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August 13, 1996

Hand Deliver

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, N.W., Room 222
Washington, D.C. 20554

Dear Mr. Caton:

Transmitted herewith for filing with the Commission are an original and ten copies of a report which will serve as Reply Comments in MM Docket No. 87-268.

If there are any questions in connection with the foregoing, please contact the undersigned.

Very truly yours,

Harry M. Shooshan III

HMS:mac
Encl.

Before the
Federal Communications Commission
Washington, D.C. 20554

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

Reply Comments of Strategic Policy Research on the Commission's *Fifth Further Notice of Proposed Rulemaking* (FCC 96-207, Released May 20, 1996)

August 13, 1996

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7500 OLD GEORGETOWN ROAD SUITE 810 BETHESDA, MARYLAND 20814 (301) 718-0111 (301) 215-4033 FAX

The Benefits of Choosing: FCC Specification of an ATV Standard

John Haring
Charles L. Jackson
Jeffrey H. Rohlfs
Harry M. Shooshan III

August 13, 1996

About the authors: Dr. Haring was Chief Economist of the FCC and headed the FCC's Office of Plans and Policy. Dr. Jackson is an engineer and chaired the ACATS Implementation Subcommittee's Working Group 1 and was a member of the Special Panel that recommended adoption of digital television technology. Dr. Rohlfs is an economist. His 1974 paper, "A Theory of Interdependent Demand for a Communications Service," was the seminal paper on network externalities and provided the first exposition of many of the analytical tools used today in the economic study of standards. Mr. Shooshan is an attorney. He was Chief Counsel for what is now the House Telecommunications Subcommittee and taught communications law at Georgetown University Law Center for 16 years.

This study was commissioned by Capital Cities/ABC, Inc., CBS, Inc., Fox Television Stations, Inc., the Association for Maximum Service Television, the National Association of Broadcasters, and National Broadcasting Company, Inc.

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Executive Summary

Most parties supported the Commission's tentative decision to adopt the ATSC DTV standard. Among the few opposing FCC adoption of an ATV standard are the National Cable Television Association which included with its comments a study by Bruce Owen arguing against Commission adoption of a ATV standard. Owen's analysis leaps to the conclusion that such standards are inappropriate for ATV after misconceiving, or failing to consider, the specifics of the technical and economic circumstances that persuasively justify standardization here.

We review the economic literature and show that it is less prescriptive than Owen infers. The decision on whether or not the government should mandate a standard must be based upon the specific facts of an individual standard.

We proceed in three steps. We first consider the economic literature and show that it provides tools that help determine when government involvement in standards is appropriate. Second, we apply the lessons of that literature to the question at hand: "Should the Commission adopt the ATSC DTV standard?" We show that economic analysis of the ATSC DTV standard and the specifics of the multiple industries involved provide strong support for adoption of that standard by the Commission. Third, we consider the specific objections that Owen raises against Commission adoption of a standard and show that those objections are flawed.

The key weaknesses in Owen's analysis are:

- it ignores the overriding goal of universal service that makes broadcast television unique among industries that are subject to technological change,
- it ignores the vast flexibility inherent in the ATSC DTV standard,
- it neglects the need to protect the existing television service from interference, and
- it fails to consider the implications of delaying the recovery of NTSC channels.

Owen picks his cites from the economics literature selectively and fails to consider the specific situation of advanced television. He fails to consider how broadcasting differs from other activities. He makes no allowance for the costs to society of delaying the introduction of ATV and of delaying the return and reuse of the NTSC spectrum. Importantly, he fails to acknowledge that the FCC must control interference and that the most efficient way to do this is to adopt a transmission standard.

Consideration of the specific circumstances of ATV standardization (many affected industries, many affected firms, the need to control interference, the preservation of universal over-the-air broadcast television service) convince us that Commission adoption of the ATSC DTV standard would serve consumers better than the alternative Owen favors — leaving that choice to the market.

