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Multicast Must-Carry for Broadcasters: WILL IT MEAN NO PUBLIC INTEREST OBLIGATIONS FOR DTV?

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The Federal Communications Commission will soon decide whether to grant local TV broadcasters enhanced "must-carry" rights on cable TV systems.[1] Specifically, broadcasters seek to expand their current one-program must-carry right to a multi-program must-carry right, which they call "multicast" must-carry.

The current debate has evolved out of the so-called digital TV (DTV) transition. Since the advent of TV, local stations have received an FCC license, at no cost, to broadcast a single program over a "channel" defined as 6 MHz of prime, low-frequency spectrum. In 1997, broadcasters received a second 6 MHz channel to transition to digital TV. The stated purpose of the DTV transition was to allow broadcasters to use one, 6 MHz channel to continue their current analog transmissions while simultaneously launching high-definition and other digital programming on the second, 6 MHz channel—a switch-over originally expected to last ten years as consumers upgraded from analog to digital tuners.

Under current law, TV broadcasters are entitled to must-carry rights on cable systems for one TV program plus information embedded in the channel directly related to that program. The one program limitation means that additional digital information ("bits") that broadcasters will be transmitting over-the-air might no longer be carried on cable TV. This is because digital technology allows broadcasters to squeeze many TV programs in the space previously occupied by one. The specific number of TV programs they can cram in depends on a number of assumptions. But a reasonable benchmark is a half dozen standard definition TV ("SDTV") programs with the current digital TV standard ("8VSB") and a dozen with the next generation standard ("enhanced 8VSB").[2] One implication of multicast must-carry rights, therefore, is that in an average TV market with thirteen analog SDTV programs, cable TV operators could be required, free of charge, to carry the equivalent of 100 or more digital SDTV programs.

Analog must-carry rights are hugely valuable for broadcasters and a major factor in determining the value of a broadcaster's FCC license. Without must-carry rights, broadcasters could in theory lose as much as 85% of their audience for multicast programming, since that is the percentage of households that receive their primary TV signals via either cable or satellite TV. The cable industry has invested more than $100 billion in bringing cable TV service to American homes, and broadcasters are entitled to free use of up to a third of that capacity. This uncompensated use of their property largely explains the cable industry's fierce opposition to expanding broadcasters' must-carry rights.[3]

Must-carry rights typically come with a bundle of subsidiary rights including retransmission consent and quality-of-service rules. Retransmission consent gives broadcasters the option to demand payment for their programming. They can either demand free carriage (must-carry) or payment for carriage (retransmission consent). Quality-of-service rules dictate that broadcasters can demand a minimum of standard definition TV quality from cable TV operators and a host of other data and picture quality standards. Henceforth, we will refer to the entire bundle of must-carry, must-pay, must-quality rights as simply "must-carry."

The New America Foundation argues that 1) the policy objectives of multicast must-carry can better be met via other means, including what we call the "Berlin DTV Transition Model," and 2) if broadcasters receive multicast must-carry, it should be a) tied to the simultaneous and unconditional giveback of their analog spectrum, b) limited to the bit rate necessary to provide one HDTV program, c) compensated for by additional public interest obligations, and d) sunset based on the penetration of standard definition quality Internet TV.

Multicast Must-Carry Policy Rationales

Advocates of digital multicast must-carry rights offer three public policy rationales:[4] 1) It will speed the DTV transition, 2) it will preserve free TV, and 3) it will preserve competition. In the courts and in FCC proceedings, much of the debate has been framed in legal terms.[5] In this issue brief, we will ignore these legal arguments and instead address the underlying policy issues.

Over the years, broadcasters' rationales for must-carry have changed. The most popular current rationale for must-carry—that it will speed the Digital TV transition—didn't even exist ten years ago when the last major battle over cable TV must-carry was fought.[6]

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#1: Speed the DTV Transition. Perhaps the most frequently cited rationale for multicast must-carry is that it will speed the digital TV transition. Broadcasters have been clear on this: "Without cable must-carry, there will be no swift and successful DTV transition as intended by Congress and the FCC and no reclamation of spectrum for other worthy public purposes."[7]

According to this reasoning, broadcasters need not give back one of their two, 6 MHz channels until at least 85 percent of Americans have access to broadcast DTV programming. Getting this spectrum back is widely considered to be a top priority because non-broadcast services (such as mobile telephone and wireless local area networks) have higher consumer welfare than broadcast services in the low frequency bands used by broadcasters. From this perspective, providing broadcasters with a little more space on cable TV systems is a small price to pay for the return of spectrum worth tens of billions of dollars.

