Compaq Computer Corporation
1300 Eye Street, NW • Suite 490 East
Washington, DC 20005

87-268

COMPAQ

RECEIVED

JUL 23 1996

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

July 15, 1996

The Honorable Reed Hundt
Chairman
Federal Communications Commission
1919 M Street, N.W., Room 814
Washington, DC 20554

EX PARTE OR LATE FILED

Re: Advanced Television

Dear Mr. Hundt:

A copy of the Comments of Compaq Computer on the FCC's Advanced Television proceeding is enclosed. Compaq, in coalition with computer, cable, consumer, and entertainment interests, opposes the adoption of the Grand Alliance standard for Advanced Television. I hope that you will carefully read Compaq's comments, in conjunction with the comments of the Computer Industry Coalition on Advanced Television Service.

If you have any questions or would like to discuss the issue in detail, do not hesitate to contact me.

Sincerely,

Joe Tasker

Joseph Tasker, Jr.
Vice President, Federal Government Affairs

Enclosure

No. of Copies rec'd 1
List ABCDE

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

RECEIVED
JUL 23 1996
FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

In the Matter of	)	
	)	
Advanced Television Systems and Their Impact Upon the Existing Television Broadcast Service	)	MM Docket No. 87-268

COMMENTS OF
COMPAQ COMPUTER CORPORATION

Jeffrey A. Campbell
Compaq Computer Corporation
1300 I Street, N.W.
Suite 490E
Washington, D.C. 20005
202-962-3830

July 11, 1996

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D C 20554

RECEIVED

JUL 23 1996

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

In the Matter of Advanced Television Systems and Their Impact Upon the Existing Television Broadcast Service	)	MM Docket No 87-268

COMMENTS OF
COMPAQ COMPUTER CORPORATION

Jeffrey A. Campbell
Compaq Computer Corporation
1300 I Street, N.W.
Suite 490E
Washington, D.C. 20005
202-962-3830

July 11, 1996

SUMMARY

Compaq Computer Corporation ("Compaq") -- the world's largest supplier of personal computers ("PCs"), the fifth largest computer company in the world and a key player in the development of innovative products and services made possible by the convergence of PCs and digital television -- urges the Commission to reject the digital television ("DTV") broadcasting standard recommended by the Advisory Committee on Advanced Television Service ("ACATS").

Compaq believes that adoption of *any* government-mandated standard for DTV broadcasting -- particularly the ACATS standard -- would disserve the public interest.

A government-mandated standard would provide little, if any, certainty to consumers, licensees and equipment manufacturers that DTV equipment will be compatible and that their investments in DTV will not be stranded that the marketplace could not (or would not) provide. In circumstances such as this where the industry is well established, the self-interest of the key industry players will drive them to develop a compatibility standard. Absent such a standard, broadcasters risk disenfranchising their viewing audience (and, as a result, losing advertising revenues) and equipment manufacturers risk fracturing the receiver market (and, thereby, reducing profits) because screens will go black if the transmission used by one broadcaster

differs not only from that used by other broadcasters but also from that accepted by the receiver

While conferring little, if any benefit, a government-mandated DTV standard would exact huge costs. Most importantly, it would stifle technical innovation in an industry where technical advances have been fast and furious, which, in turn, would inhibit competition otherwise made possible through product differentiation

In a careful weighing of the costs and benefits of a government-mandated standard, the scale is tilted heavily toward the costs. The Commission thus should not adopt *any* standard for DTV broadcasting.

If the Commission nevertheless concludes that adoption of a DTV standard would best serve the public interest it should *not* adopt the full ACATS standard. The ACATS standard includes 18 video formats that include inferior technology -- specifically, interlaced scanning, non-square pixel spacing, computer unfriendly picture rates and limited aspect ratios -- that interferes with computer compatibility. The formats are so detailed and complex that, taken together, they will vastly increase TVs' (and PC/TVs') processing power requirement and consequently, their costs to consumers. This, in turn, will seriously hamper the development of advanced DTV-based products and services.

