administrative steps involving the retail industry would be required. Participating retailers would have to know how the program is structured, which specific items were covered by the subsidy, approximately how many pieces of DTV equipment were expected to be subsidized in a particular area, and how the mechanism for retailer reimbursement would operate.

Overall, using vouchers to administer a DTV subsidy might be beneficial for low-income households because such households would not be required to pay for the DTV equipment in advance and then wait to be reimbursed. However, stakeholders told us that this type of program could create a burden on retailers because they must determine the authenticity of the vouchers. Also, stakeholders mentioned that it might be more

<sup>11</sup>State agencies we contacted suggested that mailing a paper voucher to recipients would be the least difficult and most effective way of distributing a voucher for a potential DTV subsidy. While food stamp benefits are provided to recipients electronically (through an Electronic Benefit Transfer (EBT) card), the state agencies told us it would be costly and time-consuming to add the DTV subsidy to these electronic cards.

challenging to include smaller and independent retailers in a subsidy program that uses vouchers.

*Rebate Program:* A rebate program could also be used to administer a DTV subsidy. Rebates generally require consumers to pay the full cost of an item at the time of purchase and then send documentation to an address specified by the manufacturer or retailer to receive a rebate by mail. The documentation required generally includes the original sales receipt, the UPC code from the product packaging, a rebate slip, and the customer's name, address, and telephone number. In most cases, this paperwork must be sent within 30 days of the purchase, and consumers generally receive their rebates up to 12 weeks later. According to the three rebate experts we interviewed, only about 30 percent of rebates are ever redeemed. While two rebate experts said that redemption rates would likely rise with a larger rebate, such as might be provided with a DTV subsidy, none of the three we spoke with believed that the redemption rate would rise above 50 percent. Also we were told that depending on the type of rebate, on average 1 percent to 20 percent of rebate applications are rejected based on the lack of proper documentation.

Typically, a variety of decisions are made in developing a rebate program. For example, as we discussed these decisions with stakeholders, various methods of implementing a rebate were highlighted, including placing the rebate coupon inside the equipment box, affixing it to the outside of the box, or printing a coupon at the cash register at the time of sale. The method used would, in part, determine which entities have some administrative responsibility for the rebate program. If a DTV subsidy program were designed to have a rebate coupon placed in or on the box, it would be the responsibility of the manufacturer to do so, while if it were designed to have a rebate coupon generated at the cash register, the retailer would be responsible for managing this process. A consensus on the best rebate method did not emerge from our interviews with industry experts.

One of the most difficult elements associated with using a rebate for a DTV subsidy would be applying eligibility requirements. As previously discussed, information about over-the-air and low-income eligibility is not readily available to the rebate fulfillment houses—which are the entities that process rebates for manufacturers and retailers—and there are legal obstacles to the government collecting and providing that information to them. Another downside of rebates is that consumers generally pay the full cost of an item at the time of purchase, which could create a hardship for low-income households. Furthermore, one rebate fulfillment center

representative told us that low-income individuals are less likely to redeem rebates than other segments of the population. Similarly, an official from a state agency told us that based on her experience a rebate program is not a good choice if the subsidy is supposed to target low-income individuals because many low-income individuals are not comfortable with rebates and will not redeem them. If eligibility for the subsidy is not restricted, a rebate might provide a good delivery mechanism. A benefit of using a rebate program for a DTV subsidy is that this method could take advantage of the relationships that already exist between retailers, manufacturers, and the rebate fulfillment industry.

### Several Government Programs Have Employed Rebates or Vouchers to Provide Subsidies

We identified several government programs that have used or are using rebates or vouchers to subsidize consumers' purchase of products. While aspects of these programs might provide insight into the establishment of a DTV subsidy, we found, overall, that the programs we reviewed differed in many respects from what might be undertaken for a DTV subsidy. We reviewed three rebate programs that were implemented by local governments to provide incentives for furthering a policy goal, such as clean air, water conservation, and the use of energy-efficient appliances. We also reviewed three voucher programs, including one state program that subsidizes equipment for deaf and hard of hearing citizens and two federal programs that provide assistance to needy households to purchase food. See table 1 for key information about the six programs we reviewed.

Table 1: Information on Rebate and Voucher Programs GAO Reviewed

| Program name                                                               | Subsidy type and amount                            | Administering entity                                            | Item/commodity subsidized                                              | Eligibility requirements                                                          | Total budget              | Percent of budget allocated to administrative costs                                                                     | Number of persons served | Time required to develop and implement program                                                                                                    | Length of program existence   | Information dissemination                                                                                                                                 |
|----------------------------------------------------------------------------|----------------------------------------------------|-----------------------------------------------------------------|------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Santa Cruz County Electric Bike Commuter Incentive Program</b>          | Rebate; maximum rebate is \$375                    | Ecology Action, Inc. on behalf of Santa Cruz County, California | Electric-powered bicycles                                              | Must be a resident of Santa Cruz County, also must attend a safety training class | \$1 million               | Start up administrative costs were 26.4 percent; once the program was established, administrative costs were 14 percent | 879                      | About 12 months total; 6 months to design the program and 6 months to secure funding                                                              | August 2000 through June 2006 | The program was launched with a high profile press conference attended by regional and national press; then used main stream media to promote the program |
| <b>Sacramento County Water Agency Ultra-low Flow Toilet Rebate Program</b> | Rebate; rebates vary from \$75 to \$125 per rebate | County of Sacramento, California                                | Ultra-low flush toilets (that use only 1.6 gallons of water per flush) | Must be a Sacramento County Water Agency customer (with a high flow toilet )      | \$45,000 in 2004 and 2005 | Administrative costs not separated out from general agency costs                                                        | 142 in 2004              | About 18 months to implement; majority of this time was spent coordinating with the various water agencies that were participating in the program | Ongoing; started in 2003      | Advertised in water bills and newsletters; allowed installers to advertise program's availability                                                         |

| Program name                                               | Subsidy type and amount | Administering entity                                     | Item/commodity subsidized                                                 | Eligibility requirements                                                                                           | Total budget | Percent of budget allocated to administrative costs                                                    | Number of persons served     | Time required to develop and implement program                                                      | Length of program existence | Information dissemination                                                                                                                                                                                                                           |
|------------------------------------------------------------|-------------------------|----------------------------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------|--------------------------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Consumer Rebate Program (for Energy Efficient Products)    | Rebate                  | Los Angeles Dept. of Water and Power (LADWP), California | Energy efficient appliances, lighting, and windows                        | Must be a LADWP customer                                                                                           | \$3 million  | Approximately \$1.18 million, or 39 percent of the total budget, is for labor, marketing and materials | Approximately 6,000 per year | Original program development was lengthy; program implemented in 3 months once contractor was hired | Ongoing; started in 2002.   | Provided handouts at retail stores and LADWP branch offices, advertised on radio, placed inserts in all residential utility bills, created special page on LADWP web site, had kick-off event at Home Depot that was carried on local news stations |
| Colorado Telecommunications Equipment Distribution Program | Voucher                 | Colorado Commission for the Deaf and Hard of Hearing     | Text telephones, printing text telephones, phone signalers, and amplifier | Medically certified as deaf or hard of hearing and low income, defined as 185 percent of the federal poverty level | \$650,000    | Not available                                                                                          | 260                          | Not available                                                                                       | Ongoing; started in 2003    | Worked with rehab and independent living centers, advocacy groups, subscriber based emails, and newsletters for groups representing the deaf and hard of hearing. Also did a one-time staffer in phone bills                                        |

| Program name                                                                  | Subsidy type and amount | Administering entity                                  | Item/commodity subsidized | Eligibility requirements                                       | Total budget                       | Percent of budget allocated to administrative costs   | Number of persons served         | Time required to develop and implement program | Length of program existence | Information dissemination |
|-------------------------------------------------------------------------------|-------------------------|-------------------------------------------------------|---------------------------|----------------------------------------------------------------|------------------------------------|-------------------------------------------------------|----------------------------------|------------------------------------------------|-----------------------------|---------------------------|
| Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) | Voucher <sup>a</sup>    | Department of Agriculture, Food and Nutrition Service | Food                      | 185 percent of federal poverty guideline, among other criteria | \$4.5 billion in fiscal year 2003  | About 28 percent, includes nutrition services as well | 7.6 million in fiscal year 2003  |                                                | Ongoing; started in 1974    | c                         |
| Food Stamp Program                                                            | Voucher <sup>b</sup>    | Department of Agriculture, Food and Nutrition Service | Food                      | 130 percent of federal poverty guideline, among other criteria | \$23.9 billion in fiscal year 2003 | About 10 percent                                      | 21.3 million in fiscal year 2003 | c                                              | Ongoing; started in 1964    | c                         |

Source: GAO analysis.

<sup>a</sup>Most state agencies distribute WIC benefits through checks or vouchers that enable recipients to purchase specific foods each month. A few state agencies distribute WIC foods through warehouses or deliver the foods to participants' homes.

<sup>b</sup>The Food Stamp Program provides low-income households with coupons or electronic benefits that recipients use as cash at most grocery stores.

<sup>c</sup>For long-standing programs, we did not obtain information on time required to develop and implement the program and to disseminate information to eligible participants.

We believe some aspects of the programs' implementation, such as the time required to develop a program and the manner in which program information was disseminated, might have relevance to the establishment of a DTV subsidy. For example, for two of the rebate programs, we learned that it took several months to develop and implement the programs, with one rebate program taking 12 months and another taking 18 months to implement. In reviewing various other aspects of the programs, such as eligibility determinations and what products were subsidized, we found that differences existed between the voucher and rebate programs that might also provide some insight for a DTV subsidy. For example, for all of the voucher programs we reviewed, benefits were targeted to low-income individuals, and eligibility was specifically defined. In contrast, eligibility for the rebate programs not based on income; rather, a person only had to reside in the location where the subsidy was being offered or be a water or power customer to be eligible. We also found differences in the types of products subsidized for the rebate and voucher programs that we reviewed. Whereas the rebates subsidized items in an effort to further a policy goal (generally environmental protection), the voucher programs provided recipients with items for their basic needs.

Overall, however, we observed that aspects of these programs' implementation are dissimilar to what might be undertaken for a DTV subsidy. First, choosing not to participate in any of the programs we reviewed would not cause a household to lose any existing service or functionality. In contrast, if a household chose not to take advantage of a DTV subsidy for which it was qualified, and then did not obtain the necessary equipment to receive broadcast digital signals, the household might lose access to broadcast television signals when the transition occurs. Additionally, none of the rebate programs we reviewed are comparable to the size of a potential DTV subsidy in terms of number of people served. While the national voucher programs serve millions of households, they are unlike the DTV subsidy in that they are long-established programs with an entire infrastructure designed to provide benefits to recipients on a recurring monthly basis. Due to differences in the scope of the rebate and voucher programs we reviewed and a potential DTV subsidy, it is not clear how applicable the administrative costs of these programs are to estimating the costs of a DTV subsidy.

### Other Efforts Necessary for the Completion of the DTV Transition Are Ongoing

If a subsidy program is implemented, it will pose many challenges for the implementing agency and industry. However, there are other aspects of the DTV transition not related to the implementation of possible subsidy program that are ongoing and will take time to complete or may pose their own challenges. For example:

- Under current FCC time frames, the final process for television stations to select their permanent channel placement for their digital signals is ongoing. Broadcast stations began the process of choosing their final DTV channel in February 2005.<sup>1</sup> In August 2006, FCC expects to issue a Notice of Proposed Rulemaking that includes a tentative DTV Table of Allotments once the channel election process is finished. FCC will seek comment on the proposed Table and then issue an order with a Final DTV Table of Allotments, which, at a minimum, would take several months. An FCC official told us that it would likely be sometime in 2007 before all the allotments are finalized. In order for the DTV Table of Allotments to be finalized by the end of 2006, FCC officials told us that they would need to shorten the channel election process time frames that they currently have in place. We were told that once stations know their final channel assignments, they might need to make adjustments to certain equipment. Therefore, we found that for stations that do not have certainty on their assignments until sometime in 2007, equipment modifications will be undertaken well into that year.
- Currently, a small number of television stations are not yet broadcasting digital signals. FCC told us that issues of technical interference and the permitting process for locating and constructing broadcast towers are the primary reasons these stations are not yet online with a digital broadcast signal. For example, for any station located within 200 miles of the Canadian border, coordination and approval from the Canadian government is required, in accordance with international treaties.
- At present, no requirements for the application of the Emergency Alert System (EAS) apply to stations' digital broadcast signals. FCC is now considering how requirements will be set. An FCC official told us that rules for EAS on DTV stations that are similar to requirements for analog stations should be developed within a few months, but additional work

<sup>1</sup>In the Matter of Second Periodic Review of the Commission's Rules and Policies Affecting the Conversion to Digital Television, MB Docket No. 03-15, Report and Order, FCC 04-192, released September 7, 2004, FCC established a multistep channel election and repacking process through which broadcast licensees will select their ultimate DTV channel (i.e., channels 2-51).

will look at whether there will be expanded functionality required in the digital environment. According to FCC, the equipment that stations will be required to purchase to meet the basic requirements that are likely to be set before the end of 2005 is not very expensive. Because the requirements for expanded functionality are not yet set, an FCC official told us that it is not clear what the cost of any additional equipment will be.