One problem with this argument is that must-carry is not the sole policy reform that has been justified on the basis of speeding the broadcasters' DTV transition. In the last few years, broadcasters have successfully used speeding the DTV transition as the rationale for a raft of subsidies: mandatory broadcast DTV tuners in all new TVs; mandatory plug & play rules for cable TV set-top boxes; mandatory broadcast flag detecting equipment in all digital consumer electronics hardware; preventing ultra wideband sharing in the broadcast band; and preventing the retransmission of news and public affairs programming over the Internet. In addition to must-carry, the FCC is considering or will soon be considering other rulemakings in the name of accelerating the digital TV transition.[8]

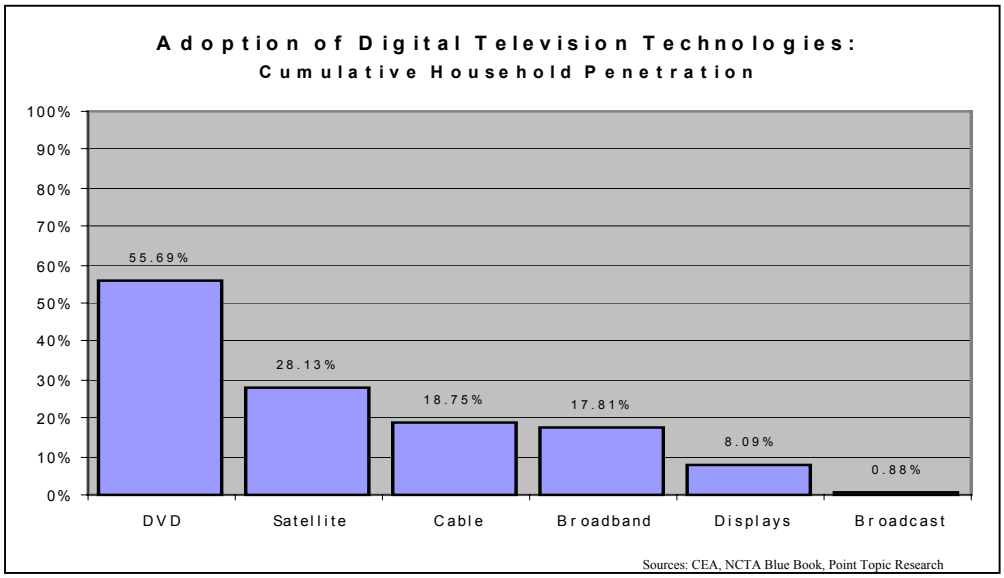
Another problem is that the value of what is to be returned at the end of the transition keeps getting whittled away. Originally, the broadcasters were expected to return over 150 MHz of their 402 MHz at the end of the DTV transition. Some of the returned spectrum was also expected to be in the more valuable VHF band. However, broadcasters now are only expected to return 108 MHz and none in the VHF band.

Moreover, the original fixed deadline of December 31, 2006 to return the spectrum was made into a soft deadline dependant on three factors, including that 85 percent of households in each market area must have broadcast DTV tuners. The 85 percent threshold is vaguely worded and its interpretation is widely expected to be contested as the percentage of broadcast DTV tuner households approaches the threshold.

An even more important obstacle to recovering broadcast spectrum is the unwritten "granny rule": the fact that many members of Congress have privately promised the broadcasters that as long as one granny has an analog TV set, they won't turn off analog TV and end the transition. This suggests that the broadcasters' DTV transition will not be complete until 100% of Americans have voluntarily unplugged every analog TV set. Since Americans purchased close to 20 million analog TV sets last year, the prospect of this happening before 2025 is unlikely.

In other words, the broadcasters' DTV transition has already been going on for more than a decade. And it is unlikely it will end in less than another two decades merely because the broadcasting industry receives multicast must-carry on top of all the other subsidies it has already received to speed the DTV transition. Indeed, despite every conceivable government subsidy, broadcast digital TV -- rather than leading the United States into DTV as intended by Congress and the FCC -- appears to be a parasite lagging far beyond its DTV competitors (see chart below). From this perspective, multicast must-carry, like the other DTV transition subsidies, looks like an excuse to subsidize the broadcasting industry, not to actually speed America's transition to DTV.