If the Commission insists on adopting a standard for DTV broadcasting, it should be one that minimizes these problems, as does the

refinement of the ACATS standard proposed by the Computer Industry Coalition on Advanced Television Service ("CICATS") CICATS refinement would allow (in fact, encourage) the convergence of PCs and televisions and bring vastly improved products to consumers at lower costs

For the reasons stated above the Commission should *not* adopt the ACATS standard

275.01\Sumry.doc

TABLE OF CONTENTS

Page

SUMMARY i

INTRODUCTION 2

I. AN OPEN AND VOLUNTARY DTV STANDARD WOULD BETTER SERVE THE PUBLIC INTEREST THAN A GOVERNMENT-MANDATED STANDARD 5

A. Consumers, Licensees and Equipment Manufacturers Can Rely On Voluntary Industry Standards For The Certainty Needed to Transition to DTV 6

B. The Government-Mandated DTV Standard Would Entail Substantial Costs 11

II. IF THE COMMISSION ADOPTS ANY DTV STANDARD, IT SHOULD NOT BE THE FULL ACATS STANDARD 14

III. THE COMPUTER INDUSTRY'S REFINEMENT OF THE ACATS STANDARD IS SUPERIOR 21

CONCLUSION 23

Exhibit 1 — Written Testimony of Robert Stearns

Exhibit 2 — "A Video Compression Efficiency Analysis using Progressive and Interlaced Scanning"

Exhibit 3 — "Comparison Between Interlaced and Progressive Scanning Formats"

Exhibit 4 — "Progressive versus Interlaced Coding"

Exhibit 5 — Written Statement of Craig Mundie

Exhibit 6 — "Advanced Television Systems for Terrestrial Broadcasting: Some Problems and Some Proposed Solutions"

275.01/toc.doc

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of Advanced Television Systems and Their Impact Upon the Existing Television Broadcast Service	)	MM Docket No. 87-268

COMMENTS OF
COMPAQ COMPUTER CORPORATION

Compaq Computer Corporation ("Compaq"), through undersigned counsel, hereby submits these Comments in response to the Fifth Further Notice of Proposed Rule Making ("Fifth NPRM") in this proceeding.[1] For the reasons set forth below, Compaq urges the Commission not to adopt the digital television ("DTV") broadcast standard recommended by the Advisory Committee on Advanced Television Service ("ACATS").[2] Adoption of the ACATS standard would impose costs -- most significantly on technological innovation -- that greatly outweigh its benefits, and thus would not serve the public interest. If the Commission nevertheless believes that a government-mandated standard

[1] *Advanced Television Systems & Their Impact Upon the Existing Television Broadcast Service*, MM Docket No. 87-268, Fifth Further Notice of Proposed Rulemaking (released May 20, 1996) ("Fifth NPRM").

[2] That standard is formally referred to as the "Advanced Television Systems Committee Standard A/53 (1995)." Compaq refers to the standard as the "ACATS standard" in these Comments.

should be imposed, Compaq recommends that it adopt the modified form of the ACATS standard proposed by the Computer Industry Coalition on Advanced Television Service ("CICATS") in its comments in this proceeding.[3]

INTRODUCTION

Compaq Computer Corporation was founded in 1982, with an initial focus on the portable computer -- Compaq was the first company to manufacture portable personal computers ("PCs") The breadth of Compaq's product line evolved to include desktop PCs as well, and Compaq exceeded $1 billion in sales faster than any other company in history Only fourteen years after its founding, Compaq is now the world's largest supplier of PCs. The company has expanded to become a full service computer company able to serve the entire realm of corporate computing, including enterprise computing. This is acknowledged by the fact that in the past four years Compaq jumped eleven positions to become the world's fifth largest computer company, with 1995 worldwide sales of just under $15 billion.

Compaq attained its leadership position in the global computer industry in several ways. First and foremost, it did so through pace-setting innovation in product introductions made possible through reliance on open and voluntary technical standards. Compaq's customers can choose their favorite operating systems, browsers, databases and applications, and know they will all

[3] Compaq supports the views expressed in this proceeding by the Computer Industry Coalition on Advanced Television Service ("CICATS"), and incorporates herein by reference the Comments filed by CICATS on July 11 1996 ("CICATS Comments").

work seamlessly on Compaq platforms. Similarly, Compaq servers are the reference platform for Microsoft, Oracle, Novell, SAP, and many other leading software developers -- a position that can only be assured when Compaq manufactures "industry-standard" platforms and others involved in the industry voluntarily adhere to technical standards around which such software is built. Second, Compaq has pursued and entered into an array of strategic partnerships with other key players in the computer software and hardware industry, including Microsoft, Intel and Cisco Systems. These alliances have allowed Compaq to blend and integrate technologies to develop products that meet real consumer needs.

