underutilization of federal spectrum below 5 GHz was such that up to 200 MHz could be made available for emerging technologies.[32/]

A report released in March 1992 by NTIA revealed relative underutilization of unclassified frequencies in the 1710-1850 MHz and 2200-2290 MHz federal government bands. "Federal Spectrum Usage of the 1710-1850 and 2200-2290 MHz Bands," E. Cerezo, ed., NTIA TR 92-285 (March 1992).[33/] The Commission should not have so lightly dismissed the alternative of using federal government spectrum in this proceeding.

The Commission's concern about "delay and uncertainty" as to when federal government spectrum will be released under the pending legislation is both illogical and unpersuasive. NPRM, 7 FCC Rcd at 1543-1544. Federal government spectrum can be released without further Congressional authorization, and even if legislation were necessary, it is very likely that spectrum released pursuant to the Technologies Act would be available for

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32/ See S. Rep. No. 93, supra, note 26 at 8. Based on the testimony of Assistant Secretary Obuchowski and others, the House Committee Report concluded that "many of the frequencies reserved for government licenses are under-utilized or inefficiently used." House Comm. on Energy and Commerce, Emerging Telecommunications Technologies Act of 1991, H. Rep. No. 113, 102d Cong., 1st Sess. (June 18, 1991) (Testimony of Assistant Secretary Obuchowski).

33/ The NTIA report, released after the NPRM, contains new information the FCC must consider in this rulemaking. Failure to consider this information, or reaching a decision in this proceeding that is inconsistent with this information, would violate the APA. See California v. FCC, 905 F.2d 1217, 1230 (9th Cir. 1990). See Petition to Suspend at 7-11 for recommendation on OET analysis of federal government spectrum.

new technologies before spectrum the Commission has targeted for reallocation in this proceeding is made available. The pending legislation would require NTIA and the FCC to identify, no later than one year after enactment, at least 30 MHz that can be reallocated immediately. Thus, at least 30 MHz could be available as early as 1993, much sooner than the spectrum targeted in this proceeding is likely to be vacated.

2. The Commission Should Consider Reallocation of MDS and Broadcast Auxiliary Bands.

The Commission concluded in the NPRM that it would not reallocate the 2 GHz frequencies used by the multipoint distribution service ("MDS") (2.15-2.16 GHz) and broadcasting auxiliary service (1.99-2.11 GHz). NPRM, 7 FCC Rcd at 1544.[34/] The Commission eliminated these bands from consideration without the benefit of public comment and without fully analyzing either their suitability for emerging technologies or the feasibility of relocating their facilities to other bands or media. The Commission should reallocate these frequencies for use by emerging technologies.

34/ The 1.99-2.11 GHz broadcast auxiliary service band includes studio-to-transmitter links ("STL"), intercity relays ("ICR"), and electronic news gathering ("ENG") mobile operations, which are licensed to television broadcasters and cable television operators. NPRM, 7 FCC Rcd at 1544. The 2.15-2.16 GHz MDS band is licensed, in general, to wireless cable television operators. Id.

(a) The MDS Band

The Commission's elimination of the 2150-2160 MHz MDS band is inexplicable in view of the fact that this MDS band is the least utilized of the bands under consideration. The Commission stated that the OET Report concluded that because there are a large number of MDS applications filed with the Commission and it is a developing industry, it is not desirable to relocate this service. Id. at 1544. The primary MDS band is in the 2500-2690 MHz band.[35/] The Commission eliminated this band from consideration for use by emerging technologies because there is no available band to relocate existing operations. Yet, the Commission gave no explanation why it could not relocate the users in the 2150-2160 MHz band to the 2500-2690 MHz band.

According to the OET Report, there are 65 licensees and 163 facilities in the 2150-2160 MHz band. OET Report at ¶ 3.3, Table 1. The Commission should determine whether the relatively few MDS users in the 10 MHz of spectrum in the 2150-2160 MHz band could be accommodated in the 2500-2690 MHz band. If so, this relocation could make 10 MHz available for emerging technologies.