1. Introduction

In its *Fifth Further Notice of Proposed Rulemaking* in MM Docket No. 87-268, the Commission reiterated its intent to adopt a standard for advanced television (ATV) and asked for comment on the issues surrounding the Commission's role in adopting and maintaining such a standard. Comments in response to that notice were filed on July 11, 1996. In this study, we respond to a study prepared by Bruce Owen[1] which was submitted to the Commission with the comments of the National Cable Television Association, and we offer our views on the Commission's proper role in ATV standardization.

2. Bruce Owen's Study

a. Owen's Position

Dr. Owen correctly summarizes the relevant economic literature on standards to the effect that the desirability of government-imposed technical standards varies with the circumstances. Then, however, he leaps to the conclusion that such standards are inappropriate for ATV after misconceiving, or failing to consider, the specifics of the technical and economic circumstances that persuasively justify standardization here. His most fundamental omission is the failure to discuss the need to preserve the existing advertiser-supported over-the-air television broadcasting service, on which hundreds of millions of viewers rely on a daily basis, and the need to avoid delay in the ATV transition in order to expedite the recovery of nationwide blocks of spectrum for other uses.

Our discussion below proceeds in three steps. We first set forth our own brief review of the economic literature and show that it provides tools that help determine when government involvement in standards is appropriate. Second, we apply the lessons of economics to establish the affirmative case for the ATSC DTV standard. Third, we consider the objections that Owen raises against Commission adoption of a standard and show that those objections are flawed.

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[1] Declaration of Bruce M. Owen in Response to the *Fifth Further Notice of Proposed Rulemaking* (July 11, 1996) (hereinafter "Owen").

b. The Economic Literature

Economic science is fundamentally predictive and descriptive, not normative. Economic analysis can assist us in deciding the appropriate role for the government in standard setting. But, the tools of economics can be properly applied only if the facts of the specific situation are carefully considered.

Owen's economic analysis consists primarily of a review of the economic literature on standards with an emphasis on the problems and uncertainty surrounding standards.[2] He reports the literature accurately, but from a one-sided perspective. One might expect such a review to serve as prelude to a discussion of the ATSC DTV standard which would show why, in this particular case, the costs of government involvement are large and the benefits small or *vice versa*. However, Owen's comments are devoid of specifics. Instead, he rhetorically emphasizes the costs of standards while de-emphasizing the benefits. He then concludes that the indeterminate theory has become determinant and that it supports NCTA's desired result.

For example, Owen discusses the possibility of delay if many firms must agree upon a standard at the same time.[3] Owen, however, fails to apply the insights and analytical framework of economics to the specific circumstances of advanced television. He repeatedly states that it is unclear that a government-mandated standard is best at this time.[4] However, the economic literature does not offer such a blanket presumption against government-mandated standards, either in general or in the specific case of advanced television. For example, in introducing the papers from a symposium on compatibility, Professor Richard Gilbert states:

> These five papers have a common theme. When production and consumption decisions are interrelated, either through network effects or through complementary products, a competitive market does not necessarily send the

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[2] Comparing Owen's analysis of the economic literature with the more fact-specific review contained in the *Fifth Further Notice* is instructive. The discussion in the *Fifth Further Notice* is much more relevant to the DTV standards issue than Owen's generalized survey.

[3] Owen at ¶ 12.

[4] *See* Owen, at ¶ 23, ". . . we are far from having a crystal ball to show us the mandatory standard that is preferable to a market outcome.", at ¶ 30, " . . . there is no credible basis for the assumption that DTV will diffuse more rapidly or more optimally with a fiat standard than with a voluntary standard . . .", at ¶ 39, "the case for government mandated standards is even worse . . .".

