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ABSTRACT

Since the previous status report in November of 1970, there has been little progress made in the actual implementation of domestic satellite television systems, because comprehensive technical specifications had not been provided by the three broadcast networks, ABC, NBC, and CBS. When the requirements were submitted to the interested vendors, PBS (Public Broadcasting Service) requirements were excluded due to the uncertainties of the free or reduced rates issue. This issue still has not been resolved. Nevertheless, PBS, CPB (Corporation for Public Broadcasting), and NPR (National Public Radio) have filed comments supportive of the FCC (Federal Communications Commission) position, especially with regard to the system objectives. They also filed recommendations for future requirements, particularly for the use of spot beams, frequency bands at 2.5, 7, and 12 GHz, and link parameters for dual service for more economical use of the satellite system. Currently joint requirements are being developed with the major networks, specifically in regard to technical specifications and the number of satellite channels and ground terminals. At this time the major obstacles for PBS participation in the system have been removed. (MC)

CURRENT STATUS OF DOMESTIC SATELLITES FOR TELEVISION NETWORK DISTRIBUTION

A Paper Presented at the
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Las Vegas, Nevada

by
Daniel R. Wells
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PBS Engineering and
Technical Operations

Report E 7205

Current Status of Domestic Satellites For Television Network Distribution

At NAEB two years ago, I presented a paper on the same subject. At that time, in November of 1970, applications for domestic satellite systems were due at the FCC the following month, based on a Report and Order that had been issued the previous March.

Eight applications for total systems were received, not on the original filing date. That date was extended, but they were received within the three months following that NAEB. It was not anticipated at that time that there would be as little progress in the actual implementation of domestic systems as there has been up to this point.

However, although the progress has been slow, we continue to believe that several domestic satellite systems will go forward, and that there is the potential in these systems for television network distribution which would be more flexible and cost effective than what we now have.

How did the applications that were filed effect the television networks?

Systems proposed in the applications, as presented to the FCC, were not scaled for network distribution. In each case, the ground environment was woefully inadequate. The particular routing, switching and technical performance requirements of broadcasters were not accommodated in any of the systems. It became apparent that the vendors who filed the applications had not been given adequate information from the broadcasters. The realistic and comprehensive specification had not been written.

On April 20 of 1971, after the applications had been filed, ABC, CBS and NBC put out a report entitled "Network Requirements for a Satellite Television Program Distribution System." There was an addendum to the Report in August of 1971. The Report was sent to each of the eight applicants with a request for proposal. This was outside the framework of the FCC. PBS requirements were not in the Report, and PBS did not participate in the process of requesting the proposals or in their evaluation. This was not by our choice. We were excluded from the process because of the uncertainties of the free or reduced rates issue.

The FCC, in the March, 1970 Report-and-Order had raised the issue of free or reduced rates with reference to the Public Broadcasting Act of 1968 and asked applicants to state how they proposed to accommodate educational and public broadcasting interests. The issue was raised but was not disposed of - one

way or the other. And still is not. So, the commercial networks were understandably cautious.

Proposals for network distribution were received from six of the eight applicants. There followed a round of negotiations among the commercial networks and the vendors in which there was an attempt to clarify these complicated proposals and put them on a basis where they could be compared.

This round of negotiations was nearing completion at the time the FCC issued a Staff Memorandum, Opinion and Order advocating a limited open entry policy. That was March 17, 1972. Thus, the FCC had taken about a year to act on the applications, and it was by no means a final decision. It was a Staff recommendation.

CPB, NPR and PBS filed comments generally supportive of the Staff position especially with regard to the objectives. Those stated objectives were:

1. To achieve new communications services.
2. Expansion of scope and flexibility of existing services.
3. The development of new technology which will aid in the attainment of new and expanded services.

In our comments, we pointed out the special urgency to public broadcasting for a satellite system that would relieve some of the pressures of growth and change, such as:

1. The need for multiple point origination to achieve de-centralized programming, which is a basic objective in public broadcasting.
2. The need to reach different types of audiences
   - Those in remote locations where extension of terrestrial systems would be very costly.
   - Minority or special interest audiences as well as mass audiences.
   - Instructional needs.
3. The PBS interconnection serves regional and state networks. The present configuration can be split into six regional networks, enabling each to originate its own programming simultaneously. For that purpose a single satellite channel having national coverage is not as flexible as a single terrestrial interconnection. The single terrestrial channel can be segmented. The satellite channel could not.
4. More and more interest is evidenced at the regional and state level in new techniques for ITV, namely, computer-assisted instruction and two-way interactive communication.