Compaq has invested heavily in the digital future, and is poised to take the PC to a new level by mating it with digital broadcast television. The development of digital broadcast television has only recently made the true convergence of computers and broadcast television possible. The computer hardware and software industries, whose stock-in-trade is visionary innovation, have been gearing up for the convergence of PCs and TVs since the potential for digital broadcasting became apparent

Compaq already has announced a hybrid PC-TV that combines a 36-inch monitor with a television tuner, PC hardware, and software.[4] The next

---

[4] "Putting TVs and PCs Together: Convergence Will Mean Larger Screens, Expanded Use of Both," USA Today, May 23, 1996, at 4D. The product has been designed to receive broadcast signals in the analog NTSC format, and thus suffers quality degradation that could be avoided with a proper standard for digital transmissions. Written Testimony of Robert Stearns, Senior Vice President , Technology and Corporate Development, Compaq Computer Corporation, before the Senate Committee on Commerce, Science and Transportation on the Electromagnetic Spectrum

generation of TV-friendly computers will allow consumers to receive digital broadcasts, including high-definition television (HDTV), work on a PC, and scan the Internet for information -- all at the same time, on the same machine. The wealth of information and services the new breed of PC-TVs will usher into the home will include electronic commerce and banking, enhanced entertainment programming, distance learning, and telemedicine.[5]

An example of the scope of products and services convergence will make possible is Compaq's latest Presario PC which will incorporate "Intercast" hardware and software to allow users to watch live television broadcasts and simultaneously receive and use information from the Internet relating to those programs. These and other products will soon bridge the gap between television and computing.

Digital technology poses a question the Commission must address in this proceeding: Will its decision provide the flexibility needed by all segments of the converging television and computer industries to realize the greatest potential of digital television? Or will it erect unnecessary barriers between the two industries and administratively guarantee a digital Dark Ages in which consumers will be deprived of the benefits convergence can make possible? Compaq exhorts the Commission to encourage a broadcast television

---

Management Policy Reform and Privatization Act (June 20, 1996) ("Stearns Written Testimony") Exhibit 1 hereto, at 5.

[5] Stearns Written Testimony, Exhibit 1 hereto, at 5.

renaissance by allowing digital television to soar unimpeded to its highest potential, unburdened by overly detailed regulatory requirements such as the full ACATS standard

I. AN OPEN AND VOLUNTARY DTV STANDARD WOULD BETTER SERVE THE PUBLIC INTEREST THAN A GOVERNMENT-MANDATED STANDARD

In the Fifth NPRM, the Commission proposes to adopt the ACATS DTV standard as a government-mandated transmission standard for digital television licensees.[6] The Commission does so because it believes that the benefits of a standard in terms of certainty for consumers, licensees and equipment manufacturers cannot adequately be realized through voluntary industry standards and that the loss of technical innovation and competition resulting from adoption of the ACATS DTV standard will not be substantial.[7] The Commission is wrong in both respects. Moreover, a government-mandated standard would run counter to the Commission's objectives in this proceeding by reducing the availability of new products and services to consumers through the introduction of digital broadcasting, discouraging technological innovation and competition, and imposing regulation where the marketplace is better able to accomplish the objective of the regulation.[8]

---

6 Fifth NPRM, at ¶ 37.

7 *Id.* at ¶¶ 31-36.

8 *Cf. id.* at ¶ 1.

A. Consumers, Licensees and Equipment Manufacturers Can Rely on Voluntary Industry Standards for the Certainty Needed to Transition to DTV

Voluntary industry standards can provide sufficient certainty to consumers, licensees, and equipment manufacturers during the introduction of DTV technology that equipment will be compatible and will not be rendered obsolete, leading to the more rapid development of equipment by manufacturers of DTV programming by licensees and acceptance of DTV by consumers.