#2: Preserve Free TV. Historically, preserving free TV has been a major justification for cable must-carry rules. From 1989 through 1992 local TV broadcasters blitzed the country with televised public service announcements and op-eds in local newspapers arguing that analog must-carry was necessary to preserve free TV. FCC Chairman Powell, other FCC commissioners, and senior members of Congress have all publicly stated that preserving free TV continues to be an important FCC policy objective. In the current must-carry battle, broadcasters claim that a primary purpose of the DTV transition is to preserve free over-the-air broadcasting because for a disproportionate share of low-income individuals "broadcast television continues to play a vital role in the delivery of video programming."[9]



One problem with this argument is that over the last ten years, government policies can best be described as "killing free TV in order to save it." In the Telecommunications Act of 1996, for example, broadcasters won the right to use their DTV spectrum allocation for paid programming provided they continue to broadcast one SDTV program free of charge. This was justified on the basis that the pay TV services would help fund the free TV services. With the latest digital compression technology, this means broadcasters only need to allocate a negligible percentage of their digital spectrum to ad-supported, "free" TV.

Even with respect to so-called ad-supported/free TV programming, the share of broadcasters' revenue coming from subscription fees has increased. Under the Cable Act of 1992, broadcasters are allowed to charge cable TV companies to retransmit their "free" signals, costs that are passed on to cable subscribers. Under the Satellite Home Viewer Improvement Act of 1999, satellite companies face similar charges, except that the charges are not on the basic tier of programming, so they are more explicit. One DBS company charges consumers $6 per month for consumers to get local broadcast channels. Some broadcasters charge when they repurpose news on the Internet or on cable video-on-demand services. According to this reasoning, the only consumers who truly receive ad-supported programming are those receiving it over the terrestrial airwaves. Thus, cable and satellite TV customers are contributing to a virtual universal service fund for the less than 15 percent of American households that exclusively rely on terrestrial, over-the-air TV.

More recently, in the FCC's report and order on the broadcast flag, broadcasters won the right to charge for the retransmission of their digital programming, thus drastically shrinking the meaning of free TV in the context of what the copyright community calls "fair use."

One simple reading of recent broadcast history is that whenever affordable technology has developed to allow broadcasters to exclude non-paying customers – the necessary foundation for pay TV – broadcasters have jumped on the bandwagon of pay TV. Rather than using pay TV revenues to subsidize free TV, broadcasters have merely allocated resources where they can earn the highest return.

To date, the FCC has provided no compelling evidence that allowing broadcasters to use their FCC licenses to generate pay TV revenues is strengthening rather than killing free TV. Similarly, the link between must-carry and free TV is extremely tenuous. It can readily be said that must-carry will enhance the profitability of the broadcast industry. But it is a much more dubious proposition to say that these increased profits will be reinvested in free TV programming. What may be said with considerably more confidence is that broadcasters have used their negotiating clout with cable companies to both launch more pay cable TV services and to squeeze out many other potential entrants and diverse voices.

Finally, the FCC has not established that ad-supported terrestrial, over-the-air broadcast TV is a policy goal worth hundreds of billions of dollars in direct and indirect government subsidies.[10] As argued here, there are other, far more efficient ways to achieve the same policy goal.

#3: <u>Preserve Competition.</u> Cable TV possesses substantial monopoly power and control over speech. Cable TV is the dominant provider of broadcast video programming in the United States with close to a 70 percent market share. And in some communities, such as rural communities surrounded by mountains and urban communities surrounded by tall buildings, cable TV has historically had an even more dominant position. Broadcasters thus claim that "cable is a monopoly gatekeeper" and from this they infer that mandating must-carry for broadcast TV optimizes competition and viewpoint diversity.[11]

One reason the broadcast industry appears not to be emphasizing this argument as much as it did in the analog must-carry debate from the late 1980s and early 1990s is that cable now faces substantial competition from direct broadcast satellite TV companies as well as from telephone companies for broadband Internet distribution. Still, there is no question that cable TV's market power is immense and may grow as next-generation broadband Internet services come to the fore. Academic studies indicate that the technological infrastructure of a triple play (voice, data, and TV) fiber-to-the-curb network is a natural monopoly like last-mile sewer, water, and electricity service.[12]

Yet it is not clear that the best solution to cable's monopoly power is to create a cable-broadcast industry duopoly. Another solution would be to foster conditions that allow other industries to compete for information distribution on equal terms with broadcasters. If competition is really the goal, why limit competition only to broadcasters? Fortunately, the switch from broadcast TV to broadband Internet TV that will be made feasible as very high-speed Internet connections become common creates a new policy option to do this. Internet TV doesn't get rid of the cable TV distribution bottleneck, but it does allow for unlimited video content distribution.