- Another challenge that may be posed by the DTV transition relates to antenna reception of digital over-the-air broadcast signals. Many stakeholders said that antennas currently used to view analog over-the-air signals will be sufficient to receive DTV signals and an FCC official told us that many viewers will have improved picture quality with digital signals. However, a few indicated that improved antenna technology may be needed for some households. An antenna manufacturer, a broadcaster, a retailer, and other stakeholders said that the ability to receive digital over-the-air signals is variable and contingent on each household's geography, among other things, and that some people may need new antennas or adjustment of existing antennas. In particular, we were told that adjusting the antenna to receive digital broadcast signals can be more difficult than analog signals because if the antenna is not aimed correctly, the television may not be able to display any signal. Also, while interference from trees, buildings, and other structures can distort an analog picture, this type of interference can cause a complete loss of digital signals.
- Ensuring that households understand the transition and how they will be affected is critical to a smooth transition. Any household that does not understand what will occur could be adversely affected. Over-the-air households are the most likely to be impacted by the transition because, to whatever extent cable subscribers will be affected, they will likely have support and information provided by their subscription video providers. Based on our work, other specific populations might also be more difficult to reach with needed information about the transition, including low-income households and those who do not speak English as a first language. The consequences of any information gaps are serious because households could lose their access to television signals. During our work on the transition to DTV in Berlin, Germany, we found that an extensive information campaign was widely viewed as critical to the success of the transition.

## Concluding Observations

There are many difficult decisions and determinations that will likely be considered if a subsidy program for DTV equipment is developed. In addition, there are unique interfaces between the challenges we identified and the administrative method used to deliver the subsidy that will require

careful consideration. For example, if such a program were developed and eligibility were limited to only low-income individuals, it might be advantageous to leverage the infrastructure and expertise that state social service agencies have in providing assistance to needy households. But to utilize the state agencies, the subsidy might need to be provided in the form of a voucher because the state agencies have experience mailing information and could mail a voucher to the low-income recipients of other assistance. In contrast, if there were no eligibility restrictions applied to the subsidy, a rebate might be a good method for administering the subsidy because it would draw on the existing relationships between manufacturers, retailers, and rebate fulfillment companies, all of whom have extensive knowledge and experience in developing, advertising, and implementing rebates. However, such a design might render the subsidy less usable by low-income Americans.

The return of the spectrum for public safety and commercial purposes is a critical goal for the United States. Implementing a subsidy program for DTV equipment poses a variety of difficult challenges and may not be the only policy option that could help advance the overall goal of reclaiming spectrum. Given the importance of this transition, it seems critical for knowledgeable officials in government and in industry to work together to find the best means to address any issues that may impede progress in completing the DTV transition—and the associated reclamation of valuable radiofrequency spectrum.

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.

## Contact and Acknowledgments

For questions regarding this testimony, please contact Mark L. Goldstein on (202) 512-2834 or [goldsteim@gao.gov](mailto:goldsteim@gao.gov). Individuals making key contributions to this testimony included Amy Abramowitz, Michael Clements, Andy Clinton, Simon Galed, Eric Hudson, Bert Japikse, and Sally Moino.

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# Enclosure II: GAO February 17, 2005, Testimony ([GAO-05-258T](#))

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**GAO**

For Release on Delivery  
Expected at 10:00 a.m. EST  
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United States Government Accountability Office

Testimony

Before the Subcommittee on  
Telecommunications and the Internet,  
Committee on Energy and Commerce,  
House of Representatives

## DIGITAL BROADCAST TELEVISION TRANSITION

### Estimated Cost of Supporting Set-Top Boxes to Help Advance the DTV Transition

Statement of Mark L. Goldstein, Director  
Physical Infrastructure Issues



**G A O**

Accountability \* Integrity \* Reliability

GAO-05-258T



Highlights of GAO-05-258T, a testimony before the Subcommittee on Telecommunications and the Internet, Committee on Energy and Commerce, House of Representatives

### Why GAO Did This Study

The digital television (DTV) transition offers the promise of enhanced television services. At the end of the transition, radiofrequency spectrum used for analog broadcast television will be used for other wireless services and for critical public safety services. To spur the digital transition, some industry participants and experts have suggested that the government may choose to provide a subsidy for set-top boxes, which can receive digital broadcast television signals and convert them into analog signals so that they can be displayed on *existing* television sets. This testimony provides information on (1) the current distribution of American households by television viewing methods and whether there are demographic differences among these groups; (2) the equipment required for households to receive digital broadcast signals; and (3) the estimated cost to the federal government, under various scenarios, of providing a subsidy for set-top boxes that would enable households to view digital broadcast signals.

We developed estimates of the cost of a subsidy for set-top boxes using data on household television characteristics, expected set-top box costs, and varied assumptions about how certain key regulatory issues will be decided.

[www.gao.gov/cgi-bin/gettrpt?GAO-05-258T](http://www.gao.gov/cgi-bin/gettrpt?GAO-05-258T).

To view the full product, including the scope and methodology, click on the link above. For more information, contact Mark L. Goldstein, (202) 512-2834, [goldsteinm@gao.gov](mailto:goldsteinm@gao.gov).

February 17, 2005

## DIGITAL BROADCAST TELEVISION TRANSITION

### Estimated Cost of Supporting Set-Top Boxes to Help Advance the DTV Transition

#### What GAO Found

The three primary means through which Americans view television signals are over the air, cable, and direct broadcast satellite (DBS). GAO found that 19 percent, or roughly 21 million American households, rely exclusively on free over-the-air television; 57 percent, or nearly 64 million households, view television via a cable service; and 19 percent, or about 22 million households, have a subscription to a direct broadcast satellite (DBS) service. On average, over-the-air households are more likely to have lower incomes compared to cable and DBS households. While 48 percent of over-the-air households have incomes under \$30,000, roughly 29 percent of cable and DBS households have incomes less than that level. Also, 6 percent of over-the-air households have incomes over \$100,000, while about 13 percent of cable and DBS households have incomes exceeding \$100,000.

The specific equipment that each household needs to transition to DTV—that is, to be able to view digital broadcast signals—depends on the method through which the household watches television, whether the household has already upgraded its television equipment to be compatible with DTV, and the resolution of certain key regulatory issues. GAO examined two key cases regarding the regulatory issues. The assumption for case one is that cable and DBS providers would continue providing broadcasters' signals as they currently do, thus eliminating the need for their subscribers to acquire new equipment. In this case, only households viewing television using only an over-the-air antenna would need to take action to be able to view broadcasters' digital signals. The assumption for the second case is that cable and DBS providers would be required to provide broadcasters' digital signals to subscribers in substantially the same format as broadcasters transmitted those signals. This would require cable and DBS subscribers, in addition to over-the-air households, to have equipment in place to be able to receive their providers' high-definition digital signals.

If a subsidy for set-top boxes is only needed for over-the-air households (case one), GAO estimates that its cost could range from about \$460 million to about \$2 billion, depending on the price of the set-top boxes and whether a means test—which would limit eligibility to only those households with incomes lower than some specified limit—is employed. If cable and satellite subscribers also need new equipment (case two), the cost of providing the subsidy could range from about \$1.8 billion to approximately \$10.6 billion.

We provided a draft of this testimony to the Federal Communications Commission (FCC) for their review and comment. FCC staff provided technical comments that we incorporated where appropriate.

United States Government Accountability Office

Mr. Chairman and Members of the Subcommittee:

I am pleased to be here today to report on our work on the potential cost of providing a subsidy to consumers for the purchase of set-top boxes in order to accelerate the transition from analog to digital broadcast television. This transition—known as the DTV transition—offers the promise of more programming options, interactive services, and high-definition television (HDTV). Moreover, the return of radiofrequency spectrum used for analog broadcast television at the end of the transition will provide many benefits to society, such as easing the spectrum scarcity facing public safety first responders, engendering economic growth and consumer value from spectrum redeployed to wireless services, and affording the federal government revenues from the proceeds of a spectrum auction. To facilitate the transition, the Congress and the Federal Communications Commission (FCC) temporarily provided television stations nationwide with additional spectrum so that stations could simultaneously broadcast both an analog and a digital signal. Stations' analog licenses are mandated to terminate in December 2006, or when 85 percent of households in each market can receive digital broadcast signals, whichever is later.<sup>1</sup> While the purchase of digital televisions is steadily increasing, it nevertheless appears unlikely that a sufficient proportion of households will have digital television equipment in place by the end of 2006.

In order to spur households' adoption of the digital equipment necessary for the transition, some have suggested that the government provide a subsidy to certain households to purchase a device, known as a set-top box, that can receive digital broadcast television signals and convert them into analog signals so that they can be displayed on *existing* television sets. This device would enable the household to view digital broadcast signals without purchasing a digital television set; such sets currently sell at considerably higher prices than traditional analog television sets. Aiding in the deployment of set-top boxes may enable the transition to end sooner than it might otherwise by increasing the number of households that can view digital broadcast signals.

<sup>1</sup>Additional requirements include (1) television stations affiliated with the four largest national networks (ABC, CBS, Fox, and NBC) are broadcasting a DTV signal and (2) the technology to convert a digital signal for use on an analog television set is generally available.

At the request of this subcommittee, we have examined (1) the current distribution of American households by television viewing methods and whether there are demographic differences among these groups; (2) the equipment required for households to receive digital broadcast signals; and (3) the estimated cost to the federal government, under various scenarios, of providing a subsidy for set-top boxes that would enable households to view digital broadcast signals. In addition to information provided in this testimony, we are conducting additional work on the DTV transition, subsidy options, and administrative approaches for implementing a subsidy program, and will provide a more detailed study for the Committee and the Subcommittee later this year.

While a subsidy for set-top boxes may be one policy option to spur the transition, there are other policies that might do so as well. In our statement today, we provide cost estimates for a possible subsidy program under various scenarios. We note, however, that in providing these cost estimates, GAO is taking no position on this policy option. We are merely providing, as requested by the Committee and the Subcommittee, cost estimates for such a program.

To address the issues we will discuss today, we purchased data from Knowledge Networks, a survey research firm that had conducted a consumer survey on household television characteristics. The survey provided the responses of 2,471 randomly selected American households and covers such topics as the method each household uses to view television (e.g., cable, over the air), how many television sets they have, and whether they have set-top boxes for digital cable service. The survey also provides information on an array of demographic characteristics for each household. These data were collected between February and April 2004. The response rate for Knowledge Network's survey was 47 percent. The relevance of the response rate for the study's findings is discussed in appendix I.<sup>2</sup> Using a 95 percent confidence interval, all percentage estimates from the survey have margins of error of plus or minus 6 percentage points or less, and all cost estimates based on the survey data have margins of error of plus or minus 16 percent or less. To assess the reliability of these survey data, we reviewed documentation of survey

<sup>2</sup>Because we did not have information on those contacted who chose not to participate in the survey, we could not estimate the impact of the nonresponse on our results. However, distributions of selected household characteristics (including presence of children, race, and household income) for the sample and the U.S. Census estimate of households show a similar pattern.

procedures provided by Knowledge Networks and questioned knowledgeable officials about the survey process and resulting data. We determined that the data were sufficiently reliable for the purposes of this testimony. We also contracted with Knowledge Networks to recontact some of respondents to its survey to ask additional questions that GAO developed.<sup>3</sup> Because the number of recontacted households for the additional questions requested by GAO was small, the findings for these questions are not generalizable to a larger population. To gather information about the likely costs of set-top boxes, we interviewed several consumer electronics firms and experts.

The estimate of the potential cost of a subsidy that we are providing should not be interpreted as the cost of a government program. In preparing these estimates we discussed the nature of our work with Congressional Budget Office (CBO). If the Congress considers legislation for a set-top box subsidy program, the CBO will, based on the specifics of the law, prepare an estimate of the cost of the program. We conducted our work from August 2004 to January 2005 in accordance with generally accepted government auditing standards.

We provided a draft of this testimony to the Federal Communications Commission (FCC) for their review and comment. FCC staff provided technical comments that we incorporated where appropriate.