In the Notice of Inquiry in this proceeding, the Commission specifically acknowledged that "voluntary standards organizations" are capable of establishing standards needed to provide certainty with respect to emerging technologies.[9] In fact, in the Fifth NPRM the Commission states that a government-mandated standard is necessary only "when two conditions are met" -- a standard produces a substantial public benefit *and* private industry has failed to produce a standard.[10] The Commission itself dismisses the second condition, yet nevertheless proposes to adopt a mandatory standard.[11]

---

[9] *Advanced Television Systems and Their Impact on the Existing Television Broadcast Service*, MM Docket No. 87-268, Notice of Inquiry, 2 FCC Rcd 5125, 5135 (1987) ("NOI"). When the Commission initiated this proceeding almost 9 years ago, it wisely questioned the continuing need for a *mandatory* terrestrial broadcast standard in light of the fact that the industry was well established and that mandatory standards may indeed "be counterproductive." To preserve technical flexibility, the Commission proposed, as an option, to adopt voluntary -- not mandatory -- standards reached through industry consensus to which broadcasters conforming to the standard would be given protection from interference. This, the Commission hoped, would "encourage the industry to coalesce around a single system without creating inflexible requirements that prevent development of newer, technically superior systems

[10] Fifth NPRM at ¶ 31.

[11] *Id.*

Compaq does not dispute that the technical standards can offer substantial public benefits. It does question the Commission's ambiguity on whether industry has failed or will fail to produce a standard that is acceptable to all participants. Compaq knows first hand the benefits of industry standards. It also knows that "voluntary industry standards" can produce benefits without imposing the costs of government-mandated standards. Compaq has earned its position in the personal computer market by producing voluntarily adhered-to "industry-standard" products that meet changing consumers needs as well as consumer needs for certainty and interoperability among hardware and software. Just as the computer industry has adopted voluntary industry standards to ensure a market for its products and services, there are sufficient incentives for all relevant sectors of private industry to voluntarily adopt a DTV standard.[12]

Perhaps the most important incentive is the fact that the market for broadcast television services is well established.[13] Broadcasters have an audience to which their programming is directed; consumers are able to redirect their attention to different broadcasters at the press of a button; and equipment manufacturers have consumers to whom their products are marketed. This

---

[12] Compaq recognizes that there are certain limited circumstances in which government-mandated standards are appropriate. The most obvious are areas in which competition is lacking; such as basic local telephone service interconnection arrangements or cable box standards. *E.g., Implementation of the Local Competition Provisions in the Telecommunications Act of 1996*, CC Dkt. No. 96-98, Notice of Proposed Rulemaking (released April 19, 1996); *Implementation of Section 17 of the Cable Television Consumer Protection and Competition Act of 1992; Compatibility Between Cable Systems and Consumer Electronic Equipment*, ET Dkt. No. 93-7, 11 FCC Rcd 4121 (1996). In such circumstances a market-based standard would end up being that dictated the by dominant providers.

[13] Fifth NPRM, at ¶ 36.

baseline of audience and consumers motivates those involved (or hoping to become involved) in the production of DTV programming and equipment to coalesce in the adoption of an industry standard

It has been well established that "equipment compatibility can be very responsive to marketplace forces. . . [those] who make incompatible products may have an incentive to voluntarily reach compatible standards as a compromise . . . to be assured of an adequate demand for their product."[14] recognizing that "compatibility increases firms' profits."[15] Compatibility can (and should) be the driving force for adoption of a DTV standard. Broadcasters need compatibility to ensure that their shows can be seen by any household that owns a television receiver -- not a subset of households with receivers that are compatible to the broadcasters' preferred transmission method, and will likely want to reach a new audience viewing on PC-TVs. Likewise, equipment manufacturers (including PC-TV manufacturers) will want to continue to sell to *all* households rather than fracturing the demand based on individual households' preferences for viewing formats, and to be able to do so at acceptable prices. A single transmission standard established by the industry will foster these objectives. It will allow broadcasters' programming to reach the entire potential viewing audience, and thereby maintain their advertising revenues, and will allow

---

[14] Dr. Jeffrey Krauss, *Implications of FCC Regulation if Telecommunications Technical Standards*, IEEE Communications Magazine, September 1982, at 29.

[15] Stanley M. Besen, Leland L. Johnson, *Compatibility Standards, Competition, and Innovation in the Broadcasting Industry*, 17 (1986) ("Besen & Johnson (1986)").

manufacturers to market sets that receive such programming to all households at reasonable prices.[16]

In the *Broadband PCS Proceeding*, where a key Commission goal was the rapid deployment of new technology, the Commission refused to mandate certain requirements on the basis that the marketplace would drive participants to a proper resolution.[17]

In addition to the advanced cellular systems and PCS models with which the Commission is familiar,[18] voluntary industry standards have worked well in the computer industry to give consumers and manufacturers the certainty needed to invest in new technologies. The personal computer industry has experienced phenomenal growth, and Compaq has become the worldwide leader in supplying personal computers precisely because the industry has