The Commission also determined that the significant number of pending MDS applications is a bar to making the 2150-2160 MHz

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35/ In paragraph 14 of the NPRM, the Commission erroneously stated that the 2.50-2.60 GHz band is used for MDS. However, the OET Report correctly states that the primary MDS band is between 2.50-2.69 GHz. OET Study at ¶ 3.2. See 47 C.F.R. § 94.61. Thus, the Commission overlooked 90 MHz of spectrum, which may be available to accommodate the MDS licensees in the 2.15-2.16 GHz band.

band available for emerging technologies.[36/] NPRM, 7 FCC Rcd at 1544. This reason should not have prevented the Commission from exploring the alternatives for the 2150-2160 MHz band. The Commission suspects that a majority of these applications are speculative or that they were filed by uninformed applicants who may have been victimized by "application mills."[37/] More than 350 MDS construction permits or conditional licenses have been cancelled or forfeited for failure to construct.[38/] Thus, the Commission has no basis for knowing the future spectrum requirements of MDS, and no basis for eliminating the 2150-2160 MHz band from consideration without further study.

(b) The Broadcast Auxiliary Service Band

The Commission concludes in the NPRM that the 1990-2110 GHz broadcast auxiliary service band should not be reallocated for

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36/ The Commission has more than 24,000 MDS applications on file. NPRM, 7 FCC Rcd at 1547, n.14.

37/ See Letter to the Editor of the Washington Post from Ralph A. Haller, Chief, Private Radio Bureau, Washington Post, April 30, 1992 at A22, Col. 4.

38/ See "Amendment of Parts 1, 2 and 21 of the Commission's Rules Governing Use of the Frequencies in the 2.1 and 2.5 GHz Bands, Notice of Proposed Rule Making, FCC 92-173, released May 8, 1992, n.32. Indeed, in the MDS proceeding, the Commission is considering returning all pending applications and establishing a new window for acceptance of MDS applications. Id. at 1546. Thus, it is clear that the Commission is unjustified in eliminating the 2 GHz MDS band as a candidate band for emerging technologies based on the existence of a large number of pending MDS applications, most of which the Commission believes are not bona fide.

emerging technologies because of its current "heavy use," the expected increased use when ATV is introduced, and the lack of suitable higher frequency bands to accommodate existing users and new growth. Id. at 1544.[39/] The OET Report, however, stated that with the introduction of ATV, "there is considerable uncertainty with regard to the demand for broadcast auxiliary service. As a result, the future requirements of the broadcast auxiliary services for operating spectrum are not known." OET Report at ¶ 3.3.2 (emphasis added). Accordingly, without knowing the future spectrum requirements for ATV, the Commission has no basis for eliminating the 1990-2110 MHz broadcast auxiliary band from consideration.

Moreover, the OET Report acknowledged that new video digital compression technology may offer the potential for improving the spectrum efficiency of mobile ENG operations. NPRM at n.16. In addition, broadcasters have demonstrated that ENG congestion may be voluntarily eliminated by pooling arrangements. Thus, the Commission's elimination of the entire 1990-2110 MHz band on the

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39/ Mobile ENG operations comprise only a limited portion of the broadcast auxiliary band, which is also used for studio-to-transmitter links and intercity relay stations. NPRM, 7 FCC Rcd at 1544. In addition, ENG frequencies are subject to high demand only at the time of major news events. OET Report at ¶ 3.3.2. At other times, ENG frequencies may not be used for long periods of time. Id. In general, ENG demand is further limited to regularly scheduled times of the day when news programs are broadcast. On the other hand, the railroads' fixed microwave operations are in use 24 hours per day, every day of the year.

basis of sporadic and limited ENG use is unjustified in light of expected efficiencies in the ENG band.