In summary:

- The three primary means through which Americans view television signals are over the air, cable, and direct broadcast satellite (DBS). We found that 19 percent, or roughly 21 million American households, rely exclusively on over-the-air transmissions for their television viewing; 57 percent, or nearly 64 million American households, view television via a cable service; and about 19 percent, or about 22 million American households, have a subscription to a DBS service.<sup>4</sup> We recognize that others have estimated a

<sup>3</sup>The additional questions were related to why the household chose to view television as they currently do and whether they are likely to make changes in the viewing methods in the near future.

<sup>4</sup>These percentages do not add up to 100 percent because (1) between 1 and 2 percent of American households do not have a television, (2) about 1 percent of households receive television service through other means, such as a wireless cable system, and (3) the numbers reported here do not include close to 3 percent of households that reported having a subscription to both cable and DBS.

lower value for the percent of households relying on over the air television.<sup>5</sup> Our results were derived from a survey of over 2,400 households, from which we estimated with 95 percent certainty that between 17 and 21 percent of households rely on over the air television. On average, over-the-air households are more likely to have lower incomes compared to cable or DBS households. While 48 percent of over-the-air households have incomes under \$30,000,<sup>6</sup> roughly 29 percent of both cable and satellite homes had household incomes less than or equal to that level. Also, only 6 percent of over-the-air households had incomes over \$100,000, while about 13 percent of cable and satellite households had incomes exceeding \$100,000. Additionally, non-white and Hispanic households are more likely to rely on over-the-air television than are white and non-Hispanic households.

- The specific equipment needs for each household to transition to DTV—that is, to be able to view broadcast digital signals—depends on certain key factors. First, the method through which a household watches television and whether it has already upgraded its television equipment to be compatible with digital television, will factor into the equipment needs of the household. Additionally, certain regulatory decisions yet to be made by FCC will play a role in determining some consumers' equipment needs. We examined two key cases regarding the regulatory decisions.
- In case one, we assume that cable and DBS providers would continue providing broadcasters' signals as they currently do, thus eliminating any need for their subscribers to acquire new equipment. That is, cable providers would initially "downconvert"<sup>7</sup> broadcasters' high-definition digital signals to an analog format before they are transmitted to their subscribers. Similarly, DBS providers would initially downconvert broadcasters' high-definition digital signals to a standard-definition digital format before they are transmitted to their subscribers. This enables the signals to be viewed on subscribers' existing televisions

<sup>5</sup>In its most recent report on video competition, FCC found that number of households subscribing to a multichannel video provider, such as a cable or DBS company, was approximately 85 percent of television households, thus implying that about 15 percent of television households rely on over-the-air television. The methodology employed by FCC differed from the household survey used to prepare our estimate.

<sup>6</sup>For a family of four, the poverty level is just under \$19,000, so the \$30,000 income level would correspond to about 160 percent of the 2004 poverty level for a family of four. The cutoff for eligibility for food stamps is 175 percent of the poverty level.

<sup>7</sup>The word "downconvert" means to take a signal in a given format and transform it into a lower-resolution format.

sets. In this case, only households viewing television using only an over-the-air antenna must take action to be able to view broadcasters' digital signals.

- In case two, we assume that cable and DBS providers would be required to provide broadcasters' digital signals to subscribers in substantially the same format as broadcasters transmitted those signals. Because some of the broadcasters' digital transmissions are in a high-definition digital format, the second case would require cable and DBS providers to transmit the signals in this format to their subscribers. To be able to view these signals, cable and DBS subscribers would need to have equipment in place, or to acquire new equipment, that can receive their providers' *high-definition* digital signals. The second case would also require, as does case one, all over-the-air households to acquire new equipment.
- If a subsidy for set-top boxes were needed only for over-the-air households, we estimate that its cost could range from about \$460 million to about \$2 billion. The subsidy cost varies depending on the price of the set-top boxes and whether a means test—which would limit eligibility for the subsidy to only those households with incomes lower than some specified limit—were employed. However, if cable and satellite subscribers also needed new equipment and the subsidy provides some support for these households as well, the overall cost of the program would grow. We estimate that in this case, the cost of providing the subsidy could range from about \$1.8 billion to over \$10 billion, depending, again, on the price of the set-top boxes and whether a means test were employed.

## Background

The United States is currently undergoing a transition from analog to digital broadcast television. 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. 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. This increased efficiency makes multicasting—where several digital television signals are transmitted in the same amount of

spectrum necessary for one analog television signal—and HDTV<sup>8</sup> services possible.

A primary goal of the DTV transition is for the federal government to reclaim spectrum that broadcasters currently use to provide analog television signals. The radiofrequency spectrum is a medium that enables many forms of wireless communications, such as mobile telephone, paging, broadcast television and radio, private radio systems, and satellite services. Because of the virtual explosion of wireless applications in recent years, there is considerable concern that future spectrum needs—both for commercial as well as government purposes—will not be met. The spectrum that will be cleared at the end of the DTV transition is considered highly valuable spectrum because of its particular technical properties. In all, the DTV transition will clear 108 megahertz of spectrum—a fairly significant amount. In the Balanced Budget Act of 1997, the Congress directed FCC to reallocate 24 MHz of the reclaimed spectrum to public safety uses. Since the terrorist attacks of September 11, 2001, there has been a greater sense of urgency to free spectrum for public safety purposes. The remaining returned spectrum will be auctioned for use in advanced wireless services, such as wireless high-speed Internet access.<sup>9</sup>

To implement the DTV transition, television stations must provide a digital signal, which requires them to upgrade their transmission facilities, such as transmission lines, antennas, and digital transmitters and encoders. Depending on individual station's tower configuration, the digital conversion may require new towers or upgrades to existing towers. Most television stations throughout the country are now providing a digital broadcast signal in addition to their analog signal. After 2006, the transition will end in each market—that is, analog signals will no longer be provided—when at least 85 percent of households have the ability to receive digital broadcast signals.

<sup>8</sup>HD television provides roughly twice as many lines of resolution, creating a television picture that is much sharper than traditional analog television pictures. HD television can also provide CD-quality sound and is in “widescreen” format, with display screen ratios similar to a movie theater.

<sup>9</sup>Some of this spectrum—24 MHz—has already been auctioned.

### Americans Watch Television through Three Primary Modes

The three primary means through which Americans view television signals are over the air, cable, and direct broadcast satellite (DBS). Over-the-air broadcast television, which began around 1940, uses radiofrequencies to transmit television signals from stations' television towers to households' television antennas mounted on rooftops, in attics, or directly on television sets. Over-the-air television is a free service. Cable television service, a pay television service, emerged in the late 1940s to fill a need for television service in areas with poor over-the-air reception, such as mountainous or remote areas. Cable providers run localized networks of cable lines that deliver television signals from cable facilities to subscribers' homes.<sup>10</sup> Cable operators provide their subscribers with, on average, approximately 73 analog television channels and 150 digital television channels. In 1994, a third primary means of providing television emerged: direct broadcast satellite (DBS). Subscribers to DBS service use small reception dishes that can be mounted on rooftops or windowsills to receive television programming beamed down from satellites that orbit over the equator. Like cable, DBS service is a subscription television service that provides consumers with many channels of programming. When the Congress enacted the Satellite Home Viewer Improvement Act of 1999, it allowed DBS carriers to provide local broadcast signals—such as the local affiliate of ABC or NBC—which they had previously not generally been able to provide.

**Over-the-Air Households.** We found that 19 percent, or 20.8 million American households, rely exclusively on over-the-air transmissions for their television viewing. We recognize that others have estimated a lower value for the percent of households relying on over the air television. Our results were derived from a survey of over 2,400 households, from which we estimated with 95 percent certainty that between 17 and 21 percent of households rely on over the air television. Compared to households that purchase a subscription to cable or DBS service, we found that exclusive over-the-air viewers are somewhat different demographically. Overall, over-the-air households are more likely to have lower incomes than cable or satellite households. Approximately 48 percent of exclusive over-the-air viewers have household incomes less than \$30,000, and 6 percent have household incomes over \$100,000. Additionally, nonwhite and Hispanic households are more likely to rely on over-the-air television than are white

<sup>10</sup>When cable service first emerged, it was simply a service that provided a wire-based delivery of broadcast, or traditional television stations' signals, but by the late 1970s, cable operators began to provide new networks that were only available through a pay television service, such as HBO, Showtime, and ESPN.

and non-Hispanic households; over 23 percent of non-white households rely on over-the-air television compared to less than 16 percent of white households, and about 28 percent of Hispanic households rely on over-the-air television compared to about 17 percent of non-Hispanic households. Finally, we found that, on average, exclusive over-the-air households have 2.1 televisions, which is lower than the average for cable and satellite households.

We asked the survey research firm to recontact approximately 100 of the respondents who exclusively watch television through over-the-air transmission to ask additional questions, including the primary reason the household does not purchase a subscription video service.<sup>11</sup> Forty-one of these respondents said that it was too costly for them to purchase a subscription video service, and 44 said that they do not watch enough television to warrant paying for television service. Most of the recontacted households seemed unlikely to purchase a subscription service in the near future. Only 18 of the recontacted households said that they would be likely to purchase a subscription video service in the near future, and another 10 said that they might do so.

**Cable Households.** We found that 57 percent, or 63.7 million American households, view television through a cable service. On average, cable households have 2.7 television sets. Sixteen percent of cable households have at least one television set in the home that is not connected to cable but instead receives only over-the-air television signals. Of the cable households surveyed, roughly 29 percent had household incomes of less than or equal to \$30,000, and about 13 percent had incomes exceeding \$100,000. We also found that 44 percent of the cable homes have at least one set-top box. Of those cable subscribers with a set-top box, about 67 percent reported that their box is capable of viewing channels the cable system sells on “digital cable tiers,” meaning that the channels are transmitted by their cable provider in a digital format. A subset of these “digital cable” customers have a special set-top box capable of receiving their providers’ transmission of *high-definition* digital signals.

Because the existence of a set-top box in the home may be relevant for determining what equipment households would need to view broadcast digital television signals, we asked the survey research firm to recontact approximately 100 cable households that *do not have a set-top box* to ask

<sup>11</sup>The actual recontacted number was 102.

questions about their likely purchase of digital cable tiers—which require a set-top box—in the near future.<sup>12</sup> First, we asked the primary reason why the household did not currently purchase any cable digital tiers of programming. Fifty-one of the recontacted respondents said that they did not want to bear the extra expense of digital tiers of cable programming, and 33 said that they did not watch enough television to justify purchasing digital cable service. Only 9 of the recontacted respondents said that they would be likely to purchase digital cable service in the near future, and another 9 said that they might purchase such service in the near future. Finally, we asked these respondents whether they would be reluctant to change their service in any way that would require them to use a set-top box. Of the recontacted respondents, 37 said they would be very reluctant to change their service in a way that would require them to use a set-top box, and another 38 said that they would be somewhat reluctant to do so.

**DBS Households.** We found that about 19 percent, or 21.7 million American households, have a subscription to a DBS service. These households have, on average, 2.7 television sets. About one-third of these households have at least one television set that is not hooked to their DBS dish and only receives over-the-air television signals. In terms of income, 29 percent of DBS subscribers have incomes less than or equal to \$30,000, and 13 percent have incomes exceeding \$100,000.

One important difference between cable and DBS service is that not all DBS subscribers have the option of viewing local broadcast signals through their DBS provider.<sup>13</sup> Although the DBS providers have been rolling out local broadcast stations in many markets around the country in the past few years, not all markets are served. DBS subscribers in markets without local broadcast signals available through their DBS provider usually obtain their local broadcast signals through an over-the-air antenna, or through a cable connection. This is important to the DTV transition because how households with DBS service view their local broadcast channels will play into the determination of their requirements to transition to broadcast DTV. We therefore requested that the survey research firm recontact approximately 100 DBS customers to ask how

<sup>12</sup>The firm actually recontacted 102 such households.

<sup>13</sup>While cable providers are generally required to provide the local broadcast signals in each market, DBS providers are required to provide *all* local broadcast stations in markets where they provide any of those stations.

they receive their local broadcast channels.<sup>14</sup> We found that when local channels are available to DBS subscribers, they are very likely to purchase those channels. Well more than half of the DBS subscribers who were recontacted viewed their local broadcast channels through their DBS service. Nearly one-fourth of the recontacted DBS subscribers view their local broadcast channels through free over-the-air television. As DBS providers continue to roll out local channels to more markets, the percentage of DBS subscribers relying on over-the-air transmissions to view local signals will likely decline.

