
From Analog to Digital TV:
The Essential Guide to Planning an Over the Air
Digital TV System and Analog TV Shut Off

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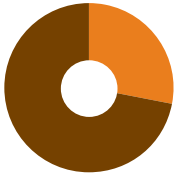
Across the globe over-the-air (OTA) television reception is received by more than a billion households and connects more people to TV programming than any other method. OTA TV reception not only provides entertainment and education but it also provides mass communication during critical national events and emergencies. TV spectrum is one of a nation's most valuable resources and the efficient use of it is critical. The stakes for proper planning of an OTA analog to digital system are very high. A misstep in a digital TV transition can have serious and disastrous consequences for a nation's spectrum management and TV infrastructure.

That is why this guide is essential for any government agency or national or private broadcaster starting a digital terrestrial TV (DTT) system, or completing the DTT transition with an analog shut off. Analog TV shut offs in the United States, Germany, the United Kingdom, and other Western European countries have received significant attention, but scores of transitions have yet to be completed with each country/region having its own conditions and criteria. There are more than 260 million TV households that are able to receive a DTT signal (with a proper receiver) today. But despite that considerable penetration, DTT has really only made it to early adolescence. Only 30% of all countries have commercial DTT transmissions.

DTT Around The World: Countries And Deployments

From Eastern Europe to Latin America and the Middle East and Africa, most countries have either not built their DTT systems or are years away from shutting off their analog systems.

DTT Transmission Status of the World's Countries



■ 70% | Countries Not Transmitting
■ 30% | Countries Transmitting

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The number of countries that have completed their analog broadcast shut off is even smaller. It is among the world's most developed countries that transitions have been completed. This has resulted in millions, or sometimes billions, of government revenue generated from "cleared spectrum" auctions. The political will, ability for these governments to partially subsidize transitions, and a sizeable number of consumers using terrestrial TV created a framework that these transition programs were built around.

The framework for most countries yet to complete their transition will be vastly different from those that have gone before. Different-sized land masses and populations, pan regional considerations, and the state of existing infrastructure will require customized plans for every country and/or territory. In countries where large segments of the population are solely dependent on OTA broadcasts for their TV reception, making the right decisions is even more critical than those made for more developed countries that have many other TV-viewing options.

The Essential Questions Check List

This DTT planning guide is designed around a broad framework that lists some of the major building blocks for creating a transition plan. Because a "one size fits all" approach is not possible, each plan must be highly customized. Through DTC's experience in analyzing the DTT market and involvement in advising those planning analog-to-digital transitions, we are able to share with you invaluable insights into the planning of a DTT transition. We call this The Essential Planning Questions checklist. It is a good starting place but every system/transition is different and these are offered only as a starting point.

Should we build an OTA Digital TV system?

For most, the answer to this question is undeniably, yes. If spectrum is valuable "property" and the more efficient use of it adds value to that property (or makes more TV services available within existing spectrum), then you've at least established that further consideration is warranted.

Making more efficient use of spectrum is a worthy goal, but in countries where the government is responsible for broadcast operations, there is competition for those national resources. In countries where basic services are not always adequately met governments must thoughtfully weigh the building of a DTT system with other demands on national resources.

For those who choose to delay the creation of a DTT system, analog broadcast equipment and consumer receivers continue to be built in significant quantities. DTC believes that servicing current analog TV systems and their customers can be accomplished in the near-term future. The majority of research & development for broadcast equipment and consumer receivers, however, is understandably being focused on digital technology, and analog equipment will receive less and less as time passes.

What are the main objectives for building a DTT system?

This may seem like an unnecessary question, but the answer to this question will dictate many aspects of how you plan your system and transition. A few factors to consider:

- If one of your main objectives is to “create” additional spectrum for other uses, plans for those other uses will impact your plan’s timetable.
- If an objective is to create an environment where more TV programming is available, the type and business model(s) surrounding the additional programming must be considered in the plan.
- Creating a multiplatform digital communications system, such as including stationary TV, mobile TV, and radio reception, into a single plan may be a primary objective. This will call for a much more comprehensive plan than one that only addresses OTA digital TV.
- Cooperating with other countries in your region to maximize efficiencies may need consideration.