The Commission also concluded that higher frequency bands which are suitable for broadcast auxiliary services "do not appear to have the capacity to support the existing 2 GHz operations and new growth." NPRM, 7 FCC Rcd at 1544. However, in the NPRM, the Commission did not identify the bands suitable for relocating auxiliary services.[40/] As opposed to the NPRM, the OET Report identified the 7 GHz band as a candidate relocation band for broadcast auxiliary services, but indicated that the spectrum available now is "only marginally adequate during periods of high demand" and that users indicated that they "anticipate" that the introduction of ATV will exacerbate the congestion. Id. These reasons do not justify elimination of the entire 1990-2110 MHz band from consideration for use by emerging technologies. The introduction of ATV operations is years away and will require a major transition, and major investment, on the part of broadcasters. At this time, there is no basis for assuming that ENG service will require more, less or the same amount of spectrum, especially in view of the fact that improvements are expected to enhance the efficiency of ENG service. In any event, the Commission should consider the

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40/ However, the Commission identified the 3.7-4.2, 5.925-6.425, 6.525-6.875, 10.7-11.7, 11.7-12.2, 12.7-13.25 and 17.7-19.7 GHz bands for reaccommodation of the displaced fixed microwave users.

options available for ENG and the other operations in the broadcast auxiliary service. The costs of relocating the auxiliary service could be marginal compared to the significant costs associated with the broadcasters' transition to ATV. Transition should be undertaken well in advance of the introduction of ATV to avoid disruption of this nascent service.

In addition to the 7 GHz band, Table 2 of the OET Report identified the 6425-6525 MHz band as a candidate relocation band for broadcast auxiliary fixed services. Neither the OET Report nor the Commission addressed the possible use of this band. Thus, the Commission apparently failed to consider all of the possible candidate bands and options for relocating certain broadcast auxiliary services (i.e., the fixed STLs and ICRs) whose current spectrum could be made available to emerging technologies.[41/] In light of these various options, the

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41/ The Spectrum Utilization and Alternatives Working Party (Working Party 3) of the Planning Subcommittee of the FCC's Advisory Committee on ATV has determined that the 4.40-4.99 and 7.75-7.90 GHz bands are candidates for broadcast auxiliary service relocation on a shared government/nongovernment basis. Working Party 3 also determined that with the introduction of ATV, the FCC should consider the following options with respect to broadcast auxiliary service:

- Where possible, use fiber optic systems to replace or augment fixed microwave circuits.
- Employ improvements in equipment and operating techniques, including FM deviation optimization, larger and shrouded antennas, and lower noise figures for pre-amps and receivers.

(continued...)

Commission should determine whether any spectrum in the 1990-2110 MHz band can be made available for emerging technologies by reaccommodating the broadcast auxiliary fixed service.

C. The Exemption of State and Local Government Microwave Users from Reallocation Is Arbitrary and Discriminatory.

The Commission proposes to exempt state and local government 2 GHz fixed microwave licensees from any mandatory relocation of their facilities because of "the need to avoid any disruption of police, fire and other public safety communications." NPRM, 7 FCC Rcd at 1545. It also observed that "state and local government agencies would face special economic and operational considerations in relocating their 2 GHz fixed microwave operations to higher frequencies or alternative media." Id.

41/(...continued)

- Consider better utilization of the currently allocated but lightly used 18, 23, 30 and 40 GHz bands.
- Consider the possible use of the 20/30 GHz bands for satellite service.
- As they become available, employ better digital compression techniques to reduce per-TV-signal bandwidth.

White Paper on the Issue of Broadcast Support Spectrum in the Context of the Advanced Television Service, Prepared by Chairman, Working Party 3 of the Planning Subcommittee of the Advisory Committee on Advanced Television Service, February 22, 1992, at 10-11.

This exclusive exemption of state and local government licensees is arbitrary, discriminatory and irrational.[42/] First, the public safety rationale for the exemption applies to nongovernment licensees, including the railroads, which use fixed microwave service for recognized public safety applications. Second, the exemption is overinclusive because not all fixed microwave uses by government licensees are safety-related. Finally, given uncertainty about the acceptability of co-primary status for users with high reliability needs, the exemption may not be in the long-term interests of even government licensees.

The Commission's rationale for exempting state and local government licensees applies equally to the railroads. The Commission has long recognized that the private microwave operations of the railroads contribute to the safety of life and property, and has emphasized that they can tolerate little, if any, interference because of the safety implications of their operations.[43/] For example, at the spectrum general allocation hearings held in 1944 for land transportation radio services, the Commission determined that there is a "purely safety aspect" to railroad radio communications for main-line end-to-end and wayside point-to-train communications. General Mobile Radio

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42/ New Orleans v. Dukes, 427 U.S. 1134 (1976)(government must have rational reason for treating similarly situated entities differently).