---

[16] In the Fifth NPRM, the Commission proposes to apply the ACATS standard only to digital broadcast licensees, and to let the market establish compatibility between broadcast television and alternative media, such as cable television, DBS, MMDS, and ITFS. Fifth NPRM at ¶¶ 63-65. The Commission recognizes that the cable industry may adopt a different digital transmission standard, for example, one that uses QAM modulation rather than VSB, as required under the ACATS standard. Fifth NPRM, at ¶ 64. If so, cable television systems and broadcast television receivers will be incompatible but this will undoubtedly be resolved through set top converters supplied by cable companies because the majority of "cable viewing hours are spent watching broadcast programming." *Id.* at ¶ 64. This result would directly contravene the objective of Section 17 of the Cable Television Consumer Protection and Competition Act of 1992 -- to "ensure compatibility between cable systems and consumer TV receivers." *Implementation of Section 17 of the Cable Television Consumer Protection and Competition Act of 1992; Compatibility Between Cable Systems and Consumer Electronics Equipment*, ET Dkt. No. 93-7, First Report & Order, 9 FCC Rcd 1981 (1994).

[17] *Amendment of the Commission's Rules to Establish New Personal Communications Services*, Gen. Dkt. No. 90-314, Second Report and Order, 8 FCC Rcd 7700, 7755-56 (1993).

[18] *E.g., id.; Amendment of the Commission's Rules to Establish New Narrowband Personal Communications Services*, Gen. Dkt. No. 90-314, 8 FCC Rcd 7162, 7168-71 (1993).

developed and adheres to standards that assure customers that they will be able to integrate products produced by various other computer companies.[19]

There is minimal -- if any -- risk that that no DTV standard will emerge if the matter is left to voluntary standards organizations.[20] And voluntary industry standards will provide sufficient certainty to consumers, broadcasters and equipment manufacturers to facilitate the introduction of DTV. There is no reason to believe that a government-mandated standard -- particularly the ACATS standard -- will provide any "additional" certainty beyond that provided through a voluntary industry standard.

---

[19] As a general matter, compatibility among products creates benefits. Greater compatibility yields a better variety of products, better performance of products (as measured by reliability and durability) and a reduction in the amount of information consumers need to make informed choices. In brief, enhanced consumer choice. Besen & Johnson, at 2. This is particularly true with respect to products that form part of a system -- a grouping of several components with an interface that allows the components to work in tandem Michael L. Katz & Carl Shapiro, *System Competition and Network Effects,* 8 Journal of Economic Perspectives 93 (Spring 1994). Compatibility also has a downside. It may sacrifice product variety and restrain innovation. *Id.* at 95. Standards provide the means for ensuring compatibility. Thus, where different groups of consumers favor "distinct features" of a product, different standards developed by the market may better serve the public than a single government-mandated standard. *See id.* at 106

[20] As reflected in the Fifth NPRM, there is a near unanimous preference among industry participants for most aspects of DTV transmission standard, so that the industry is likely to converge on a standard. Second, there has been a significant amount of information exchanged during meetings during which the preferences of various participants were aired. Third, given the recent and enormous growth of video media on computers, there is likely to be sufficient market demand to stimulate the adoption of digital television transmission standards. *See* Besen & Johnson at 129. Moreover, the Commission's proposal to eliminate simulcasting of NTSC signals will create demand for DTV products that might otherwise be lacking. *Advanced Television Systems and Their Impact Upon the Existing Television Broadcast Service,* MM Docket No. 87-268, Fourth Notice of Proposed Rulemaking/Third Notice of Inquiry, 10 FCC Rcd 10540, 10548-49 (1995). This effect will not be diminished if the Commission leaves it to the marketplace to determine which transmission standards to use for DTV transmissions.