> right signals to firms and consumers for the delivery and purchase of goods and services. . . The market would make the wrong tradeoff between product variety and network economies of scale, sometimes leading to too much variety and not enough technological compatibility.[5]

Similarly, Ian MacInnes (in a paper cited by Owen to make a different point) makes several useful observations on the role of the government in setting standards generally and for ATV in particular:

> HDTV is a more important and costly transition that was AM stereo. Therefore, the FCC cannot risk repeating this scenario. The importance of technology does not in itself justify government intervention. If so, many computer applications would receive priority. However, HDTV deserves special attention because even a hint of uncertainty would severely impair its prospects for consumer adoption. Consequently, this would reduce the probability of technological convergence.
>
> The disadvantages of market based standardization imply the need for government involvement in certain cases.[6]

An early paper on the economics of standards by Braunstein and White presents a similar view:

> A stronger case for a regulatory role can be made for cases in which compatibility also involves avoiding negative externalities in a network: e.g., ensuring that one person's telephone equipment does not interfere with someone else's use of the network.[7]

Standards for ATV run the risk of substantial negative externalities in the form of harmful interference to the existing over-the-air broadcast television service. Thus, the condition that Braunstein and White put forward as increasing the justification for government intervention is met.

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[5] Richard J. Gilbert, "*Symposium on Compatibility*: Incentives and Market Structure," *Journal of Industrial Economics*, Vol. XL No. 1, March 1992, 1-8 at 7.

[6] Ian MacInnes, "A Model for Standard Setting: High Definition Television," *Contemporary Economic Policy*, Vol. XII, October 1994, 67-78 at 75,78.

[7] Yale M. Braunstein and Lawrence J. White, "Setting technical compatibility standards: an economic analysis," *The Antitrust Bulletin*, Summer 1985, 337-355, at 354.

Thoughts similar to those of Braunstein and White were offered by Owen himself who, along with Wildman, wrote:[8]

> Once established, standards may influence economic activity for decades to come. When industries as large as the global television industry are affected, public interest in standards is justified.

Owen and Wildman also wrote:

> Policymakers might also try to identify situation in which action by a government body to announce a standard or to catalyze market selection of standards is likely to be beneficial. *These would include situations in which it is clear that most industry participants desire a new standard and that competing standards promise similar benefits, but no firm or collection of users is willing to bear the risks of being first to adopt.*[9]

Earlier, Ducey and Fratrik had identified major innovations in broadcasting as having exactly the characteristics that justify government intervention:

> When broadcasters, receiver manufacturers, and audiences must all make decisions designed to maximize their own welfare, in an environment of complex and changing technical information, relatively high economic stakes, uncertain consumer demand, and different levels of expertise, the role of a standard-setting authority (governmental or private interest) can be a welcome addition to the process.[10]

The economic literature on standards offers tools to assist in the decision of whether or not the Commission should adopt the ATSC DTV standard. Owen's one-sided recital of the literature emphasizes those points that argue against such action and ignores the comments in the literature (including his own) that justify Commission involvement in establishing this important standard.

3. Why the Commission Should Adopt the ATV Standard

We believe that the public interest will be better served if the Commission adopts the ATSC

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8 Bruce M. Owen and Steven S. Wildman, *Video Economics*, Harvard University Press, 1992, at 261.

9 *Ibid.*, at 276 (emphasis added).

10 Richard V. Ducey and Mark R. Fratrik, "Broadcasting Industry Response to New Technologies," *Journal of Media Economics*, Fall 1989, 67-87, at 83.

DTV standard than if the Commission leaves the ATV standardization process to the market.[11] The strongest economic arguments for FCC imposition of an ATV standard are based upon the following elements:

- the effect of uncertainty on consumers and broadcast service availability,
- the many different industries affected,
- the need to control interference to existing television service,
- the delay in the return of NTSC spectrum, and
- the Commission's prior statements that it will adopt such a standard.

a. Consumers/Service Availability

Uncertainty, and the consequential delay, provide perhaps the most compelling justification for Commission adoption of the ATV standard. Leaving the choice of an ATV standard to the market will increase uncertainty. Consumers know that, if they get stuck with an orphan technology, they will lose the money they spent for an ATV set. Some consumers may value ATV so much that they will ignore this concern, but many others will not. Rather, consumers sensitive to uncertainty will delay their purchases of an ATV set until they perceive that uncertainty has been reduced (i.e., the chances of buying a soon-to-be-orphaned set are sufficiently small that they can ignore that risk). Besen and Farrell described this situation well when they wrote:

