Why the FCC Must Adopt a Digital Broadcast Standard

For more than 50 years the U.S. television industry has operated on a single, industry-developed and government-adopted broadcast transmission standard. This feature has enabled competition and guaranteed the availability of free, over-the-air television to every American.

At the request of the FCC, the affected industries have again devised a new, single standard that will take America forward into the digital age of over-the-air high definition television (HDTV), and with it a host of new information services and an entirely new world of communications possibilities. Broadcasters, manufacturers, workers, and consumers are ready to go forward -- but the leap into digital tv cannot happen until the FCC adopts the industry-consensus standard that will move the country together. Here's why:

- ***Universality***. Unlike pay services such as direct broadcast satellites, cable and on-line computers, television broadcasting at its core is a universal, open and free medium accessible to virtually everyone in America. Only a single, universal transmission standard guarantees that every American will continue to have access to all free, over-the-air television signals anywhere in the United States.

- ***Predictability and Certainty.*** Consumers expect and deserve to know that a television set purchased in Los Angeles will function anywhere in the United States, that it will receive all local broadcasts and that it will provide a long service life. A single standard preserves universal access and usage, while also providing the flexibility for future innovation, similar to the way the current standard has accommodated color, stereo-sound, teletext, ghost canceling, closed-captioning and other modifications.

- ***Fostering Competition At Home and Abroad.*** The adoption of a single standard for broadcast television is an effective means of promoting competition. That fact was proven when the entire broadcast industry in America made a seamless transition from black and white to color television in the 1960's. Without an approved standard and marketplace certainty today, neither manufacturers, broadcasters nor consumers will invest the large sums of money necessary and America will fall behind its international competitors in a technology we invented. The European Community has already adopted a digital standard of its own and is aggressively marketing it around the world. America cannot afford to lose its competitive edge in this technology along with the thousands of jobs it could create.

Why the ATSC Standard?

American broadcasting is at a critical crossroads. On one path lies the ATSC (Advanced Television Systems Committee) standard -- a proven new digital broadcast transmission technology that is second to none in television quality and interoperability with computer applications. On the other path lies a theoretical proposal, being advanced by Microsoft and a handful of others. If the decision were based on viability alone, the FCC would have no choice but to select the ATSC standard. But there are more -- many more -- compelling reasons to adopt the ATSC standard without delay. They include:

- The ATSC standard provides the highest quality broadcast television pictures of any proven technology.

- The ATSC standard is the most interoperable broadcast television system ever devised. It is a consensus technology that will accommodate 18 different formats, including 14 "progressive scan" formats for computer interoperability, as well as four "interlaced" formats -- which are essential to providing high-definition, over-the-air broadcast signals, as well as interoperability with other video delivery media.

- The ATSC standard guarantees the television-viewing public extraordinary picture quality and advanced computer imaging capability. In comparison, the opponents advocate a standard that is intended to improve computer imaging capability but is not directly interoperable with other video service providers.

- The ATSC standard is the product of over $500 million in research conducted over nearly a decade by representatives from broadcasting, television manufacturing, cable and the motion picture and computer industries. The opponents of the ATSC standard are advocating a standard that does not exist and may take up to five years to develop if it is even practical at all. American consumers should not be forced to wait for a standard that we know today will have television picture-quality and service options that are *inferior* to the ATSC standard.

- Unlike advertiser-supported free television, the computer industry is dependent upon the sale of constantly changing hardware, software and on-line services. The computer industry proposal for a broadcast standard is similarly premised on providing over-the-air television through computer equipment with built-in obsolescence.

- Adoption of the ATSC standard will quickly saturate the market with a multitude of television receivers that rely on the same proven technology. The result will be a swift and steady decline in unit cost to the consumer. Competing or uncertain technologies may never achieve similar economies of scale which are essential to making future televisions affordable for most families and individuals.