Where to Start?

Starting with a comprehensive plan is essential. Whether you are starting from the beginning or have already begun DTT tests and/or commercial services, it is not too late to build a plan that addresses multiple fundamental issues. These issues encompass technical, political, fiscal, market, and government policy realities. The additional questions below address these fundamentals.

Should integrating a DTT system with other digital platforms be considered? If yes, how will that affect standards and specifications selection? How will an integrated infrastructure be built?

For many countries with relatively small populations and geographic areas, existing OTA analog systems are centralized. The need to build on an incumbent system, or a desire to incorporate greater efficiencies, will warrant considering the advantages of integrating multiple platforms into a single system.

The infrastructure cost savings are obvious, but mixing of content ingestion, work flow, transmission and reception can be complicated. Some fixed DTT, mobile DTT and digital radio standards are built on common platforms that are designed to work in concert with each other. The practical application, however, depends on incumbent analog formats, equipment availability, receiver form factors and the need for engineering expertise to put together such a system.

Those who have already chosen, or built, a DTT system may be considering a slightly different question: Is it possible to integrate another digital platform, say mobile digital TV, with an existing DTT system? Again, there are theoretical solutions but implementation can be tricky. Before making a decision, a study of spectrum use, receiver availability and general market conditions must be considered.

How do we assess our technical requirements?

The answers to this question will help guide you in the decision-making for selecting a transmission standard and technical specifications for content creation, distribution and reception. Although we separate these in the guide, these considerations are intertwined on a fundamental level. A desire to use a particular video compression specification, for example, may dictate the type of transmission standard chosen. Regardless of the standard chosen, it’s important to begin with channel-mapping analyses. Here are the basics:

Choosing a Transmission Standard

There are three major DTT transmission standards that are used by multiple countries/territories around the world – DVB-T & second-generation DVB-T2, ATSC, and ISDB-T and its Brazilian implementation SBTVD. There is a standard developed and used in the People's Republic of China (PRC), but it has not been exported to other parts of the world and it appears unlikely that it will be in the future. For the purposes of this guide, we'll concentrate on the three most widely used transmission standards.

- Transmission standards selected by neighboring countries or territories may have an impact on the standards decision. Potential synergies between countries and territories for producing content and building infrastructure should be considered. In some cases, like in Europe, there may be benefit in countries in a particular region choosing the same standard. Select southern African countries recently chose a pan-regional standard designed to build uniformity and efficiencies into regional DTT systems.

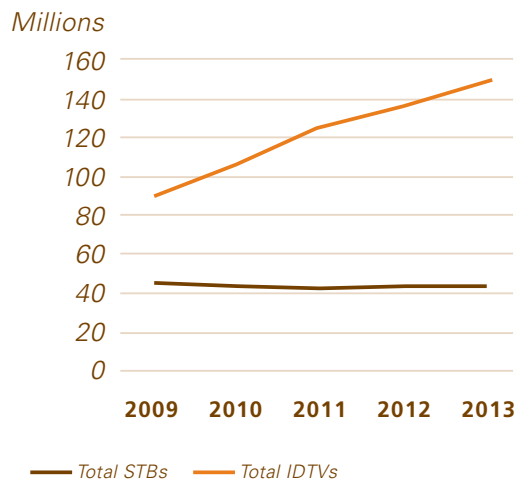
The number of borders and the amount of cross viewership on other sides of those borders must be considered carefully for each country. In addition, a thorough understanding of a country's spectrum policy as it relates to its neighbors must be considered.