43/ See General Mobile Radio Service, 13 FCC 1190, 1199-1200 (1949); Frequency Allocation, Nongovernment, 39 FCC 68, 140 (1945).

Service, 13 FCC 1190, 1199-1200 (1949). In licensing unattended stations in railroad radio operations, the Commission long ago determined that the public interest, convenience and necessity is served by improving the safety and efficiency of railroad operations. See Amendment of Part 93, Subpart H, Railroad Radio Service, Section 93.357, of the Commission's Rules to Provide for the Licensing on a Regular Basis, of Unattended Stations Used in Conjunction with Right-of-Way Safety Inspection Devices, 5 FCC 2d 842, 843 (1966). Obviously, safety of life and property is a factor in any setting where machinery and equipment operate at high rates of speed in close proximity to human beings.

In 1982, Congress amended the Communications Act to require that "[i]n taking actions to manage the spectrum to be made available for use by the private land mobile services, the Commission shall consider, consistent with Section 151 of this title, whether such actions will (1) promote the safety of life and property...." 47 U.S.C. § 332(2).[44/] Congress did not limit "safety of life and property" considerations only to state and local government licensees. Accordingly, the Commission's concern with disruption of "police, fire and other public safety communications" cannot now be limited arbitrarily to the operations of state and local government licensees. Rather, it

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44/ One of the purposes of the Communications Act is to "[promote] safety of life and property through the use of wire and radio communication." 47 U.S.C. § 151.

should apply to all operations that protect and promote safety of life and property, regardless of the status of the licensee.[45/]

The exemption of all state and local government licensees also is arbitrary because it applies to all government uses of 2 GHz microwave facilities, not just uses that are safety-related. State and local governments use 2 GHz frequencies for a wide variety of routine activities, all of which would be exempt from reallocation.[46/] This blanket exemption, without regard to whether the use is safety-related, is unjustified.

Even if the public safety exemption had been applied uniformly, it is uncertain whether authorization to remain in the Commercial 2 GHz Band indefinitely is in the long-term interest of state and local government microwave licensees. Comments filed by the Arizona Department of Public Safety point out that the public safety exemption provides little relief because they eventually will be forced to vacate the band as well:

> The proposed exemption of this agency from any mandatory transition out of the band (docket paragraph 25) offers little consolation. Eventually all exempted agencies will have to transition to another band

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45/ The other reason the Commission cites for the exemption -- the economic and operational considerations that are involved in relocating to other frequency bands -- similarly applies to private licensees in the railroad industries. State and local government agencies are not alone in facing special economic and operational considerations.

46/ Section 90.17 of the Commission's Rules states that governmental entities are eligible to operate radio-based services for routine official activities. State and local government fixed service operations are not required to be public safety-oriented.

> because manufacturers will not continue to produce equipment for such a small, declining market. Loss of access to this band will increase our cost of adding low capacity links to remote areas in the future.

Comments of State of Arizona (filed April 20, 1992) at 2.

If the Commission intends to exempt certain users on grounds of safety, then it must exempt all licensees whose use of fixed microwave facilities is related to maintaining the safety of life and property.

D. The Commission's Preselection of 2 GHz Frequencies Is Not Justified by International Compatibility Requirements.

Another reason the Commission cited in the NPRM as justification for its selection of the Commercial 2 GHz Band for a spectrum reserve is that use of that band will ensure deployment of emerging technologies that will be compatible with new services in other countries. NPRM, 7 FCC Rcd at 1543. The NPRM noted that "Europe and Japan recently have moved to allocate spectrum between 1 and 3 GHz for mobile services that use new technologies" (id. at 1543) and that the 1 to 3 GHz range is the "subject of considerable research and developmental activities, both domestically and internationally." Id. at 1544. The NPRM specifically mentioned that spectrum allocation decisions made at the World Administrative Radio Conference ("WARC") should be considered in domestic deployment of new mobile services such as PCS. Id.