### Households' Equipment Needs for DTV Transition Will Depend on their Mode of Television Viewing and Current Equipment Status, and Will Also Be Affected by Regulatory Decisions

The specific equipment needs for each household to transition to DTV—that is, to be able to view broadcast digital signals—depends on certain key factors: the method through which a household watches television, the television equipment the household currently has, and certain critical regulatory decisions yet to be made. In this section we discuss two cases regarding a key regulatory decision that will need to be made and the implications that decision will have on households' DTV equipment needs.

Before turning to the two cases, a key assumption underlying this analysis must be discussed. Currently, broadcasters have a right to insist that cable providers carry their analog television signals. This is known as the “must carry” rule, and dates to the Cable Television Consumer Protection and Competition Act of 1992. FCC made a determination that these must carry rules will apply to the digital local broadcast signals once a station is no longer transmitting an analog signal. In our analysis, we assume that the must carry right applies to broadcasters' digital signals, and as such, cable providers are generally carrying those signals. DBS providers face some must carry rules as well, although they are different in some key respects from the requirements that apply to cable providers. For the purposes of this analysis, we assume that to the extent that DBS providers face must carry requirements, those requirements apply to the digital broadcast signals.

For nearly all cable subscribers, and more than half of the DBS subscribers, local broadcast analog signals are provided by their subscription television provider. This means that these providers capture the broadcasters' signals through an antenna or a wire and retransmit those signals by cable or DBS to subscribers. We make two disparate

<sup>14</sup>They actually recontacted 102 such households.

assumptions, which we call case one and case two, about how cable and DBS providers might provide digital broadcast signals to subscribers. We do not suggest that these are the only two possibilities regarding how the requirements for carriage of broadcast signals might ultimately be decided—these are simply two possible scenarios.

**Case One.** In this case, we assume that cable and DBS providers will continue providing broadcasters' signals as they currently do. This assumption would be realized if cable and DBS providers initially downconvert broadcasters' digital signals at the *providers' facilities*, which may require legislative or regulatory action. That is, cable providers would initially downconvert broadcasters' high-definition digital signals to an analog format before they are transmitted to their subscribers. Similarly, DBS providers would initially downconvert broadcasters' high-definition digital signals to a standard-definition digital format before they are transmitted to their subscribers. In this case, there would be no need for cable and DBS subscribers to acquire new equipment; only households viewing television using only an over-the-air antenna must take action to be able to view broadcasters' digital signals. This case shares many attributes with the recently-completed DTV transition in Berlin, Germany.

All over-the-air households—which account for approximately 21 million households in the United States—must do one of two things to be able to view digital broadcast signals.<sup>15</sup> First, they could purchase a digital television set that includes a tuner capable of receiving, processing, and displaying a digital signal. The survey data we used indicated that only about 1 percent of over-the-air viewers have, as of now, purchased a digital television that contains a tuner. However, some large televisions sold today are required to include such a tuner and by July 2007, all television sets larger than 13 inches are required to include a tuner. After that time, consumers who purchase new television sets will automatically have the capability of viewing digital signals. Approximately 25 to 30 million new television sets are purchased each year in the United States. The second option available to over-the-air households is to purchase a digital-to-analog set-top box. That is, for those households that have not purchased a new television set, the set-top box will convert the digital broadcast signals to analog so that they can be viewed on an existing analog television set. Viewers with digital-to-analog set-top boxes would

<sup>15</sup> Additionally, these households could also choose to subscribe to cable or DBS service to eliminate the need to acquire additional equipment to view a television signal over the air.

not actually see the broadcast digital signal in a digital format, but would be viewing that signal after it has been downconverted, by the set-top box, to be compatible with their existing analog television set. Currently, simple set-top boxes that only have the function of downconverting digital signals to analog are not on the market. More complex boxes that include a variety of functions and features, including digital to analog downconversion, are available, but at a substantial cost. However, manufacturers told us that simple, and less expensive, set-top boxes would come to the market when a demand for them develops.

**Case Two.** In the second case, we assume that cable and DBS companies would be required to provide the broadcasters' signals to their subscribers in substantially the same format as it was received from the broadcasters. Because some of the broadcasters' signals are in a high-definition digital format, cable and DBS subscribers—just like over-the-air households—would need to have the equipment in place to be able to receive high-definition digital signals. There are several ways these subscribers could view these signals:

- Cable or DBS subscribers would be able to view digital broadcast television if they have purchased a digital television set with an over-the-air digital tuner. They would then have the capability of viewing local digital broadcast stations through a traditional television antenna—just like an over-the-air viewer. However, many cable and DBS households may want to continue to view broadcast television signals through their cable or DBS provider.
- Cable or DBS subscribers could purchase a digital television with a “cable card” slot. By inserting a “card” provided by the cable company into such a television, subscribers can receive and display the digital content transmitted by the cable provider. Only very recently, however, have cable-ready digital television sets—which allow cable subscribers to receive their providers' digital signals directly into the television set—come to the market. Similar televisions sets with built-in tuners for satellite digital signals are not currently on the market.
- To view the high-definition signals transmitted by their subscription provider, the other possibility for cable and DBS households would be to have a set-top box that downconverts the signals so that they can be displayed on their existing analog television sets. That is, any downconversion in this scenario takes place at the *subscribers' household*, as opposed to the subscription television providers' facilities, as in case one. While all DBS subscribers and about a third of cable subscribers have set-top boxes that enable a digital signal from their provider to be

converted to an analog signal for display on existing television sets, few of these set-top boxes are designed for handling *high-definition* digital signals. As such, if broadcasters' signals are transmitted by cable and DBS providers in a high-definition format, not all cable and satellite subscribers would need new equipment, although most would. In case two, as in case one, all exclusively over-the-air households need a digital television set or a set-top box.

### Cost of Federal Subsidy for Set-Top Boxes Varies Considerably, Depending on Several Factors

In this section we present the estimated cost of providing a subsidy to consumers for the purchase of a set-top box that would be designed to advance the digital television transition. The estimated subsidy costs presented here vary based on (1) the two cases discussed above about whether cable and DBS providers initially downconvert broadcasters' digital signals at their facilities before transmitting them to subscribers; (2) varied assumptions about whether a means test is imposed and, if so, at what level; and (3) the expected cost of a simple digital-to-analog set-top box. All of the estimates presented here assume that only one television set is subsidized in each household that is determined to be eligible for the subsidy.<sup>16</sup>

**Means test.** Imposing a means test would limit the subsidy to only those households determined to be in financial need of a subsidy. A means test would limit eligibility for the subsidy to only those households with incomes lower than some specified limit. We employed two different levels of means tests. The scenarios with means tests are roughly based on 200 percent and 300 percent of the poverty level<sup>17</sup> as the income threshold under which a household's income must lie to be eligible for the subsidy. The poverty level is determined based on both income and the number of persons living in the household; for a family of four the official federal poverty level in 2004 was \$18,850.

**Set-top boxes.** We provide estimates based on two possible price levels for the boxes: \$50 and \$100. This range is based on conversations we had with consumer electronics manufacturers who will likely produce set-top boxes in the future. Set-top boxes for cable and DBS are often rented by

<sup>16</sup>In our final report that will be issued later this year, we will also present scenarios under which more than one television set per household is subsidized.

<sup>17</sup>See appendix I for a methodological discussion and assumptions surrounding our determination of thresholds used to approximate the poverty level.

subscribers, rather than purchased. Nevertheless, in cases where cable and DBS subscribers need new equipment, we assume that the financial support provided to them would be equivalent to that provided to over-the-air households.

Table 1 provides the cost of a subsidy program under the assumption that cable and DBS providers downconvert broadcasters' signals at their facilities in a manner that enables them to continue to transmit those signals to subscribers as they currently transmit broadcasters' signals. In this case, cable or DBS subscribers do not require any new equipment, so only over-the-air households—approximately 21 million American households—would need new equipment. As shown in table 1, there is considerable variation in the cost of the subsidy program depending on the level of a means test and the price of the set-top box.

**Table 1: Estimated Cost of Set-Top Box Subsidy, Assuming Cable and DBS Downconversion, only Over-the-Air Households Are Subsidized**

| Assumption about means test         | Percent of over-the-air households eligible | Number of households subsidized (in millions) | Cost of subsidy, by estimated cost of set-top box (dollars in millions) |                                |
|-------------------------------------|---------------------------------------------|-----------------------------------------------|-------------------------------------------------------------------------|--------------------------------|
|                                     |                                             |                                               | \$50 set-top box                                                        | \$100 set-top box              |
| Means test at 200% of poverty level | 50% of over-the-air households              | 9.3<br>(7.8 - 10.7)                           | \$463<br>(\$391 - \$534)                                                | \$925<br>(\$782 - \$1,068)     |
| Means test at 300% of poverty level | 67 % of over-the-air households             | 12.5<br>(10.9 - 14.1)                         | \$626<br>(\$545 - \$707)                                                | \$1,252<br>(\$1,090 - \$1,415) |
| No means test                       | All over-the-air households                 | 20.8<br>(19.1 - 22.6)                         | \$1,042<br>(\$954 - \$1,130)                                            | \$2,083<br>(\$1,907 - \$2,259) |

Source: GAO.

Notes: Ninety-five percent confidence intervals in parentheses.

Analysis based on the status of television households in 2004.

Table 2 provides the cost of a subsidy program under the assumption that cable and DBS providers are required to transmit broadcasters' digital signals in the same format as they are received. Under this scenario, nearly all over-the-air households and most cable and DBS subscribers will not have the equipment in place to view high-definition digital broadcast signals. Although subscribers typically rent, rather than purchase, set-top boxes, we assume that the same level of subsidy is provided to these

households as is provided to over-the-air households to defray the cost of having to obtain a new or upgraded set-top box from their provider.

**Table 2: Estimated Cost of Set-Top Box Subsidy, No Cable or DBS Downconversion, Subsidy Provided to Over-the-Air and Cable and DBS Households**

| Assumption about means test         | Percent of U.S. households eligible | Number of households subsidized (in millions) | Cost of subsidy, by estimated cost of set-top box (dollars in millions) |                                   |
|-------------------------------------|-------------------------------------|-----------------------------------------------|-------------------------------------------------------------------------|-----------------------------------|
|                                     |                                     |                                               | \$50 set-top box                                                        | \$100 set-top box                 |
| Means test at 200% of poverty level | 31% of households                   | 35.1<br>(32.7 - 37.5)                         | \$1,753<br>(\$1,633 - \$1,873)                                          | \$3,506<br>(\$3,266 - \$3,745)    |
| Means test at 300% of poverty level | 50% of households                   | 55.5<br>(52.9 - 58.1)                         | \$2,775<br>(\$2,646 - \$2,904)                                          | \$5,551<br>(\$5,293 - \$5,809)    |
| No means test                       | Nearly all households               | 106.2<br>(105.1 - 107.3)                      | \$5,312<br>(\$5,257 - \$5,367)                                          | \$10,624<br>(\$10,514 - \$10,734) |

Source: GAO.

Notes: Ninety-five percent confidence intervals in parentheses.

Analysis based on the status of television households in 2004.

There are two issues that stand as important caveats to the analyses we have presented on estimated set-top box subsidy costs. The first is that we based the majority of the analyses on survey results that provide information on the status of American television households as of early 2004. Over the next several years, new households will be established, some households might change the means through which they watch television, televisions sets with integrated digital over-the-air tuners as well as digital cable compatibility will be purchased, and some cable and DBS households will have obtained set-top boxes capable of receiving high-definition digital signals from their providers. Households' purchase of certain new equipment could obviate the need for a subsidy for new television equipment. For example, some households may purchase a digital television set with an over-the-air tuner and begin to view digital broadcast signals in this manner; some large televisions sold today are required to include such a tuner and by July 2007, all television sets larger than 13 inches are required to include a tuner. In time, these factors could

have the effect of reducing the cost of a set-top box subsidy because fewer households would need to be subsidized.<sup>18</sup>

The second caveat to these analyses is that these subsidy estimates do not include any costs associated with *implementing* a subsidy program. If the federal government determines that it would be worthwhile to provide this subsidy, the subsidy would need to be administered in some fashion, such as through a voucher system, a tax credit, a mail-in rebate, government distribution of equipment, or some other means. Any of these methods would impose costs that could be significant for the federal government and any other entities involved in administering the program. Such costs would be difficult to estimate until a host of decisions are made about how a subsidy program would be administered.

As I mentioned earlier, our work on the DTV transition continues, and we will provide more information in a report later this year. We will discuss various ways that a subsidy program might be administered and provide some analysis of the benefits and drawbacks of these various methods. We will also provide a discussion of how information regarding the DTV transition and any associated subsidy program might best be provided to the American people.