Virtual Myths About Digital Broadcast Standards

Eleven months after the development of a universal digital standard for broadcast television by all interested parties, a handful of computer companies have mounted an eleventh-hour effort to replace this consensus private sector proposal with an untested plan of their own. They have advanced many bits and bytes in support of their position, but few, if any, real facts. Before you buy their "vapor standard," check out the reality:

The Standard

Myth: *It's unnecessary and unwise for the government to set a standard for DTV.*

Fact: The proposed Advanced Television Systems Committee (ATSC) standard is not a government-created standard. It is the result of the unprecedented cooperation of a team of 1,000 experts from all the various sectors affected. We seek only to have the government adopt what the private sector has already agreed to. Without the marketplace certainty that such a standard provides, manufacturers are reluctant to invest in new products that could be rendered obsolete by unpredictable market changes. Consumers, likewise, are hesitant to purchase major electronics with no guarantee of useful longevity or without knowing that a set purchased in Los Angeles will work in New York.

The ATSC standard does not just apply to new products but also represents a flexible transition for a medium that penetrates 98 percent of all households, with room for expansion and new technology. In the absence of FCC approval, manufacturers are likely to drift toward a competing — fully interlaced and thus non-computer compatible —standard that has garnered the support of the entire European Community and is being marketed aggressively in the rest of the world.

Myth: *The ATSC standard was developed by a small club dominated by foreign equipment manufacturers, without considering the needs of the computer and film industries.*

Fact: The long Advisory Committee process that developed the ATSC standard was completely open and included the American computer, motion picture, cable, satellite and telecommunications industries, as well as the broadcasting, broadcast equipment and U.S.-based consumer electronics sectors. Specifically, it included representatives from companies such as Apple, Compaq, Digital Equipment Corp., Hewlett-Packard, IBM, the Interactive Multimedia Association, Microsoft, Silicon Graphics, Sun Microsystems and Toshiba. One of the specified criteria of the Advisory Committee's endeavor was "interoperability."

***Myth**: The proposed ATSC standard is based on outmoded technology.*

Fact: The standard is the most flexible broadcast TV system ever devised, representing a combination of the best of all worlds: interoperability of state-of-the-art high-definition technology for broadcasters with computers, existing receivers, VCRs, camcorders, cable systems, and other applications, and plenty of "headroom" for future innovations. Its proven, tested performance and flexibility contrasts sharply with the unproven, ill-defined "vaporware" advocated by a few in the computer industry.

Transition to Digital

***Myth**: Broadcasters will not make the conversion to digital television (DTV).*

Fact: The ATSC proposed standard has been endorsed by the entire broadcast industry, in contrast to the computer companies' proposal, which is not supported by a single station. That fact speaks for itself. Moreover, the conversion to full studio DTV operation can be phased in over a period of years with manageable premiums over ordinary capital budgets.

Broadcasters are enthusiastic about the business opportunities made possible by higher-definition television, six-channel surround sound, and the opportunity to combine video material with ancillary data and provide completely separate data services. Most importantly, broadcasters recognize that their competitive position will be seriously weakened if cable, satellite and other delivery media offer DTV and they cannot. In other words, they can't afford *not* to make the conversion to DTV.

***Myth**: Only the wealthy will be able to afford DTV. The ATSC standard will cost consumers more than $91 billion over the next 10 years.*

Fact: Most people replace their televisions within 8-10 years. That's the typical useful lifespan of a receiver, and it's worth noting that it's significantly longer than the average lifespan of computer hardware.

As is typical for new electronic product introduction, per-unit costs may be higher than traditional television sets at first, but countless examples of emerging technology (digital satellite broadcasting, VCRs, etc.) have demonstrated that industry competition and mass acceptance drive prices down quickly and dramatically (when color television was first introduced, a new set cost about the same as an automobile). Even in the early stages, the additional cost of digital television sets will be measurable in the hundreds of dollars.

Consumer/Industry Acceptance

***Myth**: The public isn't interested in DTV.*

Fact: Fifteen years ago, the same argument was made about compact discs. Demonstration projects and other market research indicate strongly that the public is eager to invest in higher quality entertainment mediums.