The purported need for identical spectrum allocations worldwide in order to ensure international compatibility of new

services is inconsistent with conclusions the Commission reached when formulating the U.S. position on issues to be considered at the WARC.[47/] Among the proposals the Commission considered prior to the WARC was a recommendation that 60 MHz of spectrum be allocated on a worldwide exclusive basis for international roaming of personal mobile services.[48/] The Commission found that the majority of commenters supported its tentative proposal not to provide exclusive worldwide mobile service allocations.[49/] Commenters stated that standardized equipment, rather than an exclusive worldwide allocation, would be more likely to ensure international compatibility.

> [W]orldwide compatibility can be achieved without an exclusive mobile allocation through equipment that can be produced to operate in somewhat different allocations in different geographical areas.[50/]

This conclusion undercuts the Commission's current view that PCS must operate on the same frequencies other nations are using in order to be internationally compatible.[51/] The Commission has

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47/ See Notice of Inquiry, 4 FCC Rcd 8546 (1989); Second Notice of Inquiry, 5 FCC Rcd 6046 (1990); Supplemental Notice of Inquiry, 6 FCC Rcd 1914 (1991).

48/ Supplemental Notice of Inquiry, 6 FCC Rcd at 1917-18.

49/ Report, 6 FCC Rcd 3900, 3904 (1991).

50/ Id.

51/ Even if use of the Commercial 2 GHz Band for domestic PCS were necessary for international compatibility, the NPRM still is flawed because the Commission did not apply this factor in its consideration of all the potential frequencies in this band. For example, the Commission did not even

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not explained why it changed its position or whether the two views can be reconciled. At a minimum, the Commission should solicit comment from equipment manufacturers and others as to whether PCS must operate on the same frequencies worldwide.[52/] For example, it may be technically feasible to convert between frequencies with a simple switch on PCS hand units.[53/]

Based on currently available information, it is not clear that reallocating the Commercial 2 GHz Band for domestic PCS will achieve the Commission's goal of achieving international compatibility. Until the Commission considers all relevant technical information, its international compatibility criterion for selecting the Commercial 2 GHz Band for emerging technologies is unjustified. No spectrum should be reallocated for PCS until the uncertainty about international technology and the full

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51/(...continued)
mention international compatibility when it eliminated the MDS and broadcast auxiliary bands from reallocation. Such arbitrary application of criteria the Commission states govern its reallocation decision renders the whole proceeding unlawful.

52/ At least some European countries are using bands other than those targeted for reallocation in this proceeding for PCS. See Notice of Ex Parte Presentation by Cellular Service, Inc. (April 21, 1992) (indicating availability of European equipment for PCS operation on 1710 MHz band).

53/ Existing 2 GHz fixed microwave radio equipment is capable of operating in both the federal portion of the band (1710-1850 MHz and 2200-2300 MHz) and the commercial portion of the band (1850-2200 MHz). See Attachments B and C, consisting of excerpts from product brochures from Harris and Alcatel, which show a frequency range from 1700-2300 MHz.

impact of WARC spectrum allocation decisions is fully analyzed.[54/]

IV. THE COMMISSION'S PROPOSED RELOCATION PLAN IS FUNDAMENTALLY FLAWED.

The Commission's twofold objective of the OET Report was to identify suitable frequencies for new technologies and to develop a relocation plan for existing users who will be ousted from those frequencies. Just as the OET Report was deficient in its evaluation of the availability of frequency bands for new technologies,[55/] so likewise the report fell short of achieving its second objective. The Commission's proposal to force 2 GHz licensees to migrate to higher frequency bands and other is short-sighted and incomplete, and its estimate of the proposed costs of relocation is far too low.

54/ At the request of Senator Ernest F. Hollings, Chairman of the Senate Committee on Commerce, Science and Transportation, and Representative John D. Dingell, Chairman of the House Committee on Energy and Commerce, the Congressional Office of Technology Assessment ("OTA") is conducting a study of the impact of WARC spectrum allocation decisions on domestic radiocommunications policies, technologies and services. See OTA Project Proposal, "The 1992 World Administrative Radio Conference: Outcomes and Implications" (publication expected in early 1993).

55/ See Section III.