> Competition to become the standard may also delay market growth by encouraging buyers to wait and see what the standard will be, that is, what other buyers will do.[12]

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[11] Our view that the circumstances of broadcasting justify Commission adoption of a standard is not new for some of us. In 1983, Shooshan & Jackson, together with Henry Geller, filed a *pro bono* pleading before the Commission on standards issues. In that comment we considered the conditions under which the FCC should and should not impose technical standards on radio systems. We identified the adoption of new broadcast system designs as one of the situations where Commission standard setting was appropriate. We based this general position on consideration of both the incentives in broadcasting and the historical experience with NTSC, AM Stereo, and videotext. In reviewing NTSC standardization, we said "We believe that the Commission acted soundly in setting color television standards. If it had set no standards and left the matter to the marketplace, the result would have been confusion, if not chaos, and long delays in a service much valued by the public." See Reply Comments of Shooshan & Jackson, Inc. and Henry Geller, General Docket 83-114, September 30, 1983.

[12] *See* Stanley M. Besen and Joseph Farrell, "Choosing How to Compete: Strategies and Tactics in Standardization," *Journal of Economic Perspectives*, 117-131 at 119.

The effects of delay and consumer confusion on the roll-out of ATV must be understood in the context of a mass medium like over-the-air television. Because it is advertiser-supported, the economics of broadcast television depend on the medium's ability to reach a mass audience (ideally, the entire public). To the extent that consumers delay adopting ATV due to fear of uncertainty, or adopt incompatible technologies due to the lack of a standard, ATV will be unlikely to obtain the critical mass of viewers necessary to sustain an advertiser-supported broadcast service. Broadcasters and program producers will have little incentive to incur the costs associated with ATV if the service is not available to a mass audience. In this respect, broadcast television has fundamentally different economics than niche or subscription services.

With a rapidly evolving technology, such as advanced television, lengthy delays may be more costly than mandating a reasonable standard. Delay in the adoption of ATV may impose enormous costs on consumers.[13] ATV offers consumers substantially improved picture quality, a wide range of ancillary services, improved closed captioning, the possibility of a more diverse mix of over-the-air programming and other features that we expect many consumers will value. Since almost every household watches television several hours per day, it is clear that unnecessary delay in adopting ATV would impose substantial costs on consumers. Owen fails to address the costs to consumers of such delay.

b. Affected Industries

Before consumers can fully enjoy the benefits of advanced television, firms in several industries must decide to produce new products or undertake new activities. These industries include:

- broadcast stations,
- program providers,
- the cable industry,
- home receiver manufacturers,
- consumer electronics retailers, and
- broadcast equipment suppliers.

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[13] In late 1991, two of us coauthored a study showing that the ten years of extra delay between when cellular mobile radio was technically feasible and when the first cellular system became operational cost our nation $86 billion in benefits foregone. Jeffrey Rohlfs, Charles Jackson and Tracey Kelly, *Estimate of the Loss of the United States Caused by the FCC's Delay in Licensing Cellular Telecommunications.* November 8, 1991 (revised).

Some of these industries (e.g., receiver manufacturers) are relatively concentrated and consist of large firms that are well-positioned to prepare for quick product introduction. Other industries are much more diffuse.

Unfortunately, none of these industries has any incentive to adopt the new standard first. Early adoption leads to certain losses while the other industries adopt the standard over time. Furthermore, there is a substantial risk that those costs will never be recovered; e.g., if key industry segments fail to adopt a new standard at all.

For these reasons each industry may decide to wait for the other industries to adopt the new standard. But, of course, if each industry waits for the others to adopt first, the standard never gets adopted. Adoption of a new standard by broadcasters presents a substantial challenge. There about 1,600 television broadcast stations controlled by a few hundred different entities. Uncertainty about the standard increases the risk that broadcasters will invest in equipment that will be obsoleted by technological changes. Consequently, if uncertainty increases, broadcasters can be expected to delay or reduce their investment in ATV. As a result, there will be less ATV programming produced and distributed. This reduction will, in turn, cause some consumers to delay their purchases of ATV receivers and converters.