<u>Policy Recommendation #1</u>: Achieve the goals of multicast must-carry by other means.

The New America Foundation proposes that the policy objectives of multicast must-carry can better be met via other means. Specifically, the optimal solution to the conflicting policy goals raised by the FCC's must-carry proceeding – and by the DTV transition more broadly – would be a U.S. version of the rapid DTV transition implemented this year in Berlin, Germany. The basic features of a Berlin-style DTV Transition would include: a) a rapid, unconditional return of spectrum to the public; b) preserving and possibly expanding free TV; and c) reallocating the freed-up spectrum to enhance last-mile broadband Internet service.

On August 4, 2003 Berlin completed a one-year transition to digital TV.[13] The whole process from conception to full implementation was 18 months. A similar but even shorter DTV transition is planned for many other regions within Germany during the coming year. The three basic features of the Berlin model are as follows:

1) All analog TV transmissions are turned off at a fixed date.

2) Households that are both low-income and rely on free TV for their primary TV receive a government subsidized digital-to-analog converter box so that they can continue to receive standard definition free TV after the DTV transition. The current cost of a digital to analog converter is approximately $80, and the cost, along with other computer chips, is expected to drop by 50 percent in the next few years.

3) All other households have the choice of purchasing satellite TV or cable TV service, or purchasing a DTV converter, so that they can continue to receive free TV. In return for purchasing the converter, they get to continue receiving free TV and also get a substantial increase in the number of SDTV programs available for free over the air.

In the American context, the Berlin DTV transition model would result in a speedy DTV transition without additional cable TV must-carry obligations and without threatening the preservation of free TV. In addition, it frees up at least 108 MHz of spectrum that can be used to provide next generation broadband Internet services, including ad supported (i.e., "free") TV and other on-demand data services.[14]

In the United States, approximately 15 million households rely on terrestrial, over-the-air signals for their primary TV signal. If every one received a $50 subsidy to purchase a digital-to-analog converter box (about the size of a deck of cards) – or to offset the cost of switching to a cable or DBS service – the cost would be $750 million, which is less than 2 percent of the market value of the 108 MHz of spectrum the broadcasters would be returning.

We propose a U.S. version of the Berlin DTV model not because we believe it represents the best solution to the problem of universal TV service, or efficient use of the broadcast spectrum, but because it addresses the problems raised in this proceeding. The Berlin DTV model continues the current presumption that the best way to provide universal TV service is with the current broadcast architecture (a single broadcast tower covering thousands of square miles) and over the current low-frequency broadcast spectrum. We believe that the future belongs to Internet TV, not broadcast TV; and that the best use of low-frequency spectrum is for mobile devices (such as wireless telephones and Wi-Fi), not stationary TV sets. Nevertheless, we recognize that in the current political environment, clearing broadcasters completely out of the broadcast band is not feasible, so we do not pursue that idea further here. For those interesting in pursuing this idea, often called the "Negroponte Switch," there is already a great literature.[15]

Policy Recommendation #2: Assuming that multicast must-carry is inevitable, ask for something in return.

Must-carry may be unnecessary to achieve the stated objectives argued on its behalf. But realistically, Congress and the FCC are likely to both preserve and expand the broadcasters' current must-carry rights. Accordingly, we propose a four-point compromise that supplements the Berlin DTV model described above -- and which should strictly condition any government grant of enhanced must-carry rights to broadcast licensees:

#1: Require the unconditional return of analog TV spectrum. If broadcast licensees are allowed to opt for multicast must-carry, then that choice should be tied to an obligation to simultaneously return their 6 MHz analog spectrum channel without compensation or delay. The DTV transition has been one long story of trades with the public that seem reasonable on the surface but which involve the broadcasters getting something immediately (in this case, multicast must-carry) and the public getting something (the return of the spectrum) at some point in the distant future. But the costs are invariably renegotiated and reduced so that all that is left are public costs and no benefits. Accordingly, any must-carry or other subsidies to the broadcast industry should be structured as an election to clear their analog spectrum in a timely and unconditional fashion. This should also apply to any public interest obligations that serve as a *quid pro quo* for multicast must-carry.