A. The Commission Has Proposed Inadequate Alternative Frequencies for the Present 2 GHz Users.

The centerpiece of the Commission's proposal to relocate current 2 GHz licensees was its agreement with the conclusion of the OET Report that they "can be relocated to higher frequency bands that provide for similar type services and can support propagation over similar path lengths." NPRM, 7 FCC Rcd at 1544. In this regard, the Commission proposed to "make available all fixed microwave bands above 3 GHz, both the common carrier and the private bands, for reaccommodation of fixed microwave operations currently licensed in the 1.85-2.20 GHz spectrum.[56/] To enable this "reaccommodation," the Commission proposed a waiver of the eligibility requirements in those bands, but stated that the "technical rules and coordination procedures" currently applicable to higher frequency bands "will continue to apply." NPRM at 1545 (emphasis added).

The Commission's conclusion that the higher bands can accommodate the displaced 2 GHz users is fundamentally flawed. Two principal relocation bands identified by the OET Report are the 4 and 6 GHz common carrier bands (3.7-4.2 GHz and 5.925-6.425 GHz).[57/] However, the technical rules applicable to these bands, which the Commission said "will continue to apply,"[58/] contain

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56/ NPRM at 1544-45 (footnote omitted).

57/ OET Report at Table 2, p.14.

58/ NPRM at 1545.

channelization and loading requirements which make their use wholly incompatible by private fixed microwave licensees.[59/]

Another fundamental incompatibility with the relocation bands proposed by the Commission is that the 4 GHz common carrier band currently is used extensively by satellite receive-only earth stations. This use of the band by home TV satellite receivers raises a very serious question as to whether the use of any part of that band will be possible by the displaced 2 GHz fixed microwave licensees. The Commission's NPRM made no mention of the home TV satellite problem, and the OET Report merely made passing mention of the presence of TV satellite dishes in this band.[60/]

Apparently in recognition of the inadequacy of the band relocation proposal as set forth in the NPRM, the Commission subsequently acknowledged the need for more study and further action. In its letter of April 20, 1992, to Senator Ernest F. Hollings, the Commission said that its staff was continuing its analysis of the 4 and 6 GHz bands, and that the Commission "would consider taking further action as necessary to facilitate incumbent users' migration to those bands." This statement is, in essence, an admission by the Commission that it acted

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59/ This incompatibility has been pointed out in detail to the Commission by UTC in its Petition for Rulemaking (filed March 31, 1992); and by Alcatel Network Systems, Inc. Alcatel Petition, supra, n.9.

60/ OET Report at Table 2, p.14.

prematurely in the NPRM. In this regard, railroads and other users of the 2 GHz fixed microwave band should not be required to relocate unless and until the Commission has assured itself and them that adequate and workable replacement spectrum exists. This the Commission clearly has not done.

The shortcomings of the Commission's approach in this proceeding are revealed dramatically at Table 4 of the Commission's OET Report, where the capacity in three bands (the 4 GHz common carrier band, the 6 GHz common carrier band and the 6 GHz private microwave band) in the top 50 cities are analyzed for their ability to accommodate the displaced 2 GHz users. According to the OET Report, there is adequate capacity in these three bands to accommodate the displaced users in all cities except Baltimore.[61/] When the 4 and 6 GHz common carrier bands are excluded from the analysis, however, because of the deficiencies in those bands as described above, it is clear that there is insufficient relocation capacity in 12 of the largest metropolitan areas in the nation.[62/] This insufficient capacity is clear even assuming the propriety of the methodology used in the study. The methodology is suspect, however, because the staff employed a "block analysis" approach whereby the available

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61/ OET Report at Table 4, p. 26.

62/ These twelve metropolitan areas are: New York, Houston, Los Angeles, Pittsburgh, Baltimore, New Orleans, Chicago, Sacramento, Washington, D.C., Philadelphia, Dallas-Fort Worth, San Francisco.

capacity was determined based on benchmark assumptions,[63/] rather than a path-by-path approach that represents the real-world situation in determining frequency availability for discrete microwave links.