Choosing Technical Specifications

The cost and availability of infrastructure equipment and consumer receivers must be carefully weighed. In addition transmission fundamentals must be considered at the very beginning of the plan. This step will require broadcast equipment and receiver equipment cost analyses.

- It is important to conduct cost analyses whether they're done by broadcasters, content owners, or other stakeholders. In the cases where the government will have any involvement in financing/subsidizing the system and/or consumer receivers (see Government Involvement section below) it is vital.
- *Important warning:* The potential size of your market for either professional or consumer equipment, and the types of specifications chosen, could result in higher costs (or lack of supplier interest) than that of costs incurred by other countries. Potential suppliers and service providers who do not foresee a reasonable payback for supplying your market may have to increase prices or decline to participate at all.

Estimated Worldwide DTT TV & STB Receiver Shipments



“A carefully weighted analysis from both
the technical and business perspectives
on old vs. new technologies is essential.”

How do we future proof our system?

Available technology is always in flux and it is imperative that you carefully weigh the newest improvements against more widely deployed technology. The shelf life of the new system, availability and costs of the latest equipment and the availability of content are all key considerations when making these decisions. Not all technical advances fall squarely in the traditional broadcast arena. Watch for advancements in other wireless technologies, as well.

New compression technology, varying transmission options, better multimedia encapsulation schemes, etc., present a smorgasbord of improvements. Some of these improvements are not trivial especially those that build greater efficiencies in the system and creating more virtual bandwidth. A carefully weighted analysis from both the technical and business perspectives on old vs. new technologies is essential.

How do we make decisions about receiver specifications?

Planners should consider all types of receivers that will eventually be used. Many countries building DTT systems and/or programs focus on low-cost single-purpose STBs when choosing specifications, especially if they plan to offer a receiver subsidy for all or part of the population. STBs can be designed to be low-cost and are often considered a way to promote widespread adoption. But, integrated TVs, STBs with PVR functions, hybrid STBs, PC USB sticks, and other TV tuners will likely be a part of the mix for years to come. Not considering future devices when selecting specifications can result in future headaches.

- It is vital to consider all transmissions that will be delivered before the shut off of analog TV. A system that combines, for example an existing NTSC analog format and SBTVD digital format, may require special receivers and those receivers' availability and costs should be weighed.
- Technical specifications must also be considered for auxiliary items that make up part of the receiver system. One of the most critical areas is antenna specifications. Planners must consider the population's current use of indoor and/or outdoor antennas. This is particularly critical for the very high frequency (VHF) band, where most reception problems occur. Other factors to consider are whether or not transmission is from a central point. If transmission occurs from multiple points, planners may need to consider specifying/recommending higher-power antennas.
- If the government is involved in specifying receivers tied to a subsidy, it will likely need to issue requirements to ensure that all subsidized receivers adhere to a "uniform package." Not only will specifications need to be clearly spelled out, but decisions regarding whether or not a receiver package be required to include peripheral items such as remote controls, connecting cables, and other items must be decided.
- It's important to know if there may be a desire/need to build a DTT system that incorporates upon completion, or later, a pay TV component. If so, conditional access systems (CAS) must be considered. Even without an eventual path to pay services, CAS may want to be considered because of the addressability factor. CAS come in different varieties that can mix hardware and software security. Planners should also consider if a conditional access system will require any "enhanced" features, such as digital rights management (DRM) or interactive software components.
- If a pay service is planned, an interactive and/or middleware solution should be considered. There are several initiatives around the world to develop and make available interactive systems either on an open standards or proprietary basis.

What role, if any, will the government have in the distribution of receivers to the public?

The answer to this question will have profound impact on most all other decisions and planning items for a digital transition. Most countries that have completed the analog-to-digital transitions have subsidized (or partially subsidized) the consumer purchase of receivers whether they be digital-to-analog converters or digital receivers. In the case of analog switch off, the cost of the most basic receiver must be affordable enough so that households dependent on OTA transmission can reasonably acquire a receiver.