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.

## Contact and Acknowledgments

For questions regarding this testimony, please contact Mark L. Goldstein on (202) 512-2834 or goldsteinm@gao.gov. Individuals making key contributions to this testimony included Amy Abramowitz, Dennis Amari, Michael Clements, Andy Clinton, Michele Fejfar, Simon Galed, Eric

<sup>18</sup>As we mentioned above, if at a later date the Congress considers legislation for a set-top box subsidy program, the CBO will, based on the specifics of the law, prepare an estimate of the cost of the program.

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Hudson, Catherine Hurley, Bert Japikse, Sally Moino, Karen O'Connor, and  
Madhav Panwar.

## Appendix I: Methodology for Use of Survey Data Regarding Television Viewing

To obtain information on the types of television service and equipment used by U.S. households, we purchased existing survey data from Knowledge Networks Statistical Research. Their survey was completed with 2,375 of the estimated 5,075 eligible sampled individuals for a response rate of 47 percent; partial interviews were conducted with an additional 96 people, for a total of 2,471 individuals completing some of the survey questions. The survey was conducted between February 23 and April 25, 2004.

The study procedures yielded a sample of members of telephone households in the continental United States using a national random-digit dialing method. Survey Sampling Inc. (SSI) provided the sample of telephone numbers, which included both listed and unlisted numbers and excluded blocks of telephone numbers determined to be nonworking or business-only. At least five calls were made to each telephone number in the sample to attempt to interview a responsible person in the household. Special attempts were made to contact refusals and convert them into interviews; refusals were sent a letter explaining the purpose of the study and an incentive. Data were obtained from telephone households and are weighted by the number of household telephone numbers.

As with all sample surveys, this survey is subject to both sampling and nonsampling errors. The effect of sampling errors due to the selection of a sample from a larger population can be expressed as a confidence interval based on statistical theory. The effects of nonsampling errors, such as nonresponse and errors in measurement, may be of greater or lesser significance but cannot be quantified on the basis of available data.

Sampling errors arise because of the use of a sample of individuals to draw conclusions about a much larger population. The study's sample of telephone numbers is based on a probability selection procedure. As a result, the sample was only one of a large number of samples that might have been drawn from the total telephone exchanges from throughout the country. If a different sample had been taken, the results might have been different. To recognize the possibility that other samples might have yielded other results, we express our confidence in the precision of our particular sample's results as a 95 percent confidence interval. We are 95 percent confident that when only sampling errors are considered each of the confidence intervals in this report will include the true values in the study population. All percentage estimates from the survey have margins of error of plus or minus 6 percentage points or less, unless otherwise noted.

In addition to the reported sampling errors, the practical difficulties of conducting any survey introduce other types of errors, commonly referred to as nonsampling errors. For example, questions may be misinterpreted, some types of people may be more likely to be excluded from the study, errors could be made in recording the questionnaire responses into the computer-assisted telephone interview software, and the respondents' answers may differ from those who did not respond. Knowledge Networks has been fielding versions of this survey for over 20 years. In addition, to reduce measurement error, Knowledge Networks employs interviewer training, supervision, and monitoring, as well as computer-assisted interviewing to reduce error in following skip patterns.

For this survey, the 47 percent response rate is a potential source of nonsampling error; we do not know if the respondents' answers are different from the 53 percent who did not respond. Knowledge Networks took steps to maximize the response rate—the questionnaire was carefully designed and tested through deployments over many years, at least five telephone calls were made at varied time periods to try to contact each telephone number, the interview period extended over about 8 weeks, and attempts were made to contact refusals and convert them into interviews.

Because we did not have information on those contacted who chose not to participate in the survey, we could not estimate the impact of the nonresponse on our results. Our findings will be biased to the extent that the people at the 53 percent of the telephone numbers that did not yield an interview have different experiences with television service or equipment than did the 47 percent of our sample who responded. However, distributions of selected household characteristics (including presence of children, race, and household income) for the sample and the U.S. Census estimate of households show a similar pattern.

To assess the reliability of these survey data, we reviewed documentation of survey procedures provided by Knowledge Networks, interviewed knowledgeable officials about the survey process and resulting data, and performed electronic testing of the data elements used in the report. We determined that the data were sufficiently reliable for the purposes of this report.

Due to limitations in the data collected, we made several assumptions in the analysis. Number of televisions and number of people in the household were reported up to five; households exceeding four for either variable were all included in the category of five or more. For the purposes of our analyses, we assumed that households had no more than five televisions

that would need to be transitioned and no more than five people. Number of people in the household was only used in calculating poverty, but may result in an underestimate of those households in poverty.

Calculations of poverty were based on the 2004 Poverty Guidelines for the 48 contiguous states and the District of Columbia, published by the Department of Health and Human Services. We determined whether or not each responding household would be considered poor at roughly 200 percent and 300 percent of the poverty guidelines. Income data were reported in categories so the determination of whether or not a household met the 200 percent or 300 percent threshold required approximation, and for some cases this approximation may have resulted in an overestimate of the number of poor households. In addition, income data were missing for 24 percent of the respondents. To conduct the analyses involving poverty, we assumed that the distribution of those in varying poverty status was the same for those reporting and not reporting income data. Comparisons of those reporting and not reporting income data show some possible differences on variables examined for this report; however, the income distribution is very close to the 2003 income estimates published by the U.S. Census Bureau.

To determine total numbers of U.S. households affected by the transition and total cost estimates for various transition scenarios, we used the U.S. Census Bureau's Current Population Survey estimate of the total number of households in the United States as of March 2004. To derive the total number of households covered by the various scenarios, we multiplied this estimate by the proportions of households covered by the scenarios derived from the survey data. The standard error for the total number of U.S. households was provided by the Census Bureau, and the standard errors of the total number of households covered by the scenarios take into account the variances of both the proportions from the survey data and the total household estimate. All cost estimates based on the survey data have margins of error of plus or minus 16 percent or less.

In addition, we contracted with Knowledge Networks to recontact a sample of their original 2004 survey respondents in October 2004. Households were randomly selected from each of three groups: broadcast-only television reception, cable television service without a set-top box, and satellite television service. For each group, 102 interviews were completed, yielding 306 total respondents (for a 63 percent response rate). To reduce measurement error, the survey was pretested with nine respondents, and Knowledge Networks employed interviewer training, supervision, and monitoring, as well as computer-assisted interviewing, to

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reduce error in following skip patterns. Due to the small sample size, the findings of these questions are not generalizable to a larger population.

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# Enclosure III: GAO July 21, 2004, Testimony (GAO-04-926T)

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GAO

United States Government Accountability Office

Testimony

Before the Subcommittee on  
Telecommunications and the Internet,  
Committee on Energy and Commerce,  
House of Representatives

For Release on Delivery  
Expected at 10:00 a.m. EDT  
Wednesday, July 21, 2004

## TELECOMMUNICATIONS

### German DTV Transition Differs from U.S. Transition in Many Respects, but Certain Key Challenges Are Similar

Statement of Mark L. Goldstein, Director  
Physical Infrastructure Issues



G A O  
Accountability \* Integrity \* Reliability

GAO-04-926T

 G A O  
**Highlights**

Highlights of GAO-04-926T, a testimony before the Subcommittee on Telecommunications and the Internet, Committee on Energy and Commerce, House of Representatives

#### Why GAO Did This Study

In Berlin, Germany, the transition from analog to digital television (DTV), the DTV transition, culminated in the shutoff of analog television signals in August 2003. As GAO previously reported, the December 2006 deadline for the culmination of the DTV transition in the United States seems unlikely to be met. Failure to meet this deadline will delay the return of valuable spectrum for public safety and other commercial purposes. Thus, the rapid completion of the DTV transition in Berlin has sparked interest among policymakers and industry participants in the United States.

At the request of this subcommittee, GAO examined (1) the structure and regulation of the German television market, (2) how the Berlin DTV transition was achieved, and (3) whether there are critical components of how the DTV transition was achieved in Berlin and other areas of Germany that have relevance to the ongoing DTV transition in the United States.

[www.gao.gov/cgi-bin/getrpt?GAO-04-926T](http://www.gao.gov/cgi-bin/getrpt?GAO-04-926T).

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

July 21, 2004

## TELECOMMUNICATIONS

### German DTV Transition Differs from U.S. Transition in Many Respects, but Certain Key Challenges Are Similar

#### What GAO Found

The German television market is characterized by a central role of public broadcasting and is regulated largely at the state level. Although the federal government establishes general objectives for the telecommunications sector and manages allocations of the German radiofrequency spectrum, 15 media authorities organize and regulate broadcasting services within their areas of authority. The two public broadcasters are largely financed through a mandatory radio and television license fee of 16 Euro (\$19.68) per household, per month, or about 6 billion Euro (\$7.38 billion) in aggregate per year. Today, only 5 to 7 percent of German households rely on terrestrial television. Most households receive television through cable service, which typically costs less than 15 Euro (\$18.45) per month, or satellite service, which is free once the household installs the necessary satellite equipment.

Berlin officials and industry participants engaged in extensive planning for the rapid DTV transition in the Berlin test market. In Germany, government officials and industry participants are implementing the DTV transition largely for the purpose of improving the viability of terrestrial television; officials do not expect to recapture radio spectrum after the transition. Several elements of the DTV transition apply throughout Germany. For example, Germany is implementing the transition within specified "islands," which are typically larger metropolitan areas, because officials thought that a nationwide DTV transition would be too big to manage at one time. Also, the German DTV transition focuses exclusively on terrestrial television, not cable and satellite television. The Media Authority in Berlin specified other components of the DTV transition for the Berlin area, including a short (10 month) simulcast period, financial and nonfinancial support provided to private broadcasters, subsidies provided to low-income households, and an extensive consumer education effort.

Certain aspects of the DTV transition in Berlin and other regions of Germany are relevant to the ongoing transition in the United States because, even though the television market and the transition are structured differently in the two countries, government officials face similar key challenges. We found that much of the focus of government officials leading up to and during the brief simulcast in Berlin was on ensuring households who rely on terrestrial television received the necessary consumer equipment. In the United States, most television stations are providing a digital signal—that is, the United States is in the simulcast phase. Thus, the challenge facing the Congress and the Federal Communications Commission, as was the case in Berlin, is encouraging households to purchase set-top boxes or digital televisions. The key components of the Berlin DTV transition that enabled the rapid deployment of set-top boxes included (1) implementing an extensive consumer education effort; (2) providing subsidies to low-income households for set-top boxes; and (3) setting a relatively near-term, date certain that all stakeholders understood would be the shutoff date for analog television.

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Mr. Chairman and Members of the Subcommittee:

I am pleased to be here today to report on our ongoing work on the transition from analog to digital television, commonly referred to as the digital television (DTV) transition. The DTV transition offers the promise of more programming options, interactive services, and high-definition television (HDTV). To facilitate the transition, the Congress and the Federal Communications Commission (FCC) temporarily provided television stations nationwide with additional spectrum to simultaneously broadcast both an analog and a digital signal. This simulcast is mandated to end in December 2006, or when 85 percent of American households can receive digital broadcast signals, whichever is later. At that time, television stations will return valuable radio spectrum for public safety and other commercial services; however, as we reported in 2002, that deadline seems unlikely to be met.<sup>1</sup>

In Berlin, Germany, a DTV transition—referred to in that country as the DVB-T switchover—culminated in the shutoff of analog broadcast television signals in August 2003. The rapid completion of the DTV transition in Berlin has sparked interest among policymakers and industry participants in the United States. At the request of this subcommittee, we have examined (1) the structure and regulation of the German television market, (2) how the Berlin DTV transition was achieved, and (3) whether there are critical components of how the DTV transition was achieved in Berlin and other areas of Germany that have relevance to the ongoing DTV transition in the United States. In addition to information provided in this testimony, we are conducting additional work on the ongoing DTV transition in the United States and will provide a more detailed study for this committee in early 2005.

To address these issues, we conducted a site visit in Germany and interviewed a variety of government, industry, and consumer representatives. In particular, we met with

- two federal government agencies with responsibilities related to the DTV transition;

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<sup>1</sup>See U.S. General Accounting Office, *Telecommunications: Additional Federal Efforts Could Help Advance Digital Television Transition*, [GAO-03-7](#) (Washington, D.C.: Nov. 8, 2002).

- two Media Authorities that are overseeing the DTV transition in their respective areas;
- the Berlin Social Welfare Office, which assisted in providing subsidies for set-top boxes during the transition;
- the two major public broadcasting station groups;
- the two primary commercial station groups;
- a cable television provider and a cable television association;
- Deutsche Telekom, which is a primary owner of broadcast towers throughout Germany;
- an official who works for association of electrical and electronic equipment manufacturers and is also the director of Deutsche TV-Plattform, an organization of government and industry participants in the DTV transition; and
- a German association of consumer groups.