B. A Government-Mandated DTV Standard Would Entail Substantial Costs.

The Commission has recognized that government-mandated standards "deter[] technological innovations" and cause a "loss of variety" in products.[21] The Fifth NPRM fails to adequately consider other relevant costs of a government-mandated standard, including the risks that the adopted standard may be biased or that changing the standard will be difficult once it has been adopted. This omission leads the Commission to wrongly conclude that the ACATS standard is sufficiently flexible to minimize these costs.[22]

It is widely accepted that mandated standards impose significant costs in terms of freezing technology, and that those costs increase where the underlying technologies are themselves subject to rapid change -- as advanced television technologies have proven to be.[23]

---

[21] Fifth NPRM at ¶¶ 33, 35; *Advanced Television Systems and Their Impact on the Existing Television Broadcast Service*, MM Docket No. 87-268, First Report & Order, 5 FCC Rcd 5627, 5628-29 (1990) ("We believe that an HDTV system will be viable over the long term by permitting the introduction of future changes and improvements in a timely and non-disruptive manner."); *Advanced Television Systems and Their Impact upon the Existing Television Broadcast Service*, MM Docket No. 87-268, Memorandum Opinion & Order/Third Report & Order/Third Further Notice of Proposed Rulemaking, 7 FCC Rcd 6924, 6968 (1992) ("As we have indicated previously in this proceeding, one of our goals is to ensure that the DTV technical standard is sufficiently flexible to allow it to incorporate future advances in technology . . . [including] interoperability with other video media, such as high resolution computer displays"); *see* Fifth NPRM, at ¶ 22. Indeed, throughout this proceeding, the Commission has repeatedly noted the significant disadvantages of adopting a mandatory standard -- the foreclosure of technological advances subsequent to the time the standard is established -- and sought to avoid this potentiality, stating that "we do not believe that any action we take should preclude the future improvement of DTV systems not discourage the development of technically superior DTV systems". Even in the Notice to which these comments respond, the Commission admitted that "the inherently unforeseeable nature of innovation makes it impossible to predict the extent to which a required standard might affect future technological advances."

[22] Fifth NPRM at ¶ 38, 40.

[23] Besen & Johnson (1986), 5, 135

The Commission has recognized that the "benefits of allowing experimentation and innovation may be particularly great at the introduction of a new technology when technical change occurs most rapidly."[24] That is *precisely* the case with advanced television. Digital technologies were not even envisioned at the outset of this proceeding, but were introduced several years ago by a single participant in the Advisory Committee's process, and were quickly responded to by other participants before testing began. Although ACATS may have recommended the standard for DTV, that does not relieve the Commission of its obligation to consider the significant costs that adoption of a mandatory standard would impose in terms of technological innovation.

The Commission has, in the past, rejected the recommendations of an advisory committee on just this basis. In the *DBS Proceeding*, for example because the technology was new and regulations could have hindered the development of digital broadcast satellite ("DBS"), the FCC rejected an Advisory Committee's recommendation that it adopt mandatory DBS technical standards.[25] Again, in the *Advanced Cellular Proceeding*, consideration of the cost to technological innovation lead the Commission to reject a mandatory standard. The Commission recognized that the "cellular industry is moving

---

[24] *Inquiry into the development of regulatory policy in regard to Direct Broadcast Satellites for the period following the 1983 Regional Administrative Radio Conference*, Gen. Dkt. No. 80-603, Notice of Proposed Policy Statement and Rulemaking, 86 F.C.C.2d 719, 748 (1981).

[25] *Amendment of Subpart C of Part 100 of the Commission's Rules & Regulations, with respect to Technical Standards for Direct Broadcast Satellite Service*, 1986 FCC LEXIS 2818, ¶¶ 4, 12.

towards a voluntary standard for future cellular technology . . . [and] that this process can be encouraged by providing a mechanism to implement new technology without delay."[26] And, most recently in the *Broadband PCS Proceeding*, the Commission found "that imposition of a rigid technical framework could stifle the introduction of important new technology."[27]

In this case as well, key industry participants and activists are concerned that a mandatory standard will impose significant costs upon technical advances. Several representatives from the Massachusetts Institute of Technology and Harvard University recently characterized the adoption of any mandatory DTV standard as "inadvisable." They specifically noted that such an approach would defeat the "flexibility, adaptability and evolution of digital information processing."[28]

Mandatory standards eliminate (or at best, reduce) the incentive for companies to invest in developing technologies to capture some of the market by distinguishing their offerings from those of competitors. Regulation either prevents them from bringing an innovative product to market because it involves

---

[26] *Amendment of Parts 2 & 22 of the Commission's Rules to Permit Liberalization of Technology & Auxiliary Service to Offerings in the Domestic Public Cellular Radio Telecommunications Service*, Gen. Dkt. No. 87-390, Report & Order, 3 FCC Rcd 7033, 7034 (1988).