B. Fiber Optic and Satellite Systems Are Not A Suitable Alternative To 2 GHz Fixed Microwave Systems.

Noting the results of an "informal survey," the OET Report stated that all major fixed microwave user groups in the 2 GHz band have employed fiber optics.[64/] Using a cost estimate of $40,000 per mile, the OET Report concludes that fiber optic cable is a suitable replacement for fixed microwave in the 2 GHz band.[65/]

This conclusion is flawed for several reasons. First, although an average cost of $40,000 per mile may be an appropriate figure for all installations, rural and urban alike, it is not an accurate estimate for urban installations. In the experience of at least two of AAR's members, total costs for installation of fiber optic facilities in urban areas have run in excess of $125,000 per mile. Obviously, it is in the urban areas where PCS will be deployed initially, so this cost figure is the relevant one.

63/ OET Report at 24.

64/ OET Report at 29, n.36.

65/ Id. at 29-30.

There are reasons other than cost why the use of fiber optic systems as a replacement for microwave systems is not acceptable for the railroads. First, the railroads' fixed microwave systems are, in most cases, integral to the operation of their mobile VHF radiocommunication systems. Many microwave sites are located so as to provide better coverage for dispatcher and other mobile radio-based station operations than would be feasible with trackside installations. Elimination of the microwave facilities in favor of fiber optic cables would require installation of additional repeater links from trackside terminals to repeaters at higher elevations.[66/]

Finally, many of the fiber installations used by railroads are operated in parallel with, not in lieu of, existing microwave routes. This is necessary for reasons of safety and redundancy. Fiber cables, however, are much more susceptible to extended outages, due to breaks and cuts, than microwave systems. For this reason, if the Commission were to require a microwave user to convert entirely to fiber on a particular route, installation of <u>two</u> separate fiber routes, a primary and an alternate, would be necessary to protect against inevitable outages. This has obvious and significant cost implications.

66/ In addition, the typical fiber system repeater spacing of 30 to 35 miles is too great for adequate continuous RF coverage. It would be necessary to install additional VHF mobile base stations at intermediate points, further increasing the cost of converting to a fiber optic system.

The suggestion in the OET Report that displaced 2 GHz microwave users convert to satellite technology also is without merit. Although railroads currently are using certain types of satellite technology for certain applications (e.g., Global Position System ("GPS") for locomotive and vehicle positioning and engineering right-of-way surveying; and receive-only satellite weather information), studies by individual railroads have concluded that satellite technology as a replacement medium for delivering voice and data services to and from trackside sites throughout the rail network is not technologically or economically feasible.

C. The Commission Has Underestimated The Cost Of Converting To Alternative Frequencies and Media.

The OET Report concluded that the average cost per facility of changing from 2 GHz to 6 GHz, assuming the change occurred at the end of the useful life of the "frequency sensitive" equipment, would be only $25,000. In the experience of AAR's members, this figure is unrealistically low. A more accurate incremental cost would be in the range of $150,000 to $175,000, more than six to seven times the amount estimated by the Commission's staff. The electronics alone account for an additional $58,000, consisting of an additional $50,000 in the transmitter, $2,000 per microwave site in training costs, $5,000 per site for new test equipment and $1,000 per site in documentation expense.

Similarly, the Commission's estimate for ancillary replacement costs was unreasonably low. The OET Report includes an estimate of $15,000 per site for antenna and transmission line upgrade per site. The more accurate figure, however, is approximately four times that estimate. Generally, in the 6 GHz band there are four antennas per site in order to accommodate space diversity to account for fading, bringing the figure for this category to $60,000. Furthermore, as a general rule, most towers designed for 2 GHz equipment will require structural improvement to handle the higher antenna loading. In this regard, structural improvements on the order of $40,000 per tower are not uncommon, and structural engineering costs typically amount to approximately $2,000. In addition, new path engineering costs, typically $4,000, must be included in the estimate. Finally, it is estimated that one path in five will require additional land to accommodate the structural work or a larger tower, which would average about $10,000 per site.

The following is a summary of the costs described above:

Cost to Convent from 2 GHz to 6 GHz Band

Item	Costs
Equipment	$ 58,000 (over like for like replacement costs)
Path	
Frequency Coordination	1,500
Antenna Upgrade/Repeater	60,000
Structural Improvements	40,000
Structural Engineering	2,000
Path Engineering	4,000
Land Acquisition 1 for 5	10,000
Total	**$175,500**

Importantly, the foregoing estimates do not include the additional costs that would be incurred in the event it were necessary to convert from analog to digital systems, nor do they include the cost of new intermediate microwave repeaters that would have to be "dropped in" on links where the longer path links possible at 2 GHz would not be possible at 6 GHz.