Consider broadcast equipment suppliers. This industry consists of a range of firms including builders of transmitters and cameras, manufacturers of recording equipment and manufacturers of measurement and test equipment. Many of these firms can be expected to delay their investment in bringing ATV products to market or supporting ATV designs if uncertainty about the standard is increased.

It is well known that, when multiple firms must produce products to allow a new standard to come into use, the opportunities for delay increase. The economic literature refers to this as the "chicken and egg" problem.[14] As Owen and Wildman put it:

> Sometimes all the components of a new product system cannot be supplied

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[14] Michael L. Katz and Carl Shapiro, "Systems Competition and Network Effects," *Journal of Economic Perspectives*, Vol. 8, No. 2, Spring 1994, 93-115 at 102.

> by a single firm. The success of a firm that supplies some of the system components then depends on other firms introducing the remaining parts. In this situation risk-averse firms may choose to delay introducing their own components until the complementary system components are available. If all component suppliers adopt this strategy, however, the new standard will never be introduced. The potentially paralyzing fear of being first to commit to a new standard when the supply of complementary components is uncertain is known as the "chicken and egg" problem.[15]

In the ATV case, there are many suppliers of complementary system components and the risk of deadlock would appear to be substantial. Commission adoption of a standard will allow all firms to produce ATV products and services confident in the knowledge that their ATV activities will mesh with those of other suppliers.

c. The Need to Control Interference

As we will discuss in section 4 below, a government-mandated standard is essential in the ATV context to protect the existing television service from destructive interference and to ensure a universally available, interference-free, advertiser-supported over-the-air digital broadcast service in the future.

d. Delay in Return of NTSC Spectrum

Delay in the adoption of ATV standards creates another cost — the delay in the return of the NTSC spectrum. The radio spectrum is a scarce natural resource. The Commission contemplates that, once the transition to ATV is complete, the NTSC channels will be reclaimed and put to new uses. The costs from delay in the release of the NTSC spectrum has no parallel in the normal economic analysis of standards choice.

e. The Commission's Prior Statements

There is yet another cause for concern if the Commission chooses not to adopt the ATSC DTV standard — the "uncertain trumpet" effect.[16] As noted in the *Fifth Further Notice*, the Commission has, on several occasions, stated its intention to adopt an ATV standard. If the

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15 Owen and Wildman, *op. cit.*, at 273.

16 "For if the trumpet give an uncertain sound, who shall prepare himself to the battle?" (I Corinthians 14: 8)

Commission ultimately decides not to adopt a standard, the Commission's change in position will likely be read by some consumers, by some media pundits, and by some in industry as a vote of no confidence in the ATSC DTV standard — perhaps as a vote of no confidence in ATV altogether. Consumers, broadcasters, and equipment makers may, consequently, be slower to move to support DTV than they otherwise would have been. Others, aware of this hesitation, will hesitate also. The adoption of ATV will stretch out. Owen is silent on the negative implications of a last-minute change of direction by the Commission.

4. Responses to Owen's Specific Claims

Owen's analysis is nearly devoid of any consideration of the technology of the ATV standards. He does drop a disparaging remark about the choice of 6 MHz channels for ATV when he says "...the Commission chose to protect the interests of terrestrial broadcasters by requiring a standard whose signals can fit into the existing terrestrial broadcast spectrum slots."[17] It is not clear to us that the Commission's decision to choose a channel plan that fits well with existing spectrum use protects any specific interest other than the broad public interest. The gaps in the VHF and UHF spectrum come in multiples of 6 MHz, and an ATV design using 6 MHz channels is far easier to fit in than one using say, 8 MHz channels. Owen's criticism of the ATV design using 6 MHz channels is comparable to claiming that municipalities have sold out to the automobile manufacturers because they paint lines in municipal parking lots which allow existing cars to fit into the parking spaces.