In addition to the meetings we conducted in Germany, we spoke by telephone with a German expert on digital television issues and representatives of a European satellite provider. We also met with officials at the German Embassy in Washington, D.C. The information that we gathered was sufficiently reliable for the purposes of our review. We conducted our work from April 2004 to June 2004 in accordance with generally accepted government auditing standards.

We provided a draft of this testimony to FCC and the Department of State (State) for their review and comment. Staff from FCC and State provided technical comments that we incorporated as appropriate.

My statement will make the following points:

- The German television market is characterized by a central role of public broadcasting and is regulated largely at the state level. Although the federal government establishes general objectives for the telecommunications sector and manages allocations of the German radiofrequency spectrum, 15 media authorities organize and regulate broadcasting services within their areas of authority. Broadcasting in Germany is commonly characterized as a “dual system” in which public and private broadcasting coexist, with each market segment consisting of

two dominant broadcasting entities. The two public broadcasters are largely financed through a mandatory radio and television license fee of 16 Euro (\$19.68)<sup>2</sup> per household per month, which amounts to about 6 billion Euro (\$7.38 billion) per year. Although terrestrial broadcasting—the transmission of television signals from towers to homes through the radiofrequency spectrum—was once the only means by which German households received television program signals, today only 5 to 7 percent of German households rely exclusively on terrestrial broadcasting. The remaining households obtain either cable service—which typically costs less than 15 Euro (\$18.45) per month—or satellite service, which is free once the household has installed the satellite receiving dish and receivers.

- Berlin officials and industry participants engaged in extensive planning for the rapid DTV transition in the Berlin test market. In particular, digital terrestrial transmissions were initiated in November 2002 and all analog signals were shut off in August 2003. In Germany, government officials and industry participants are implementing the DTV transition largely for the purposes of improving the viability of terrestrial television. Government officials do not expect spectrum to be returned after the transition. Several elements of the DTV transition were decided by federal authorities and will thus apply throughout Germany. For example, Germany is implementing the transition within specified “islands,” with each island defined as a specific metropolitan area. Additionally, the DTV transition focused exclusively on terrestrial television, and households that rely on cable and satellite service did not need to purchase equipment to continue to receive television service. The Media Authority in Berlin specified other components of the transition, such as the short simulcast period, the financial and nonfinancial support provided to private broadcasters, the subsidies provided to certain low-income households, and an extensive consumer education effort. While the Berlin DTV transition is generally viewed as successful, it is unclear whether a full DTV transition will occur throughout Germany.
- Certain aspects of the DTV transition in Berlin and other regions of Germany are relevant to the ongoing transition in the United States because, even though the television market and the transition are structured differently in the two countries, government officials in both countries face similar key challenges for completing the transition. In particular, we found that much of the focus of government officials leading up to and during the brief simulcast in Berlin was on ensuring that

<sup>2</sup>Throughout this testimony, we use the July 13, 2004, exchange rate of 1.2302 to convert Euros into U.S. dollars.

terrestrial households received the necessary consumer equipment to support the switchover to digital. In the United States, most broadcast television stations are now providing a digital signal—that is, we are already within the simulcast phase. The concern today in the Congress and at FCC is how to coax consumers to purchase set-top boxes or digital televisions—the same objective of Berlin officials. The key components of the Berlin transition that enabled a rapid deployment of set-top boxes to terrestrial consumers and thereby enabled the switchover to DTV were (1) an extensive public information campaign; (2) subsidies for needy households to defray the set-top box costs; and (3) the setting of a near-term, date certain for the cessation of analog broadcasts that all stakeholders understood must be met.

## Background

Terrestrial television service—also known as over-the-air broadcast television—is transmitted from television towers through the radiofrequency spectrum to rooftop antennas or antennas attached directly to television sets inside of homes. With traditional analog technology, pictures and sounds are converted into “waveform” electrical signals for transmission, while digital technology converts these pictures and sounds into a stream of digits consisting of zeros and ones. Digital transmission of television signals provides several advantages compared with analog transmission, by enabling better quality picture and sound reception as well as other new services. In addition, digital transmission uses the radiofrequency spectrum more efficiently than analog transmission. This increased efficiency makes multicasting, where several digital television signals are transmitted in the same amount of spectrum as one analog television signal, and HDTV services possible. But, to implement digital transmission, upgrades to transmission facilities, such as television towers, are necessary, and consumers must purchase a digital television or a set-top box that will convert digital signals into an analog form for viewing on existing analog televisions.

Both the United States and Germany have programs in place to complete the transition from analog to digital television. In the United States, the Congress and FCC provided television stations with additional spectrum to transmit both an analog and digital signal, and set a deadline for the shutoff of the analog signal at the end of 2006, or when 85 percent of households can receive the digital signal, whichever is later. In Germany, the federal government set a deadline of 2010 for the shutoff of analog signals and did not provide spectrum for an extended simulcast period. Each Media Authority (there are a total of 15 throughout Germany) decides on the specific timing of the terrestrial transition. The city of

Berlin, Germany, and its surrounding metropolitan area initiated digital terrestrial transmissions in November 2002 and shut-off all analog signals in August 2003.

### German Television Market Is Characterized by Central Role of Public Broadcasting and Is Regulated Largely at the State Level

We were told that regulation of the German television market is primarily the responsibility of state government, with the federal government exercising only limited authority to regulate this market. Television broadcasting in Germany is commonly characterized as a “dual system” in which public and private broadcasting coexist, with each market segment consisting of two dominant broadcasting entities. Both segments are subject to the broadcasting laws passed by the respective German states. Although terrestrial broadcasting was once the only means by which German households received television program signals, today only 5 to 7 percent of these households rely on terrestrial broadcasting, with the remainder using cable or satellite service for the reception of television signals.

### Federal and State Government Agencies Have Important Roles in Television Regulation

The federal government exercises important but limited authority in regulating television broadcasting, leaving the state (called Länder) governments with the primary responsibility for broadcasting regulation. At the federal government level, the Ministry of Economics and Labour is responsible for establishing and advancing general objectives in the telecommunications sector, such as the promotion of new technologies and innovation, and ensuring competition among providers of telecommunications services. In the context of the DTV transition, the Ministry led the effort in Germany to develop and recommend a strategy for the transition from analog to digital radio and television broadcasting. A separate federal entity, the Regulatory Authority for Telecommunications and Posts (RegTP), established in 1998, is responsible for technical aspects in the provision of telecommunications services, including management of Germany’s radiofrequency spectrum allocations, the development of standards for the distribution and use of telecommunications systems, and testing of electronics equipment. RegTP is playing a key role in the DTV transition in Germany by establishing procedures for and assigning frequency allocations to roll out digital video broadcasting service.

Federal and state government officials told us that the authority to directly organize and regulate broadcasting services rests with each of the regional governments as part of their jurisdiction over educational and cultural matters. In each of the German states, a “Media Authority” serves as the

primary regulatory authority over radio and television broadcasting services.<sup>3</sup> Charged with implementation of their respective state-enacted broadcasting laws, the 15 Media Authorities are independent agencies and are not considered to be part of the state government administrations. Among the most important functions of the Media Authorities is the establishment of procedures for assigning broadcast frequencies allocated by RegTP to public and private broadcasters.<sup>4</sup> The Media Authorities also have a significant role in overseeing the transition to digital television.

Broadcasting laws and regulations in Germany are affected to some extent by actions of the European Union (EU). Although Germany and other EU-member states manage their own broadcasting policies, rules and guidelines are set at the EU level on matters that involve common interests, such as open borders, fair competition, and a commitment to public broadcasting. In the EU's Action Plan to stimulate advanced services, applications, and content, EU member states are encouraged to have a strategy for the DTV transition with an assessment of market conditions, a date for the switchoff of analog terrestrial broadcasting, and a platform-neutral approach that takes into account the competing cable, satellite, and terrestrial delivery platforms.

#### German Television Market Dominated by Two Public Stations Groups and Two Commercial Stations Groups

Terrestrial, or over-the-air, television in German is commonly characterized as a "dual system" in which public and private broadcasting coexist, with each market segment consisting of two dominant broadcasting entities. Public broadcasting corporations are the creation of the states, but operate largely as self-regulated entities. At the regional level, the German states have formed regional public broadcasters that operate their own television channels with regional-specific programming. The regional public broadcasters also formed a national network in 1950 known as ARD. ARD provides a nationwide broadcast channel (Channel 1), with some of its programming supplied by these regional broadcasters. A second nationwide public broadcasting channel, ZDF, was formed directly by the German states in 1961 as an independent, nonprofit

<sup>3</sup>The states of Berlin and Brandenburg have jointly formed a single media authority.

<sup>4</sup>Because broadcasting frequencies do not respect state jurisdictional boundaries, an "Interstate Agreement on Broadcasting" was entered into by the states to harmonize disparate provisions of state broadcasting laws. The treaty addresses matters related to the protection of children, advertising content and sponsorship, and specific aspects of public broadcasting and private broadcasting.

corporation. In addition to their own channels, ARD and ZDF jointly operate four additional public television channels that are broadcast in various parts of Germany. We were told that approximately 40 percent of television viewing in Germany is of the various public channels provided by ARD and ZDF.

The public broadcasters are given one frequency each by the Media Authorities for the terrestrial broadcast of their programming channel. Their primary source of revenue derives from a compulsory monthly fee paid by owners of radios and television sets.<sup>5</sup> The amount of the fee is set jointly by the states, based on a recommendation of an independent panel, and is set at 16 Euro (\$19.68) per month for each household.<sup>6</sup> We were told that this amounts to about 6 billion Euro (\$7.38 billion) annually. ARD receives slightly less than two-thirds of the fee revenues and allocates shares among its regional broadcasters, while ZDF receives about one-third of the total fee revenues. Two percent of the total fee revenue is distributed to the 15 Media Authorities. ARD and ZDF generate additional revenues from limited on-air advertisements. However, they are restricted to a maximum of 20 minutes of advertising per day before 8:00 p.m. and are precluded from any advertising on Sundays and holidays.

The introduction of private television broadcasting in Germany is a relatively recent development. In the early 1980s, additional spectrum frequencies were made available for the opening of private television broadcasting. Today, two broadcasting groups—RTL Group and ProSiebenSat.1 Media—dominate this segment of the television broadcasting market, each operating multiple channels. Unlike their public broadcasting counterparts, private broadcasters must obtain licenses from relevant Media Authorities. Because frequencies are limited, not all private broadcasters operate nationally, and with the growth of cable and satellite systems, some have chosen not to renew terrestrial licenses in all locations. In particular, private broadcasters often do not provide terrestrial service in rural areas. Private broadcasters generate all of their revenues from advertising and receive no payments from the fees paid by owners of radios and television sets.

<sup>5</sup>The fee may be waived for welfare recipients and low-income households. Collected by a special agency known as GEZ (Gebühreneinzugszentrale), the fee is based upon a treaty entered into by the German states.

<sup>6</sup>We were told that the 16 Euro (\$19.68) fee is in some cases assessed for a second or third television set in a home if an adult child in the home owns the television.

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German Television Is  
Available on Three  
Platforms: Terrestrial,  
Cable, and Satellite

Although terrestrial broadcasting as described above was once the only means by which German households could receive television program signals, there are currently three methods for television delivery—terrestrial broadcasting, cable television service, and satellite service. Terrestrial broadcasting, in fact, is now the method least relied upon by German television households for receiving program signals—only about 5 to 7 percent of German households rely exclusively on terrestrial television. Some German households that receive their primary television signals by satellite or cable may have a second or third set in the household that is used only for terrestrial reception. Households relying on analog terrestrial broadcasting receive between 3 to 12 channels, with an average of 5 to 6 channels. The primary transmitter networks that transmit television broadcast signals from various towers throughout the country are owned and operated by Deutsche Telekom. Broadcast stations pay Deutsche Telekom to transmit their terrestrial signals. ARD also owns a network of terrestrial broadcast towers for its own operations.