***Myth**: The ATSC standard is not computer interoperable.*

Fact: This is simply wrong. Of the 18 formats in the standard, 14 utilize progressive scanning for computer interoperability. The other four, which use television's traditional interlaced scanning, do not substantially interfere with computer performance. They simply provide interoperability with existing equipment and other video services, and are the only way to transmit digital television using current technology. In fact, the ATSC standard is the most computer-friendly digital television system on the planet, far more so than the European Community's competing Digital Video Broadcast standard (interlaced only) that is being heavily marketed around the world while the FCC delays approval of the ATSC standard.

***Myth**: Specifying a 16:9 aspect ratio in the transmission standard will mean continued "butchery" of motion pictures shown on television.*

Fact: The 16:9 format reflects a broad worldwide consensus as to the best balance between resolution, bandwidth, receiver cost, and compatibility with existing formats. Accommodating an 18:9 broadcast in a 16:9 transmission would require only very marginal "letter-boxing" to present the whole picture, and as long as movies continue to be produced in a variety of formats, the letterboxing of some will be a fact of life. The Motion Picture Association of America (MPAA) was a party to the consensus on the 16:9 format and continues to support it.

***Myth**: The ATSC standard will stifle innovation and development in related industries.*

Fact: Just the reverse is true: a common and flexible standard makes innovation possible by providing a secure environment for investment by industry in research, development and new production. Without it, manufacturers are unlikely to branch out into new areas, stifling the creation of new jobs in facilities that manufacturers have committed to building in the US if the ATSC standard is approved.

Of course, it also remains true that the standard applies *only* to broadcast transmissions. Computer companies, and everyone else, are free to build any kind of products they want, using any kind of technology they choose. The ATSC standard is only a broadcast transmission standard, not a receiver product mandate.

Creating an Industry Standard for Digital Television (DTV)
A Chronology

The creation and development of a broadcast industry standard for advanced or digital television began nearly a decade ago. When this process started, there was a very real prospect the Japanese would develop their standard first and preempt American technology.

Rather than have the U.S. government take on this massive and costly effort, however, private industry took the lead. The standard that now awaits FCC adoption is the culmination of hundreds of millions of dollars of private investment and the merging of the best aspects of numerous proposals, including input from both the computer and cable industries.

Here is a brief history of how this standard was created:

1987 **FCC INQUIRY.** In February, broadcasters asked that the FCC begin an inquiry into the development of advanced television. Later that year, the Commission began its inquiry into advanced television, and in November, created an FCC Advisory Committee on advanced television to begin the actual process of seeking advanced television options for broadcasting.

That advisory committee and its subcommittees included over 1,000 industry experts, representing not only broadcasters, but also computer, motion picture, cable, satellite and telecommunications industries, as well as broadcast equipment and consumer electronics manufacturers, and members of academia.

As a result of that process, 23 different proposals were introduced, all using analog technology (such as is used in current TVs) or some hybrid -- digital/analog -- approach.

1990 **FIRST ALL-DIGITAL SYSTEM.** General Instrument introduced an all-digital transmission system -- something previously thought unfeasible. Three of the remaining proponents switched to digital technology, and they, along with a Japanese analog system, were then subjected to exhaustive laboratory testing by the Advanced Television Test Center and elsewhere. All the testing was designed and overseen by the Advisory Committee. Over the next three years, these tests demonstrated the superiority of digital technology, putting the American entrants into the lead in the race for the future of television.

1993 **THE GRAND ALLIANCE.** Based on testing and proposed enhancements, the four digital proponents decided to merge their proposals into one single design -- the so-called "Grand Alliance." This product represented the best of each of the four original designs, plus substantial improvements requested by the Advisory Committee, thus creating the most interoperable broadcast TV system ever devised. *Without a single dissenting vote,* the Advisory Committee authorized moving forward.

The final decision includes a number of modifications *including changes made at the suggestion of the computer industry* representatives involved with the Advisory Committee. A panel of experts to ensure interoperability included membership from such computer companies and interests as Apple, Compaq, Digital Equipment Corp., Hewlett-Packard, IBM, the Interactive Multimedia Association, Microsoft, Silicon Graphics, Sun Microsystems and Toshiba.

1995 **SUBMISSION TO THE FCC.** Testing of the Grand Alliance system -- including field tests -- is completed. A final recommendation to the FCC to adopt the standard based on the Grand Alliance technology provides industry and consumers assurance that digital tv will be interoperable with other devices (such as computers, VCRs, camcorders, cable set-top boxes, etc.), and that signals will be viewable by anyone with a digital or analog receiver.