#2: Limit the must-carry bit rate to HDTV. The bit rate granted to the broadcasting industry should be a compromise between the positions of the broadcasting and cable industries. Broadcasters want retransmission of the full 19.4 Mbps of their 6 MHz spectrum channel; cable companies want to limit the bit rate to one TV program. We recommend giving broadcasters must-carry rights to 9.7 Mbps, half their proposed total. The reason 9.7 Mbps was chosen is that it is adequate for one HDTV program as well as being capable of subdivision into multiple SDTV programs using the existing 8VSB standard -- and more than six SDTV programs with the current generation of TV program compression technology.[16] This still gives broadcasters a huge benefit, although only half the benefit they are seeking. As long as broadcasters use their bits for "free TV," they keep must-carry rights for those bits.

#3: Demand a *Quid Pro Quo*: Update the "Public Interest Obligations" for Multicast Broadcasting. Broadcasters' existing public interest obligations could be extended to the new programming allowed under multicast must-carry.[17] At a minimum, disclosure of information necessary to verify broadcasters' public interest claims needs to be improved.[18] But even better would be to monetize those obligations. Specifically, in return for the new must-carry rights -- rights worth billions of dollars -- as well as for access to the public airwaves, broadcasters should pay a spectrum user fee of 5 percent of gross revenues. One option would be to use

the fee initially to allow low-income households to receive next-generation TV service by subsidizing their purchase of digital-to-analog TV converter boxes (as required by the Berlin DTV model). Another option would be to use the fee to fund public interest programming, including innovative educational applications and content for both TV and high-speed Internet connections. The Digital Promise Project has provided a detailed blueprint for such a program and has suggested setting up a management entity along the lines of the National Science Foundation to administer the funds.[19]

#4: Sunset the Must-Carry Obligations. Limiting multicast must-carry to one HDTV capable bit stream would sunset as much as 75% of the cable capacity currently allocated to analog must-carry.[20] Moreover, the development of Internet TV will ultimately make one-size-fits-all broadcast TV obsolete.[21] The only question is when. The advantage of Internet TV is that it gives viewers infinite choice while allowing them to watch TV at their own convenience. The disadvantage is that it is currently more costly. But the costs are dropping roughly at the rate of Moore's Law, so in the future an ever-increasing number of people will be turning to Internet TV for their TV. This suggests not eliminating must-carry, but opening it up to all content providers. Specifically, we recommend a broadcast must-carry sunset linked to a sunrise provision for Internet TV must-carry for all—what Larry Lessig and Tim Wu call "network neutrality."[22] When a cable subscriber receives a sustained 3 Mbps bit rate from a cable company for a fixed rate and with non-discrimination of bits based on source (e.g., cable, broadcast, or other), the cable industry's broadcast must-carry obligations are sunset for that subscriber.[23] Most basic cable subscribers will receive 3 Mbps service by mid-2004 but they will not receive a sustained 3 Mbps.[24] Although a sustained 3 Mbps has already been achieved in South Korea, it may take many years before that happens in the United States.[25]

All the evidence so far is that the cable industry will fight tooth and nail against providing subscribers with a sustained non-discriminatory Internet bit stream capable of providing standard definition Internet TV. Internet TV is a frontal assault on their current business model that uses their gateway control of video to secure higher revenues. But the proposal above gives the cable TV industry a greater incentive to switch from their closed and proprietary video-on-demand services to an open Internet TV model.

If the two-phased, 100% bandwidth giveback to the cable industry doesn't seem enough to justify a must-carry/open access regime for all -- just like today's narrowband Internet -- then it should be remembered that the cable industry has been granted highly valuable public rights of way, which have given cable companies substantial monopoly power and led cable assets to have a market value far higher than their replacement value. The government has no obligation to guarantee to cable companies either monopoly profits or monopoly speech control. Indeed, it has a positive obligation to foster competition and diverse and antagonistic sources of speech. If this type of open access doesn't work, the alternative, which many rural communities are already implementing, may be to set up next-generation broadband municipal networks, with open access built into the design.[26]

Conclusion

A fundamental concern of any must-carry regime is that it rewards and codifies the indefinite use of low frequency spectrum for broadcast service. This is objectionable because an overwhelming and increasing majority of Americans prefer to receive their TV service by cable and/or satellite subscription and because, perhaps more importantly, the highest and best use of broadcasters' low frequency spectrum is for non-broadcast services such as portable high-speed Internet service.