Introduced in the early 1980s, cable television service is now the dominant method for the delivery of television programming in Germany: about 60 percent of the households subscribe to a cable system. Like terrestrial broadcasting in Germany, the 15 Media Authorities regulate cable television service in their respective areas. The state media laws set forth the must-carry requirements in each region, which specify the broadcast stations that cable providers are required to carry on their systems.<sup>7</sup> We were told that these regulations vary considerably by region, with some areas requiring cable systems to carry nearly all public and private stations, and other areas imposing significantly fewer must-carry responsibilities on cable systems. To be carried by a cable operator, however, public and private broadcasters must pay a carriage fee to the cable operator, which is negotiated directly between the parties. Typical cable systems in Germany were constructed for the provision of analog service, provide about 30 to 33 channels of analog programming, and cost

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<sup>7</sup>These must-carry requirements can apply to stations that are broadcast terrestrially and stations that are not broadcast terrestrially.

subscribers less than 15 Euro (\$18.45) per month. It is often the case that this fee is included in the household's rent.<sup>8</sup>

The third method of distribution of television programming is through satellite service, which today is received by an estimated 35 percent of German television households. According to RegTP, to provide satellite television service in Germany, a license to use the necessary spectrum is required by the agency. Also, any broadcast station that wants to be carried on a satellite system must obtain authorization to do so from one of the Media Authorities. The predominant provider of satellite television service in Germany is ASTRA, a Luxembourg-based company that provides satellite service throughout Europe. In order for a broadcast channel—whether a public station or a private station—to be carried by a satellite provider, a contractual agreement is reached between the broadcaster and the satellite provider that gives the right to the satellite provider to rebroadcast the signal, but requires the broadcast station to pay a fee for that carriage. For viewers, satellite service is available free of charge; however, viewers must purchase the equipment needed in order to receive programming. In addition, they must be able to situate the satellite dish toward the southern sky to receive the transmission signal from the geostationary satellite. The costs for a satellite dish and related equipment are estimated at less than 200 Euro (\$246.04). Satellite television service provides viewers in Germany with approximately 125 channels, about 60 of which are in German.

<sup>8</sup>The ownership of German cable systems is somewhat more complex than in the United States. While in the United States, there is only one entity that distributes programming from the cable headend to customers, more than one entity may own portions of the cable infrastructure in Germany. That is, one cable company may own the infrastructure and transmit signals from the headend into neighborhoods, but another may own the distribution network within an apartment building—in which a much higher percentage of Germans live compared with the United States. Although there is only a limited number of companies in Germany that own the portion of the cable infrastructure from the headend into neighborhoods, we were told there are thousands of entities that own facilities that reach individual households.

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### Berlin Officials and Industry Participants Engaged in Extensive Planning for the Rapid DTV Transition in the Berlin Test Market

In Germany, government officials and industry participants are implementing the DTV transition to improve the viability of terrestrial television in the face of a low and declining share of households that rely solely on terrestrial television. Several elements of the DTV transition will apply throughout Germany, including an island based approach, where the DTV transition will occur separately in different metropolitan areas, and the adoption of standard-definition digital television.<sup>9</sup> In Berlin, extensive planning facilitated the rapid DTV transition. Important elements of the Berlin DTV transition included a short simulcast period, financial and nonfinancial support provided to private broadcasters, subsidies provided to eligible low-income households for set-top boxes, and an extensive consumer education effort. While the Berlin DTV transition is generally viewed as successful, it is unclear whether a full DTV transition will occur throughout Germany.

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### German DTV Transition Was Largely Designed to Preserve Terrestrial Television

A primary rationale for the German DTV transition was to preserve terrestrial television in the face of a low and declining share of households that rely solely on this method of television reception. As mentioned previously, fewer than 10 percent of German households rely solely on terrestrial television, and the share has been rapidly declining in recent years. Since broadcasters reach over 90 percent of German households through cable and satellite service, concerns arose about the continued costs associated with the transmission of terrestrial television relative to the number of viewers. By increasing the number of television channels delivered terrestrially, the DTV transition was seen as a means to improve the viability of terrestrial television. Because there was concern that terrestrial viewership would continue to decline, German regulators decided that any DTV transition would need to occur relatively quickly.

Some industry participants in Germany suggested that a switch-off of terrestrial television might be the better course. These parties argued that terrestrial television is costly and that German households have both cable and satellite as alternatives. Further, cable service is offered at reasonably low prices and satellite service is completely free of charge once the

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<sup>9</sup>As mentioned previously, DTV functions through the transmission of pictures and sounds in streams of digits consisting of zeros and ones, which reduces interference, improves picture and sound quality, and makes new services possible. HDTV is a type of DTV that provides significantly enhanced picture and sound quality, with up to 1,080 lines of resolution compared with 480 in analog television. We refer to standard-definition digital television to identify digital television that is not of the high-definition variety.

satellite dish and receiver have been installed. Ultimately, however, German regulators decided to proceed with a DTV transition.

The transition provided benefits for both consumers and broadcasters. For consumers, the presence of digital terrestrial television ensures that consumers maintain a choice of three mechanisms to receive television service. We were told that this choice is important in cities such as Berlin, where many people cannot receive satellite service and, without terrestrial television, would be dependent on cable service. Further, one consumer group noted that digital terrestrial television allows consumers to avoid paying a fee for cable service while receiving a similar number of channels as they would with cable service. For broadcasters, the presence of terrestrial television provides a third mechanism for the transmission of their signals. We were told that this helps keep the fees that broadcasters must pay to cable companies to carry their signals lower than would be the case if broadcasters were reliant solely on cable and satellite for the transmission of their signals.

**Certain Decisions about  
the DTV Transition Will  
Apply Throughout  
Germany**

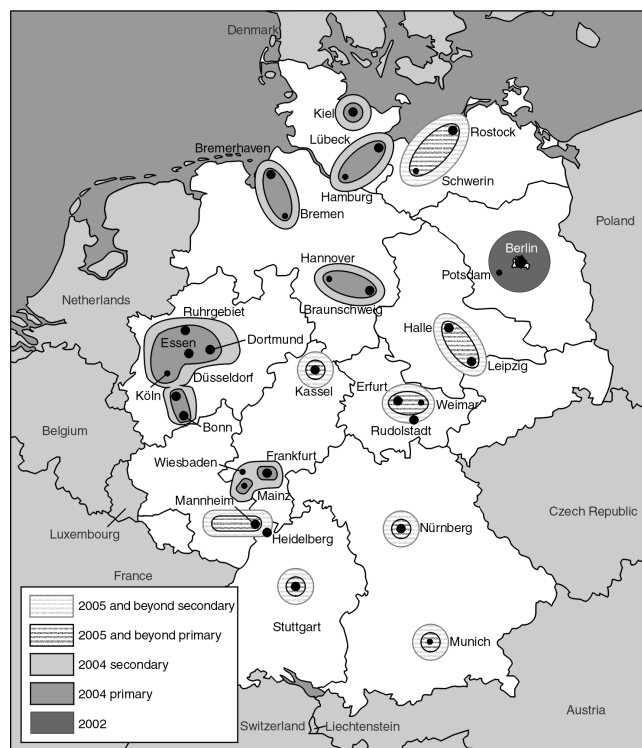
In Germany, the Digital Broadcasting Initiative (the Initiative) establishes a nationwide framework for digital broadcasting. The federal government established the Initiative in 1997, and the federal Ministry of Economics and Labour and the Länder (or states) chair and deputy chair, respectively, the Initiative. Other members of the Initiative include representatives of the federal and state governments; public and private broadcasters; content providers; cable, satellite, and terrestrial operators; equipment manufacturers; and consumer groups. The Initiative develops strategies for digital broadcasting, including terrestrial television and radio, cable, and satellite service. The Initiative set a deadline for the DTV transition of 2010; this date is a strategy or recommendation, and not set forth in German law.

The Initiative developed different strategies for television and radio, cable, and satellite service, and the DTV transition occurring throughout Germany at this time only focuses on terrestrial television. Thus, only households that rely solely on terrestrial television—about 160,000 in Berlin—were required to purchase equipment in order to be able to continue to receive terrestrial television service on their existing analog televisions. Households that rely on cable or satellite service were unaffected by the DTV transition because cable and satellite providers converted the signals to ensure that households receiving their service could continue to view the signals without any additional equipment. Although, households that

receive cable or satellite service would require equipment for televisions in their homes that are not connected to the cable or satellite service.

The Initiative determined that the German DTV transition would occur through an island-based approach, in which each island will transition independently to digital terrestrial television. Each island is a major metropolitan area, such as Berlin or Munich. Figure 1 illustrates the various islands in Germany and the actual or planned year for the DTV transition. We were told that Germany adopted this approach because the DTV transition could not be achieved throughout the entire country simultaneously; officials thought that a nationwide DTV transition would be too big to manage at one time. Additionally, by adopting the island approach, German officials gained experience with the DTV transition, and thereby were able to assess whether the public would accept terrestrial digital television. Several officials told us that the islands will eventually grow together, and the DTV transition will encompass the entire country. However, we were also told that had the Berlin DTV transition not been a success, the transition in other areas may have been reevaluated and may not have gone forward.

Figure 1: Actual and Planned Start Date for German DTV Islands



Source: GAO analysis based on 1992 MAGELLAN Geographix/SMS Santa Barbara, CA; DVB-T-Projekte/IDR-BNA.

Note: Primary refers to areas with reception via room antenna, and secondary refers to areas with reception via outside antenna.

In addition to the island-based approach, Germany decided to adopt standard-definition digital television, instead of high-definition digital television.<sup>10</sup> The government and industry officials with whom we spoke cited several advantages of standard-definition digital versus high-definition digital for Germany.<sup>11</sup> First, the equipment that consumers must purchase for standard-definition digital is generally less expensive than the equipment necessary for high-definition digital.<sup>12</sup> Second, with high-definition digital, broadcasters must install more costly equipment and incur higher transmission costs than would be the case with standard-definition digital. Finally, German officials believe that terrestrial television with a standard-definition digital signal is more competitive with cable and satellite than it would be with a high-definition digital signal. These officials noted that the increase in competitiveness of terrestrial television derives from its mobility and the increased channels available with standard definition digital. In particular, officials we spoke with noted that standard-definition digital technology allows multiple channels to be shown with the same amount of spectrum that was previously used to transmit one analog terrestrial channel. Thus, terrestrial television in Berlin now offers nearly as many channels to viewers as they receive on their cable systems. This greater number of channels combined with the mobility of terrestrial television—a feature not available with cable or satellite that enables consumers to take their television to their boats and garden homes—was seen as a factor that would make terrestrial television more attractive relative to cable or satellite service.<sup>13</sup>

Finally, German officials did not plan for the return of spectrum following the DTV transition. Germany has allocated a limited amount of spectrum for terrestrial television, and all the analog frequencies have been dedicated to digital television. As previously mentioned, broadcasters

<sup>10</sup>The digital standard that Germany adopted supports both standard-definition and high-definition digital television. However, Germany decided to implement standard-definition digital television.

<sup>11</sup>The advantages of high-definition digital primarily relate to the picture quality. High-definition digital provides roughly twice as many lines of resolution, creating a television picture that is much sharper than analog television. Further, high-definition digital is in wide-screen format, with display screen ratios similar to a movie theater.

<sup>12</sup>Consumer groups generally opposed the introduction of high-definition television because of these higher costs and the fact that high-definition digital only provides benefits with large-screen televisions.

<sup>13</sup>The German digital standard also permits indoor reception. Thus, households in the central areas of the islands do not need to modify or install a rooftop antenna.

intend to use the spectrum for multiplexing—providing four digital channels in the same amount of spectrum that they previously provided one analog channel. However, if all multiplexes are not used, some spectrum could be returned to the government. But, it is not clear that this spectrum could or would be assigned to a different use, such as mobile telephone or Internet access.

**mabb and Industry  
Participants Engaged in  
Extensive Planning for the  
Berlin DTV Transition**

mabb, the Media Authority that regulates radio and television in the states of Berlin and Brandenburg, made several key decisions about how the DTV transition would occur in the area under its authority.

*When to undertake the DTV transition.* Each of the 15 Media Authorities throughout Germany made decisions about when to undertake the DTV transition within their region. Berlin was the first of Germany's islands to undertake the DTV transition.<sup>14</sup> We were told that Berlin had several characteristics that made it favorable to serve as a test market for the DTV transition. First, the percent of households that rely solely on terrestrial television is relatively low in Berlin. Since the DTV transition in Germany requires only equipment modifications for terrestrial televisions, the number of households affected was relatively small—only about 160,000 households—and the transition more manageable. Second, Berlin had more spectrum dedicated to television because spectrum that had been used by both East and West Berlin was all still allocated to terrestrial television use. Third, because Berlin is not near other major cities, no signal interference concerns arose in the area, as they might for cities such as Bonn or Cologne, which are near other cities and the German border with other countries. Finally, Berlin also has fairly simple topography—it is basically flat—enabling easier transmission of television signals.