V. DISPLACED INCUMBENTS OF THE COMMERCIAL 2 GHZ BAND MUST BE GUARANTEED AN ADEQUATE RELOCATION BAND AND FULL COMPENSATION.

Even if alternative frequencies or media were available and sufficiently reliable to accommodate fixed microwave users of the Commercial 2 GHz Band, the Commission still must show that displaced licensees will not bear the cost of vacating the band for PCS and other emerging technologies. The Commission stated that it intends to minimize the "significant costs" relocation will entail by permitting new technology entrants to pay them.[67/]

67/ The Commission's proposal to provide for recompense to displaced users should not be viewed as an act of magnanimity. Displacement of existing 2 GHz licensees without proper compensation may very well, under certain circumstances, constitute an unlawful taking of property in violation of the Fifth Amendment. Although the Communications Act does not bestow on any licensee a vested right in retention of its license (see Victor Broadcasting, Inc. v. FCC, 722 F.2d 756 (D.C. Cir. 1983); FCC v. Sanders Brothers Radio Station, 309 U.S. 470, 474 (1940), courts recently have given increasing weight to the constitutional rights of property owners in the face of governmental actions resulting in the reduction of property value. Thus, when governmental action extinguishes a "fundamental attribute of ownership," there may be a "taking" for purposes of the Fifth Amendment. Agins v. City of Triburon,

(continued...)

NPRM, 7 FCC Rcd at 1545. Other than stating that it will permit private negotiations between existing users and new service providers (id.), the Commission fails to propose any specific procedures or attach any proposed rules governing compensation.

As discussed in Section IV, incumbents displaced from the Commercial 2 GHz Band will face enormous costs in relocating their facilities in a manner that will guarantee safe and reliable operations. If they are forced off the Commercial 2 GHz Band, they must be guaranteed, at a minimum, full compensation for all costs connected with (1) securing new equipment and transmitter sites, (2) adjusting all operations to new communications facilities, (3) retraining and equipment acquisition necessary to meet safety and reliability needs, (4) loss of business during transition, and (5) any other costs incurred as a result of displacement.

67/(...continued)
447 U.S. 255, 262 (1980); Kaiser Aetna v. United States, 444 U.S. 164, 176 (1979); see also, Penn Central Transportation Co. v. New York City, 438 U.S. 104, 127 (1978) ("use restriction may constitute a taking if not reasonably necessary for effectuation of a substantial government purpose"); Nollan v. California Coastal Commission, 483 U.S. 835 (1987) (must be an "essential nexus" between ends and means if regulation is not to violate the Takings Clause of the Fifth Amendment). Here, the Commission's proposed reallocation plan, depending on how it is implemented, could render useless millions of dollars worth of microwave equipment designed to operate in the 2 GHz Band, as well as result in the loss of value of transmitter sites that were acquired specifically for use on particular 2 GHz paths.

The Commission's concern that incumbent users of the Commercial 2 GHz Band might experience "windfalls" as a result of being displaced seems premature in light of the lack of a sufficient guarantee that they will be compensated at all for conversion costs. The fact that PCS entrepreneurs claim that few, if any, microwave incumbents will have to relocate their operations indicates that these entrepreneurs do not plan to foot the bill for vacating the Commercial 2 GHz Band, as the Commission proposes. These issues must be fully investigated before any spectrum is taken away from the railroads and other vital industries that now occupy the Commercial 2 GHz Band.

One alternative the Commission should immediately consider to further its goal of minimizing the cost of relocation is making federal government frequencies available as a relocation band for displaced microwave licensees. As discussed in Section III, federal spectrum can be made available through coordination with NTIA, which is obligated by its spectrum management policies to facilitate demand for spectrum by commercial users. Specifically, the Commission should seek to make available the 1710-1850 MHz band, which is immediately adjacent to the spectrum targeted in this proceeding.

The NTIA Report indicates relative underutilization of the 1710-1850 and 2200-2290 MHz federal government bands, as regards unclassified uses, as measured by total number of facilities, utilization per bandwidth and increased use during the last 10