In paragraphs 30 and 31 of his declaration, Owen offers specific objections to Commission adoption of the ATV standard. Restated in our words, these are:

- We should avoid being locked in to an inferior standard for the long term;
- Early consumer adopters will be wealthy and don't need protection against uncertainty;
- No matter what, it will take a long time to retire NTSC; and
- Because the ATSC DTV standard exists, and is apparently quite good, the market will move swiftly without a government mandate.

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[17] Owen, at ¶ 26.

We consider — and reject — each of these objections in turn.

a. An Inferior Standard

One of Owen's major objections to adoption of the ATSC DTV standard is its possible suppression of future innovation.[18] But, the flexibility and extensibility of the packet format supporting the higher-level functions of the ATSC DTV standard provide an opportunity to accommodate a wide range of innovations in services, video compression technology, etc. The only areas where the ATSC DTV standard can be properly characterized as fixed are transmission (which, as we explain below, is necessary to control interference and to assure the geographic distribution of broadcast services) and the packet transport layer — the very feature that supports the higher-level functions and provides flexibility and extensibility.

The ATSC DTV standard does not lock society into a 1996 vision of digital broadcast services. Rather, it builds a broadcast bit-way and allows the flexible creation of services that are delivered over that bit-way. Such flexibility is not just theoretical. The packet protocols used on the Internet were defined about two decades ago.[19] They support a wide range of services (e-mail, web browsers, Internet telephony, video conferencing) some of which had been imagined at that time (but not specified) and others of which are totally new. Because the protocols were general and flexible, they could support a wide range of services. The ATSC DTV standard permits similar growth.

b. Protecting the Wealthy

Owen's emphasis on initial adopters treats digital television as a new electronic toy only the wealthy will purchase. The reality is that the transition to digital will require every consumer — wealthy or not — ultimately to replace, or purchase a converter for, every television set in order to continue to receive broadcast television service. If the Commission foregoes a standard and relies on the market, the proliferation of incompatible technologies would, as we have noted, lead

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[18] *See* Owen, at ¶ 27, 30, 36, 37, 38, and 39.

[19] Vinton Cerf and Robert Kahn, "A Protocol for Packet Network Intercommunication," IEEE Transactions on Communications, Vol. Com-22, No. 5, May 19, 1974, at 647-648.

to delays in deploying the service and impose financial burdens (e.g., investing in the "wrong" technology) on all consumers.

c. Retirement of NTSC

The need for a reasonable transition period to allow consumers time to replace their existing receivers is not a valid argument against a government standard. Indeed, without a standard, consumer delay will lead to an inordinately long transition which would postpone indefinitely government recovery of valuable NTSC spectrum.

d. The Market Would Be Swift Without a Government Mandate

The familiar story of AM stereo provides a complete response to this unsupported assertion. In the case of ATV, the FCC wisely took a different course. It announced that it would select a single standard and set in motion a competitive process through ACATS to select the winner. The Grand Alliance was formed as a direct result of this government intervention. If the standards choice is thrown back to the market, there is no assurance that the industry consensus forged by the Commission's process can be maintained. Individual firms might decide to pursue their own short-run economic self-interest, each offering incompatible "improvements" to the ATV standard.

e. Control of Interference

The design of the transmission system used with ATV is critical in protecting NTSC receivers from interference.[20] For a number of reasons, some of which we will mention here, substantial interference protection benefits will flow from Commission adoption of a standard (such as the ATSC DTV standard) that specifies the transmission system used, and which has been extensively tested for its interference characteristics.[21]

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[20] Analog television is more susceptible to interference than are most other signals. Thus, the technical problems of protecting the existing NTSC service as we make the transition to digital television pose substantial challenges.

[21] The industry is reasonably familiar with the properties of this modulation technology and can provide informed analysis and comments on proposed DTV channel plans based upon this technology.