1996 **COMPUTER COMPANY OPPOSITION AND FCC DELAY.** On the eve of the FCC's recommendation for final approval of the standard, a handful of computer interests raise questions and ask that the FCC delay its adoption. Despite the fact that the ATSC standard is the result of combining the "best of the best" of numerous proposals and accommodates the needs of the computer industry, the FCC has not adopted it after 11 months.

Interlaced vs. Progressive Scanning

A television signal consists of a rapid sequence of still pictures (frames) used to portray motion. Progressive and interlaced scanning are two methods of creating those still pictures. On computers, the picture is created "progressively" that is, line by line until the picture is complete at, for example, 72 times per second. On your television set, half the lines are displayed at 60 times a second and then the other half are woven in at 60 times per second in a process called interlace scanning.

Interlace technology was invented 50 years ago to reduce the bandwidth needed to transmit high quality pictures and to make television signal transmission possible within a 6 MHz wide channel. In digital television, broadcasters must still fit their digital signals within 6 MHz channels.

- Interlaced mode will accommodate higher resolution, higher quality, 1000 line scanning in a 6 MHz channel. In contrast, progressive only allows 720-line scanning.

- Broadcasters will migrate to an all-progressively scanned system when compression technology allows 1000 scan lines of progressive scan images to be squeezed into a 6 MHz channel.

It is imperative that the interlaced transmission options are retained in the ATSC standard primarily for three reasons:

- Interlaced transmission is essential for interoperability with the existing television service. All current broadcast signals, current analog and digital cable signals, digital satellite broadcast signals, home VCRs and camcorders are based on interlaced scanning.

- All current digital and analog television standards in the world are based on interlaced scanning.

- In a fixed bandwidth, interlaced scanning allows highest resolution pictures under current technology.

Square vs. Non-square Pixels

The ATSC digital standard includes both square and non-square pixel transmission modes. However, the computer industry standard would eliminate the modes with non-square pixels from the digital television (DTV) standard.

- Pixel is short for picture elements. A picture is represented by a matrix of tiny samples or picture elements--for example, 480 vertical pixels by 704 horizontal pixels, the current television standard.

- Square or non-square pixels refers to the spacing between pixels. Square pixel spacing means that the horizontal spacing between pixels is the same as the vertical spacing.

- Computers use square pixel spacing.

- In the ATSC standard, all the high definition (HDTV) modes use square pixels. However, several of the standard definition (SDTV) modes include non-square pixel configurations.

- Non-square pixel spacing must be included in the digital standard to ensure backward compatibility with the existing inventory of television programming (i.e., news, sports, movies).

- Non-square pixel transmission formats are needed for compatibility with the International Telecommunications Union international standard (ITU-R-601) for studio origination of digital video signals that has been in place for almost fifteen years and is the standard throughout the world.

Flexible Formats

The proposal of the computer companies would exclude all interlaced and non-square pixel display formats.

- Formats define the parameters of the shape, size, and location of pixels on electronic displays.

- The Advanced Television Systems Committee (ATSC) standard is designed to transport up to 18 different input formats--14 progressive and 4 interlaced. Nine of the formats were added to improve compatibility with computers and three with existing TV standards.

- There are only three fundamentally different formats -- 1080, 720, and 480 scan lines. The "18 formats" comes from counting each combination of frame rate and aspect ratio associated with these scan rates as a different format.

- ATSC's digital standard enables interoperability with other video media including computers and telecommunications (e.g., satellite, cable, Multichannel Multipoint Distribution Systems, digital video discs, and telco video).

- Supporting multiple formats greatly expands the functionality and value of digital television to consumers while adding very little to the price of consumer equipment.

- The ATSC digital standard allows a large range of receivers, from low-cost models to full feature high-end sets for all income levels.

- Hitachi America has demonstrated, and others are developing, effective techniques to process and display all of the digital TV formats with a cost-reduced decoder that can deliver lower-definition, lower cost receivers and converters.