5. Then there is system growth in public broadcasting. There are presently 230 transmitters which is far more than the number of stations affiliated with any one commercial network. And the growth in number of stations is continuing.

So, our comments to the FCC in April described the special stake public broadcasting has in domestic systems being authorized without delay.

To avoid delay we feel it is unwise at this time to hold out for features that would make satellite systems more economical and useful. However, it's probably important to list those features - to keep them in mind as eventual requirements:

1. The use of spot beams (rather than national beams) to provide:
   - a conservation of power and resultant low cost by illuminating only the area being used;
   - a conservation of spectrum by re-use of the same frequencies in each beam;
   - routing of reverse feeds from different originating stations to network centers for switching coordination without using distribution downlink channels.

2. The use of frequency bands authorized at WARC at 2.5 GHz, 7 GHz and 12 GHz to allow for direct distribution.

By direct distribution, we mean locating the satellite receive terminal at the site of the studio plant in the case of the broadcast station, at the cable head end for cable systems and at the school building in the case of instructional centers.

You'll recall that an advisory was sent to PBS stations this summer requesting the longitude and latitude of all drop points on the interconnection. This was for the purpose of a ground terminal frequency coordination study to determine how close to the station studio plant a ground station could be located without interfering with existing terrestrial microwave. The object, of course, is to reduce or eliminate the costly links between the ground terminal and the broadcast station.

3. Choose link parameters to enable a dual service, wherein the satellite signal is received by approximately $100,000 ground terminals at broadcast stations concerned with CCIR relay grade service and the same satellite signal is received by approximately $5,000 ground terminals at instructional centers concerned with TASO grade 1 service.

The ATS-F satellite will demonstrate all three of these characteristics in 1974, i.e., spot beams, the use of a frequency band at 2.5 GHz and a dual service concept. (Dale Ogden will be describing the ATS-F educational television experiment of the Federation of Rocky Mountain States in the Engineering Session tomorrow morning.)

But even though these features are highly desirable, and attainable with present technology, we cannot hold out for their inclusion in the first generation domestic system, because they are not incorporated in present proposals, and to include them now would delay the start of the system - a delay we want to avoid.

In our comments to the FCC in April of this year, we also pointed out that PBS had not been a party to the proposals submitted directly to the commercial networks, that we needed to be

- in order to comment meaningfully on the FCC docket;
- even more important, so that the requirements of public broadcasting would be taken into account in the proposals for network distribution.

The FCC responded by directing ABC, CBS and NBC to include PBS in all such formulations of requirements and in negotiations with vendors.

I'm pleased to report that since June of this year such a cooperative effort is underway.

Over the summer, we have been working with ABC, CBS and NBC to develop joint requirements.

Those requirements are in three major categories:

A. Number of Satellite Channels

The PBS requirements for satellite channels were given as follows:

1. PBS will require three channels continuously available (24 hours/day) inclusive of eclipse and sun transit periods. Interruptions of service due to causes other than sun outages are to be restored as soon as possible but in no event longer than one hour following the interruption.

   In addition, PBS requests the price of a fourth channel on the same continuous basis, the requirement for which is not yet firm.

2. In addition, PBS requires on a scheduled basis access to a total of three channels for two hours a day, seven days a week. These are for the purpose of regional programming most of which are for instructional television during day time hours.

   42 channel-hours

3. In addition to (1) and (2) above, PBS requires access to one channel for two hours per day, seven days a week with two extra hours on Fridays for the purpose of program assembly.

   16 channel-hours

4. In addition to (1), (2) and (3) above, PBS requires access to one channel on an occassional basis for an average of seven hours per week for the purpose of covering unexpected special events.

   7 channel-hours

We believe these channel requirements can be accommodated, along with those of the commercial networks, on a 24-channel satellite. A diversity factor is achieved because PBS peaks of activity don't necessarily coincide with commercial network activity.

B. The Number and Location of Ground Terminals:

The commercial networks had already specified 151 markets, each to be served by a shared ground terminal.

Some 29 of these had receive and transmit capability - the others were receive-only.

PBS stations that were specified for satellite service included:

110 points served by AT&T
85 presently interconnected
25 to be interconnected by Dec. 31, 1972

13 points - new stations that have been granted licenses

4 points non-contiguous to the 48 states
Alaska, Hawaii, Puerto Rico, Virgin Islands

These represent our known requirements through 1973.