- A financial analysis that is tightly coordinated with receiver and professional equipment cost analyses must be produced.
- Identification of potential funding sources and the means through which to receive funding approval must make up this financial analysis. A well-researched receiver/STB cost analysis is essential to preparing a subsidy plan.
- If a government subsidy is part of the receiver distribution, it must be decided what, if any, other components of a “receiver package” will be included. Will a subsidy incorporate the cost of an antenna? Remote control? Cables between a television and STB?
- If the government, or some other entity, is partially subsidizing receivers, what kinds of controls, if any, will there be on receiver quality? In other words, will there be some type of testing and/or certification program to ensure all receivers adhere to a minimum standard or specification? There are independent equipment-testing companies that can perform this kind of testing. Receiving a certification from one trusted source could help to streamline a certification program.
- If a subsidy program is established, how will the subsidy be delivered to the end user? This must be well thought out and tied to the education plan to minimize confusion to consumers and retailers.

How will we inform and educate everyone about the new TV system?

This is a critical component. It is not possible to have a successful transition without a well-planned information and education plan. The amount of money that can be devoted to an education program will directly impact the size of the effort.

Don't assume that consumers are the only constituency that require information and education about the government's DTT and transition plans. It is critical to also develop educational material for the retail community, private broadcasters (if applicable), pay TV providers, local content providers, and other government institutions. In addition, we recommend that you involve all stake holders when planning your education/information program. Not only can they help identify the most important elements of education materials, but they can also help distribute the message. A small budget can be stretched farther with these groups invested in the education process.

Traditional media outlets are not the only way to distribute your education materials. Identify community organizations, schools, and places of worship where citizens can learn about the transition. This is especially important if you are working with a small budget. ♦

How can you get additional help in planning for a DTT transition?

The DTC Digital TV Transition Group has more than a decade of experience helping government agencies and other DTT stakeholders plan for digital transmissions. Among the services we offer:

- Creating DTT transition plans covering all aspects of a transition – technical, business, community education, receiver distribution, and subsidy programs
- Customized analyses of technical standards and specifications across platforms
- Customized receiver cost analysis and research on available consumer receivers
- Advising and planning complete consumer receiver distribution systems for government agencies
- Troubleshooting live transmission networks
- Creating educational materials designed to inform the public and other stakeholders of the information necessary to foster a smooth transition

“The focus on technology, planning, market considerations, and consumer education provided us with the comprehensive expertise that would have been difficult to find anywhere else.”

- The Bureau of Telecommunications & Post of Curacao

“DTC demonstrated expertise and inside perspective in the digital TV market. Its work contributed to the Second Authority's implementation of our analog to digital TV transition.”

- Second Authority for Television and Radio of Israel

We hope that you find this guide, which is created from The DTC Digital TV Transition Group's years of experience working with broadcasters, government entities, and DTT receiver suppliers, useful and invite you to contact us to learn more about how we can help you in the all-important planning for a digital TV transition.

The DTC Digital TV Transition Group's work has included forecasting the DTT receiver market throughout the world, helping individual governments plan their DTT transitions, creating education materials for distribution to consumers and retailers, planning government receiver distribution programs, and providing the only digital converter-box tracking service for the world's largest analog TV shut-off program.

The DTC Digital TV Transition Group's only agenda is to help countries make the entire transition in a smooth, timely, and cost-effective manner. The Transition Group has no allegiance to any one transmission standard, technology, or manufacturer, and we fully understand how high the stakes are when planning and implementing an analog TV shut-off.

If you are at the beginning of a DTT transition or are planning for an analog TV shut-off, please contact Myra Moore at DTC to learn how the Transition Group can help guide you through this complex process. Every member of the team has been directly involved in digital TV transitions. Our experts come from engineering, government, business and market research backgrounds. For detailed information on the team, please go to <http://dtcreports.com/dtvbios.aspx>.