If ATV is to be packed in among the existing VHF and UHF stations, the transmission technology chosen for ATV must provide adequate protection to the existing NTSC service. Under our system of spectrum management, the Commission must define such adequate protection and must efficiently implement that definition. If the Commission were to adopt Owen's advice and not choose a standard, what guide could it offer broadcasters in their choice of ATV transmission technologies? How could the Commission design an ATV table of allotments?

Channel planning requires a transmission standard. The table of allotment and assignments that the Commission will release shortly is based on specific technical assumptions about coverage and interference that are drawn from the tested Grand Alliance system. In the absence of a tested standard, channel assignments would be pure guess-work. Without a tested standard, the Commission would not be able to police interference. The responsibility for protection from interference would fall to individual stations. There might be a long period of negotiation and litigation before ATV stations could be engineered. Given that a uniform transmission standard is necessary to the technical viability of broadcast television, the arguments against adopting the lab-tested and field-tested ATSC DTV standard would have to be overwhelming. Owen has not made those arguments.

In some other services, most notably cellular and PCS, the Commission has successfully left the choice of modulation standard to the marketplace. However, these services differ substantially in both their radio interference and economic characteristics.

Cellular and PCS are licensed in large blocks, both in terms of bandwidth and geography. The boundaries between such blocks are typically in areas of lesser demand (between cities, not in the center of cities). The FCC imposes general regulations in these services that assure that interference is normally confined to within a few miles of the boundary of the service areas.[22] Most of the interference generated by a cellular system, however, is to other cells in the cellular

[22] There are, of course, exceptions to this such as the over-water ducting paths between cell sites in the Los Angeles and San Diego regions.

system (as much as 95% in a large modern system).[23] In contrast, television stations generate all their interference to transmissions of other television stations. In this situation, the cellular/PCS approach to interference protection would be totally impractical.

Consider now the economic context. Cellular and PCS customers typically have a contract with only one service provider and do not need a personal unit that can communicate with all suppliers. Broadcasting operates quite differently. Viewers have no contract with individual broadcasters. They tune their receivers across the dial and benefit from the ability to tune in all stations. At the same time, each station benefits from the consumer's willingness to buy a receiver — a willingness that is increased because a single receiver can tune in multiple stations. These externalities are completely ignored in Owen's analysis.

5. Conclusions

Owen's application of economic tools to the specific situation of advanced television is fundamentally flawed. He fails to consider how broadcasting differs from other activities. He makes no allowance for the costs to society of delaying the introduction of ATV and of delaying the return and reuse of the NTSC spectrum. He also fails to acknowledge that the FCC must control interference and that the most efficient way to do this is to adopt a transmission standard.

Owen's criticism of the limits ATV standardization will place on future innovation ignores the flexibility of the digital transport system that is at the heart of the ATSC DTV standard. The ACATS DTV design is a flexible and extensible standard. It does not restrict the use of future innovations in video coding or service definition beyond the limits of the digital transmission used. Yet, defining this transmission layer is essential in providing assured protection to existing television broadcast signals.

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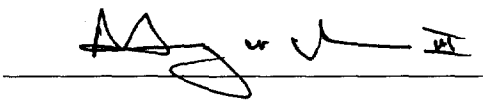
[23] We understand that each of the cellular systems in Los Angeles has about 500 cells. The cell-to-cell interference in a cellular system is proportional to the number of cells. The system-to-system interference between a cellular system and its neighbors (assuming it has neighbors on all sides) is proportional to the square root of the number of cells. So the ratio of internal interference to external interference grows as the square root of the number of cells. For a system with 500 cells this ratio is about 22, meaning that 95% of interference lies inside the system.

Application of the economic literature to the specific circumstances of ATV standardization (many affected industries, many affected firms, the need to control interference, the preservation of universal over-the-air broadcast television service) supports Commission adoption of the ATSC DTV standard, rather than the alternative Owen favors — leaving that choice to the market.

The Commission's process to date has produced a remarkable industry consensus on an appropriate ATV standard. We strongly believe that public interest will best be served if the Commission completes this process and adopts the ATSC DTV standard.



Harry M. Shooshan III