*Length of Simulcast.* mabb and industry participants implemented the DTV transition in the Berlin area with a short simulcast period. The DTV transition agreement negotiated between mabb and the broadcasters specified a three-phase simulcast process:

- On November 1, 2002, the simulcast period commenced as digital signals for some of the stations of both public and commercial broadcasters began to be transmitted. Berlin officials dedicated two additional channels

<sup>14</sup>By the end of 2004, eight islands plan to have digital terrestrial television, including Berlin, Cologne and Bonn, Düsseldorf and Ruhrgebiert, Hannover, Bremen, Frankfurt, Hamburg and Lübeck, and Kiel.

for the simulcast, with each of these channels carrying four multicast digital stations. Thus, eight of Berlin's eleven analog stations were initially simulcast.

- On February 28, 2003, five previously analog channels were converted to digital channels, with each channel carrying multiple stations. Thus, the digital signals of more stations were turned on, including stations that were not previously available terrestrially in Berlin. The analog transmission of all national private broadcasters stopped, and public broadcasters transitioned their analog signals to lower-power analog frequencies.
- On August 8, 2003, all analog transmission stopped.

The government and industry officials with whom we spoke with cited several reasons for the short simulcast period. First, Germany does not have enough spectrum dedicated to television service to implement a long simulcast period while also providing additional stations; the spectrum used for analog transmission is the same spectrum that will be used for digital transmission. Second, an extended simulcast period is costly for broadcasters, who, as mentioned earlier, must pay for terrestrial transmission. Third, a quick and certain shutoff date provides an incentive for households to purchase the necessary set-top boxes. German federal officials and other Media Authorities are generally encouraged by the success of the short simulcast period in Berlin. In the state of North-Rhine Westphalia, the Media Authority intends to implement a 6-month simulcast period for public broadcasters, with no simulcast period for private broadcasters, in the state's two islands.

*Private broadcaster support.* mabb made the decision to provide financial and nonfinancial support to private broadcasters. Public broadcasters were able to finance their transition costs through the radio and television license fee they receive. Private broadcasters, on the other hand, do not receive license fees, but were viewed as important participants in the DTV transition. Therefore, mabb decided to provide support to private stations, which consisted of three elements. First, for 5 years, mabb will pay the broadcasters' incremental costs associated with digital transmission (i.e., mabb will pay the difference between the broadcasters' former analog transmission costs and their digital transmission costs). In return, the private broadcasters agreed to provide digital terrestrial television for at least 5 years. Second, as incumbent broadcasters, the private broadcasters received authority to provide multiplexed service. That is, the private broadcasters were allowed to increase the number of terrestrial channels

they provide in Berlin using the spectrum they were already assigned.<sup>15</sup> Third, one broadcaster told us that in return for participating in the DTV transition in the Berlin island, it received favorable must-carry status throughout the region that mabb regulates—that is, mabb will require that its stations be carried on cable systems in the region. At this time, it is not clear whether and to what extent the other Media Authorities plan to provide similar support for private broadcasters' DTV transition in other regions.<sup>16</sup> One private broadcaster told us that it would be unwilling to participate in the DTV transition in other islands if it does not receive the multicast authority.

*Subsidy of set-top box for needy households.* In addition to supporting private broadcasters, mabb provided support to certain households for the purchase of set-top boxes. According to mabb, the overriding principle was that households must pay for the set-top boxes necessary to watch terrestrial digital broadcast signals. However, mabb made contingencies for low-income households. Households that were entitled to government aid could apply to the Social Welfare Office for assistance. If the household met the income eligibility criteria and relied solely on terrestrial television (i.e., the household did not receive cable or satellite service), the household received a voucher for a free set-top box. Qualifying households received their set-top box either from specified retailers, or the box was delivered to their home, whichever means was least costly. During the DTV transition period, mabb paid 75 percent of the subsidy cost and the Social Welfare Office paid the remaining 25 percent of the subsidy cost. mabb funded its share of the subsidy through the portion of the radio and television license fee that it receives, while the Social Welfare Office funded its share of the subsidy through its regular budget. Following the transition period, the Social Welfare Office began paying the entire cost of the subsidy, up to 129 Euro (\$158.70). According to mabb, a total of 6,000 set-top boxes were provided to needy households with a total cost of 500,000 Euro (\$615,100).

*Extensive consumer education.* mabb and industry participants conducted an extensive consumer education effort. One official told us that a primary concern with the DTV transition is making sure that

<sup>15</sup>Public broadcasters were also allowed to provide multicast service.

<sup>16</sup>The private broadcasters that we spoke with told us that they do not anticipate receiving financial support in Germany's northern states, since the anticipated digital transmission costs will be similar to the existing analog transmission costs.

households that rely solely on terrestrial television understand that they must do something to be able to continue receiving television. In Berlin, two important consumer education mechanisms were messages on terrestrial-only television signals and information sessions with retailers. On television signals received by terrestrial television, households saw a rolling scroll that informed them about the DTV transition. Deutsche TV-Plattform and the Berlin Chamber of Commerce also held information sessions with retailers. Other consumer education mechanisms included a direct mailing to every household, a consumer hotline, flyers and newsletters, an Internet Web site, and advertisements on buses and subways.<sup>17</sup> One primary concern with the consumer education effort was to avoid confusing cable and satellite subscribers. Because the DTV transition only affected households relying solely on terrestrial television, the consumer education effort focused on means that would target only these households, and not households subscribing to cable and satellite service. We were also told that a short consumer education period was best for informing households about the DTV transition; in Berlin, the consumer education effort lasted approximately 4 weeks and cost approximately 800,000 Euro (\$984,160).<sup>18</sup>

**The Berlin DTV Transition Is Generally Viewed as Successful, but Full DTV Transition May Not Occur in Rural Areas**

Relatively few consumer complaints and problems arose during the Berlin DTV transition. For example, a consumer organization that we spoke with told us that there were very few complaints, and that most complaints that did arise concerned the cost of the set-top box, which they said was approximately 100 to 125 Euro (\$123.02 to \$153.78).<sup>19</sup> We were also told that there were minor technical problems and few reception problems. An mabb official with whom we spoke thought that reception had improved following the DTV transition, because the agency ensured a strong digital signal and because digital transmission is superior to analog transmission. The technical and reception problems that did arise included difficulties installing and using the set-top box; reception problems in some multiple-dwelling units, particularly ground-floor units and buildings with rooftop antennas and boosters; and interference problems for some cable subscribers because of the strength of the digital signal.

<sup>17</sup>We were told that the direct mailing was expensive and not very effective.

<sup>18</sup>This figure does not include the value of commercial time that broadcasters devoted to the DTV transition.

<sup>19</sup>This consumer organization did mention that the DTV switchover could be expensive for households with multiple televisions, as each television would need a separate set-top box.

During the Berlin DTV transition, some households changed the mechanism through which they receive television service. We were told that between one-third and one-half of households that previously relied solely on terrestrial television switched to either cable or satellite service, rather than purchase the set-top box. An official with mabb told us that the percent of households switching from terrestrial television to cable and satellite was less than they had expected. On the other hand, more set-top boxes—over 200,000—were sold than the number of former terrestrial-only households, indicating that some households purchased multiple boxes, and that some cable and satellite households also purchased set-top boxes for a second or third television that only received terrestrial service. We were also told that relatively few cable subscribers switched to terrestrial television following the DTV transition. As previously mentioned, cable payments are often included in the household's rent payment and some cable contracts are long-term in nature, thereby reducing the incentive and flexibility that some households have to switch away from cable service. Some industry officials told us, however, that they expect some cable subscribers to switch to terrestrial service in the longer term.

The government, industry, and consumer representatives with whom we spoke mentioned several factors as contributing to the success of the Berlin DTV transition. These factors include the following:

- The DTV transition provided enhanced consumer value for Berlin households. The number of channels available through terrestrial television increased from approximately 11 to 27 and included an electronic program guide.
- The government and broadcasters did not have to finance the new programs. The new channels available through terrestrial television following the DTV transition already existed on cable and satellite systems.
- There was good cooperation between the government officials and broadcasters, which helped ensure that consumers received additional channels.
- The transition affected a relatively small percentage of Berlin households; only households that relied solely on terrestrial television—less than 10 percent of Berlin households—had to take action to avoid losing their television service.

- The set-top boxes were relatively inexpensive, and the price fell throughout the transition period.
- There was a scheduled time line for the DTV transition and a firm shutoff date.
- There was good communication to consumers about the DTV transition.

While the Berlin DTV transition appears successful, a full DTV transition might not extend throughout Germany. Government and industry officials with whom we spoke said that private broadcasters will most likely not provide digital service in rural areas outside the islands, but that public broadcasters will provide digital service in these areas. This is not entirely different than the current situation with analog television, where the private broadcasters do not provide terrestrial television in all areas of the country. However, it does raise the possibility that a full DTV transition, including the digital terrestrial transmission of both public and private broadcasters, might not occur throughout Germany.

Finally, some groups we spoke with identified problems with the Berlin DTV transition. The cable television industry in Germany mentioned several problems. Cable industry officials with whom we spoke objected to the use of the radio and television license fee for the DTV transition. These officials told us that all German households pay the license fee, but only terrestrial households in the islands benefit from the DTV transition. In fact, the cable industry has petitioned the European Commission about the use of the license fee for the DTV transition. Other problems noted by the cable industry officials with whom we spoke include cable subscribers purchasing set-top boxes by mistake and the expense and problems cable operators incurred to upgrade their headend facilities to receive the digital signal. Regarding the set-top box subsidy, the Social Welfare Office thought that the process could have been handled a little better. In particular, it found that approximately 20 percent of the applications for subsidies were not handled adequately, most often because they were incomplete or missing signatures.

### Need for Set-Top Box Deployment Is Key Challenge in Germany and in the United States

Based on our examination of the DTV transition in Berlin and other areas of Germany, it is clear that the manner in which DTV is to be rolled out is considerably different than in the United States. Nevertheless, we found that much of the focus in Berlin leading up to and during the simulcast period was on making sure that consumers who receive television solely through terrestrial means obtain the necessary set-top boxes so that they would be able to view DTV signals once the analog signals were turned off. Since the DTV transition in the United States is already in a simulcast phase—that is, most digital broadcast television signals are already being transmitted—the phase of encouraging consumers to adopt DTV equipment is upon us. FCC has yet to fully determine how cable and satellite households will count toward the 85 percent threshold. Ultimately, the Congress and FCC will need to turn their attention to providing information, incentives, and possibly assistance to those who need to purchase equipment in order for the transition—and the return of valuable spectrum—to be completed. Ensuring that consumers understand the transition, how they will be affected by it, and what steps they need to take is critical not only for ensuring the transition moves forward, but for ensuring that consumers do not unexpectedly lose television reception or incur costs beyond what is necessary to successfully transition to digital television.

The Berlin experience highlights a few factors, which relate to consumers' purchase of set-top boxes, that were very important for the success of the DTV transition in that city:

- *Information provided focused a great deal on need for set-top box and benefits of completing the transition.* The Berlin authorities and broadcasters provided extensive information to the public, the media, and retailers about what the transition would entail, what consumers needed to do, how they would benefit by transitioning to digital television, and where to get assistance if there was confusion about what equipment was necessary or if there were problems with equipment or reception. This effort was planned and coordinated among many parties, adequate resources were dedicated to the information campaign, and nearly everyone we spoke with told us it a critical factor to the success of the rapid DTV transition in Berlin.
- *Set-top boxes were subsidized for needy households.* Subsidies were provided to certain households that might have had difficulties affording the necessary set-top boxes. In particular, low-income households that rely on terrestrial television could apply for financial assistance for the purchase of a set-top box. Because of the low penetration of terrestrial

television, only about 6,000 households required this subsidy at a cost of about half a million Euro (\$615,100). Nevertheless, this may have helped in the management of the transition by ensuring that the transition would not be an undue burden for lower-income households.

- *Near-term date certain for transition deadline made clear when set-top boxes would need to be in place.* Finally, the Media Authority in Berlin set a date certain for the transition that required consumers to make decisions quickly about how they would adapt to the transition. This enabled all stakeholders to know what they needed to work toward: when set-top boxes needed to be available in the market; when education of consumers, hotlines, and TV scroll information would be required; and the date by which consumers needed to decide how to transition or lose their television service.

To summarize my statement, Mr. Chairman, although the context of the transition differs considerably in Germany as compared with the United States, there may be interesting and helpful lessons for the Congress and FCC from the DTV transition in Berlin and other areas of Germany. This concludes my prepared statement. I would be happy to respond to any questions that you or other Members of the Subcommittee may have at this time.

### GAO Contacts and Staff Acknowledgments

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 Amy Abramowitz, Dennis Amari, and Michael Clements.

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