Still, no one believes that it is politically feasible to clear broadcasters completely out of the broadcast band; DTV broadcasting is likely to occupy the airwaves for years to come. So the Berlin DTV model strikes a balance between allowing broadcasters to preserve their status quo service rights while freeing up spectrum for better uses. For those who believe this still doesn't sweeten the pie enough for broadcasters, we propose a multicast must-carry compromise, but only if broadcasters pay a spectrum user fee as a percentage of their advertising revenues. This fee could then contribute to a universal TV service fund and a public interest programming fund.

To the extent that must-carry is desirable, it should not be restricted to broadcasters. As the TV platform evolves from broadcast TV technology to Internet TV technology, the cable industry should be required to treat all bits equally regardless of their ownership.

Perhaps the saddest feature of the current must-carry policy is its political consequences. As long as broadcasters get exclusive access to cable TV, they have no incentive to fight for opening up the cable TV networks for anyone else. If, however, they lost their privileged carriage rights, they would have an incentive to fight both for non-discriminatory carriage for all and a cable network architecture that would make that possible.

Anyone who believes that giving broadcasters multicast must-carry, in the form the broadcasters currently propose, will either appreciably speed the DTV transition or be the last subsidy given in the name of speeding the DTV transition, is living a pipe dream, as proven by more than 15 years of failed efforts to reclaim the spectrum reserved for the broadcasters' transition to advanced TV.

It is true that multicast must-carry may represent the end of the current pro-regulatory moment in the DTV transition. But a deregulatory phase, lobbied just as vehemently, is about to begin. In the coming years, as surely as night follows day, the broadcasting industry will

request spectrum flexibility and the dismantling of free TV so that it can acquire an additional revenue stream and compete in the new world of Internet TV and information services. In the name of preserving free TV, federal policy will slowly kill it off, and the purposes of the DTV transition will be made a farce. If the broadcasters win, we are truly still at the beginning, not nearing the end, of the hideously botched DTV transition.

ENDNOTES

1 Federal Communications Commission, "NPRM: Carriage of Digital Television Broadcast Signals," CS Docket 98-120 (July 10, 1998).

2 Enhanced 8VSB allows broadcasters to catch up with widely available video compression technologies used in personal computers. The current version of Microsoft's Windows Media Player, for example, allows for standard definition TV quality in 1.5 Mbps. More generally, the U.S. broadcast DTV standard has fallen far behind the DVB 2.0 standard adopted outside North America.

3 See Adam Thierer, "DTV Mandate Tally Could Grow Again With Upcoming Multicasting Decision," Cato Institute, TechKnowledge, Issue #67, December 5, 2003. Available at http://www.cato.org/tech/tk/031205-tk.html.

4 e.g., see NAB/MSTV/ALTV, "Reply Comments to the FCC, In the Matter of Carriage of Digital Television Broadcast Signals," CS Docket No. 98-120, (August 14, 2001).

5 Most notably, Turner Broadcasting System, Inc. v. FCC, 520 U.S. 180 (1997).

6 See the legislative history leading up to passage of the Cable Act of 1992.

7 See *supra* note 4, page 2. In the same set of reply comments, the broadcasters make this claim 5 times and three times use the word "inevitable" as in "no digital must carry will inevitably cause" a "prolonged DTV transition."

8 These include preventing unlicensed underlays in the broadcast band and allowing use of enhanced DTV standards to compete with the superior DVB 2.0 DTV standard, the worldwide broadcast DTV standard used outside North and South America.

9 *Id*., pp. ii, iii,21.

10 See J.H. Snider, "The Myth of 'Free' TV," New America Foundation, Spectrum Series Working Paper #5, June 2002.

11 See *supra* note 4, pp. iv, 20.

12 Anupam Banerjee and Marvin Sirbu, "Towards Technologically and Competitively Neutral Fiber to the Home (FTTH) Infrastructure," Paper presented at the TPRC, September 2003.

13 See "Berlin Launches DVB-T," *DVB-Scene*, December 2002, p. 8. See also Mark Landler, "German Way to Go Digital: No Dawdling," *New York Times*, Nov. 3, 2003. p. C1.