Most of the commercial network 151 points and the PBS 127 points are co-located. So, the total number of points in the combined requirements is kept relatively low by the sharing of ground terminals.

PBS stations which are not included:

101 points presently served by state systems
13 of these are independent licensees co-located with commercial affiliates designated to be served by a ground terminal. These stations were earmarked for potential satellite service, depending on availability of funds.

2 off-shore points which are out of the range of the satellite coverage.

C. Technical Specifications

The joint technical specifications have been prepared and agreed to within the Technical Subcommittee of the Network Satellite Committee. They are currently being reviewed within each of the networks. A copy of the draft specification is attached.

Note that there are more transmission parameters than are contained in NTC Report #5 and the parameters are tighter. They cover the end-to-end, meaning studio-to-studio, path. The space portion is basically a two-hop microwave, so that even with the attendant distribution from ground terminal to studio, the number of hops is far less than the average for stations now served by AT&T in the terrestrial system.

It's also interesting to note that both an "Acceptance Performance Limit" and an "Operational Reporting Limit" are given for each parameter. The acceptance limit is met by the carrier during the initial acceptance tests of the entire system. These same limits must be met periodically in tests conducted by the carrier. The reporting limits are somewhat looser and are to be used on a day-to-day basis. If the performance falls below any of these limits, the broadcaster would report the condition to the carrier for immediate corrective action.

We've looked at the joint requirements of ABC, CBS, NBC and PBS. The intention is that they will be sent out to vendors - the six applicants who had previously responded to a request for proposal - by the end of November, with a request for new proposals.

Following the FCC Staff Memorandum, Opinion and Order March 17, 1972, the Commission acted by adopting the Second Report and Order June 16 (docket 16495).

For the most part, it took the Staff recommendations, except that it specified open entry instead of limited open entry; that is, the FCC would not force applicants to join in consortia.

Interestingly enough, since the Second Report and Order was issued, two joint ventures have been proposed:

Fairchild and Western Union International formed the American Satellite Corporation (Amsat).

Comsat and MCI/Lockheed requested permission to form Space Communications Corporation (Spacecom). Apparently, Comsat hopes that by having only a minority interest in Spacecom, objections will be removed to its operating in the retail market. Spacecom would be in addition to the system Comsat proposes to provide for AT&T and in addition to Comsat functioning as manager and part owner of the Intelsat international satellite consortium. Comments on Spacecom are due today (October 30) and reply comments November 10.

The FCC ordered each applicant to indicate by July 25 whether it intended to proceed with its original system as filed. This date was extended to October 16. The applicants said they would wait until pending policy questions were resolved.

Comsat filed for a stay, which was denied.

Comsat and AT&T filed a petition for reconsideration, which is still pending.

So at present, applications are not firm, and the Commission is not yet doing the processing which would lead toward authorizations.

Offers were made for public broadcasting for free service in two of the satellite applications to the FCC. The free service is not a complete system. Considerable costs would have to be incurred beyond what is offered, especially in the ground environment. In the end, the decision may be based on a cost comparison between the free service offers with their attendant costs and sharing a system with the commercial networks.

The interest of the commercial networks in a satellite system is now tempered by the AT&T rate reduction filing in October, 1972. If approved, the new tariff would reduce commercial network total interconnection costs from about $70 million to about $50 million a year. How attractive the satellite service will appear in the light of that reduction remains to be seen.

Are we now on the track?

Is PBS in the ball game, fully represented in the deliberations that will lead to final resolution of domestic systems?

And, are the right systems being proposed? Do we have among the choices a domestic system that will satisfy broadcast distribution in general and public broadcasting in particular?

The answer to neither of these questions is quite what we'd like it to be.

In terms of the first question, our representation, I think the main road blocks have been removed. We are now in a position to deal with the applicants both separately and in cooperation with the commercial networks, to make the cost comparison between the true costs of the free offers on the one hand and the costs of a shared system with the commercial networks on the other.

With regard to the second question, the systems proposed in response to the network requirements will accommodate our present operation. They don't go as far as we would like in providing for the growth of public broadcasting nor in the flexibility that will be needed for instructional television. But we can continue to press for the evolution of those systems.

We do feel that the vendors will soon have a set of requirements and specifications that are realistic for the first generation of satellites.

I hope that next year at this time a report to NAEB can detail specific steps toward the implementation of a domestic satellite system - according to commitments rather than possibilities.

We'll continue to work toward that end.