[27] *Amendment of the Commission's Rules to Establish New Personal Communications Services*, Gen. Dkt. No. 90-314, Third Memorandum Opinion & Order, 9 FCC Rcd 6908, 6919 (1994).

[28] Comments of V. Michael Bove, Jr., Lee W. McKnight, Nicholas Negroponte, Andrew Lippman and Suzanne Chambliss Neil, on the Fifth NPRM, MM Dkt. No. 87-268 (filed June 21, 1996), at 1.

technologies that do not comply with the standard or delays introduction of the product while the company seeks a waiver of such regulation.

Moreover, the process by which a government-mandated standard is defined is risky. The standard may not be the best available at the time it is adopted because technology evolved between the time that the standard was recommended and when it was adopted, or the standard was the least objectionable to the most influential participants before the agency adopting the standard.

In sum, a government-mandated standard imposes significant costs in terms of stifling technological innovation and competition through product differentiation, which costs outweigh its benefits. The Commission should thus not adopt a mandatory DTV standard but leave it to market forces to do so.

II. IF THE COMMISSION ADOPTS ANY DTV STANDARD, IT SHOULD NOT BE THE FULL ACATS STANDARD.

Despite Compaq's strong belief that natural market forces are better able than the regulatory process to create an optimal DTV standard, if the Commission nevertheless determines that it should adopt a DTV standard, that standard should **not** be the full ACATS standard. While many of the ACATS's standard's components are technologically sound and will serve the interests of most or all segments of the market, other components are inferior and will debase the overall quality and potential of Advanced Television.

If the Commission adopts a standard. Compaq would not object to incorporation of four of the five major components of the ACATS standard, namely, video coding, audio coding, packetized data transport, and RF/transmission [29] The fifth component of the ACATS standard, consisting of 18 video formats, should be rejected. Those formats incorporate inferior technology that interferes with computer compatibility and taken together, are so detailed and complex that they will vastly increase TVs' (and PC/TVs') processing power requirement and consequently, their costs [30] This, in turn, will impede computer compatibility and hamper the development of advanced DTV-based products and services.

The principal flaws in the ACATS standard's video formats are the inclusion of: (1) interlaced scanning; (2) non-square pixel spacing; (3) picture rates that are difficult to convert for display on computer monitors and that are too slow for computer applications; and (4) a limited number of fixed aspect ratios.

Interlaced scanning is foreign to computer monitors, all of which use progressive scanning. The flicker that interlaced scanning causes on text

---

[29] *See* Fifth NPRM at ¶¶ 8-18. Compaq would propose that any standard that is adopted add a bit error correction mechanism as soon as the industry develops one, and that it allow full use of the MPEG-2 compression and transport protocol -- free of the limitations the ACATS standard imposes -- to provide for optional layering of data, as explained in greater detail below, to enhance picture quality.

[30] Stearns Written Testimony, Exhibit 1 hereto, at 3; Informal Reply Comments of William F. Schreiber (Professor of Electrical Engineering, Emeritus, MIT), on Fourth Further Notice of Proposed Rule Making, MM Dkt. No. 87-268 (filed March 11, 1996) ("Schreiber Reply Comments") at 9.

and graphics induces unacceptable eye fatigue and makes it unacceptable for computer users. Interlaced scanning technology was developed over 50 years ago, and it still retains a host of imperfections that are remedied by use of progressive scanning in place of interlaced

The Commission,[31] the scientific community,[32] the computer and software industries,[33] the American Broadcasting Company,[34] and ACATS[35] have all acknowledged the superiority of progressive scanning to interlaced. The co-existence in the standard of interlaced and progressive scanning will not immunize against the infirmities of interlaced scanning: Commentators have cautioned that the inclusion of interlaced scanning will doom progressive

---

[31] NOI, at 5126

[32] Eric Petajan, "A Video Compression Efficiency Analysis Using Progressive and Interlaced Scanning" (AT&T Bell Laboratories), Exhibit 2 hereto; Comments of William F. Schreiber, on MM Dkt. No. 87-268 (submitted June 24, 1996) (hereinafter cited as "Schreiber Comments"); P Delogne, "Comparison Between Interlaced and Progressive Scanning Formats" (Laboratoire de Telecommunications et Teledetection, Universite Catholique de Louvain, Louvain-la-Neuve, Belgium) (hereinafter cited as "Delogne Study"), Exhibit 3 hereto; Philippe Guillotel (Thomson Multimedia R&D France) & Stephane Pigeon (Universite Catholique de Louvain), "Progressive versus Interlaced Coding," Exhibit 4 hereto, at 1 ("progressive pictures have higher vertical resolution, seem much more attractive than interlace for signal processing, and guarantee the compatibility with other multimedia applications")