14 Next generation Internet networks include a hybrid broadcast model. For example, through intelligent routing, a live program from Washington, DC to New York City only needs to be sent once over the backbone and then is subdivided as it approaches the household.

15 George Gilder, *Life After Television*, (New York, NY: W.W. Norton, 1992.); Nicholas Negroponte, *Being Digital,* (New York, NY: Knopf, 1995); Thomas W. Hazlett, "The U.S. Digital TV Transition: Time to Toss the Negroponte Switch," Working Paper 01-15, AEI-Brookings Joint Center for Regulatory Studies, 2001; J.H. Snider, "Who Owns the Airwaves? Four Theories of Spectrum Property Rights," New America Foundation, Spectrum Series Issue Brief #3, April 2002.

16 The number of bits required for HDTV partially depends on the amount of motion in the programming. Low motion programming such as a weather report or a talk show may require less than 2 Mbps. A car chase may require more than 9.7 Mbps. Cable TV systems now generally allocate less than 10 Mbps for HDTV. Extra bits for the car chase may be sent ahead of time during a slow sequence and stored in memory so that when the car chase occurs the effective bit rate can be higher than 9.7 Mbps.

17 See http://www.benton.org/PIAC.

18 For example, information necessary to verify the broadcasters' public service announcements claims needs to publicly released. Broadcasters claim to provide more than $4 billion worth of such announcements per year.

19 See www.digitalpromise.org. See also Thomas Kalil, "An Information Commons for E-learning: Designing a Digital Opportunity Investment Trust," New America Foundation, Spectrum Series Working Paper #2, June 2002. See also Henry Geller and Tim Watts, "The Five Percent Solution: A Spectrum Fee to Replace the 'Public Interest Obligations' of Broadcasters," New America Foundation, Spectrum Series Issue Brief #4, May 2002.

20 The calculation is based on the following two factors. First, wired transmissions are more efficient than wireless transmissions, so the cable industry can cram a 19.4 Mbps data stream into 3 MHz whereas the same data stream requires 6 MHz over-the-air. See Appendix A of NAB/MSTV/ALTV, "Reply Comments to the FCC, In the Matter of Carriage of Digital Television Broadcast Signals," CS Docket No. 98-120, (August 14, 2001), report of Merrill Weiss and Sean Driscoll.

Second, this 3 MHz can then be divided into half to provide the 9.7 Mbps/HDTV level of must-carry service described above. See Andrew Odlyzko, "Implications for the Long Distance Network," in *Internet TV*, Eli Noam *et al.* ed., (Mahwah, NJ: Lawrence Erlbaum, 2004), p. 13.

The result is that 4.5 MHz of the 6 MHz currently allocated to each broadcaster for analog must-carry can be returned to the cable industry. If we assumed that the average American household currently receives 13 over-the-air analog TV channels, this returns to the cable industry more than 50 MHz of spectrum.

21 E.g. see *supra* note 19, Eli Noam, *et al*., *Internet TV*.

22 See documents filed to the FCC, "In the Matter of Internet Over Cable Declaratory Order Proceeding," CS Docket No. 02-52; Lawrence Lessig, *Code and Other Laws of Cyberspace*, (New York: Basic Books, 1999); Tim Wu, "Network Neutrality, Broadband Discrimination," *Journal of Telecommunications and High Technology Law*, Vol. 2, forthcoming 2003; Mark Cooper, "The Failure of 'Intermodal' Competition in Cable Markets," Consumer Federation of America, April 2002. See http://papers.ssrn.com/sol3/papers.cfm?abstract_id=388863.

23 The definition of a "sustained" 3 Mbps stream could be "enough bandwidth from a cable TV operator to provide 3 Mbps to 40% of the cable modem subscribers on a particular hub." This assumes less than 40% of subscribers require maximum bandwidth at any one time.

24 The 3 Mbps is about twice the data rate that streaming broadcast standard definition TV now requires. Thus, a 30-minute sitcom could be downloaded in 15 minutes.

25 George Gilder, "Message from Korea," *Gilder Technology Report*, July 2003.

26 e.g., Larry Lessig, "When a High-Speed Monopoly is a Good Thing," *Wired*, December 2003; William Lehr, and Glen Hubbard, "Economic Case for Voluntary Structural Separation," Paper presented at the TPRC, September 2003.