[33] Stearns Written Testimony, Exhibit 1 hereto; Written Testimony of Craig Mundie, Senior Vice President, Consumer Platforms Division, Microsoft Corporation, before the Senate Committee on Commerce, Science and Transportation on the Electromagnetic Spectrum Management Policy Reform and Privatization Act (June 20, 1996) ("Mundie Written Testimony"), Exhibit 5 hereto, at 5-6; *see* Testimony of Joseph Tasker, Jr. (Compaq Computer Corporation) before the FCC *en banc* hearing in MM Dkt. No 87-268 (Washington, D.C., December 12, 1995), Tr. 225-227.

[34] *ABC Believes Progressive Scanning HDTV Will Be Cheaper, Better*, Communications Daily (June 7, 1996) at 3-4.

[35] *Advisory Committee Final Report and Recommendation*, Advisory Committee on Advanced Television Service (November 28 1995) ("ACATS Final Report"), at 14.

scanning to extinction, despite the technical and economic advantages of progressive scanning.[36] Moreover, mandating two alternative scanning formats will multiply the conversions that receiving equipment will have to perform, boosting consumers' costs.[37] Interlaced scanning should not be included in any DTV standard the Commission adopts.

Another computer-hostile video format element in the ACATS standard is the inclusion of non-square pixel spacing.[38] All computer monitors use square pixel spacing, and both the Grand Alliance and ACATS have acknowledged the importance of square pixel spacing to computer compatibility.[39] Although receivers and computers can be built to convert non-square pixel spacing, the capability to do so will increase the cost of receiving equipment; therefore, mandating both pixel formats will increase the complexity and cost of consumer equipment.[40]

---

[36] Delogne Study, Exhibit 3, at § 6. Similarly, Prof. Schreiber has written that "the presence of any interlaced format is likely to result in the death of all the [progressive] formats," and that "[f]ailure to adopt . . . precautions [he recommends] will preclude any transition from interlaced to progressive scan transmission in the future. The interlaced format will then become the only format, and maximum efficiency in the use of spectrum will never be achieved." Schreiber Reply Comments at 6, 2.

[37] Schreiber Reply Comments, at Third Appendix, p. 3. Schreiber Comments on Fifth NPRM at 6-7.

[38] Comments of Apple Computer, Inc., on the Fourth NPRM, MM Dkt. No. 87-268 (filed November 20, 1995), at 6; Comments of Microsoft Corporation on the Fourth NPRM, MM Dkt. No. 87-268 (filed December 12, 1995), at 5.

[39] Reply Comments of the Digital HDTV Grand Alliance on the Fourth Further Notice of Proposed Rule Making in MM Docket 87-268 (filed January 22, 1996), at 40; ACATS Final Report, at 16.

[40] Technical Detail of CICATS Proposal, Exhibit B to CICATS Comments ("CICATS Technical Exhibit"), at 7-8.

The 30 Hz and 60 Hz picture rates prescribed by the ACATS standard are too slow for computer applications, and difficult and costly to convert for display on computer monitors. Computer monitors require picture rates faster than 60 Hz -- typically, 70 Hz or higher -- to prevent flicker that users find bothersome.[41] Although picture rates of 30 Hz and 60 Hz can be up-converted for display on computer monitors, the conversion requires costly, additional processing power and it degrades picture quality.[42]

Finally, the ACATS standard's limit of two prescribed picture aspect ratios -- 16:9 and 4:3 -- is unnecessarily restrictive and ill-considered, inasmuch as neither aspect ratio is consistent with the production or presentation of most high-quality motion pictures, and will therefore perpetuate the adulteration on television of motion pictures which the film industry has been forced to accept under the NTSC standard. In addition, display devices in both televisions and computer monitors are on the brink of undergoing a major metamorphosis to new display technologies, such as flat screen that will allow much greater flexibility in the selection of picture aspect ratio. If the ACATS standard is adopted, however, such flexibility will be lost on DTV.

Apart from the flaws inherent in individual components of the ACATS standard, the overarching complexity of the video formats it would

---

41 CICATS Technical Exhibit at 10-11

42 *Id.*