

## TRANSITION IN THE BROADCASTING SERVICES AND STATION BUILDINGS OF THE JAPAN BROADCASTING CORPORATION

Hiroaki SATO<sup>1</sup>  
Kenji KAYANUMA<sup>2</sup>

<sup>1</sup> Engineering Development Center, Engineering Administration Department, Japan Broadcasting Corporation (NHK), 2-2-1 Jinnan, Shibuya-ku, Tokyo 150-8001, Japan, satou.h-oc@nhk.or.jp

<sup>2</sup> Engineering Development Center, Engineering Administration Department, Japan Broadcasting Corporation (NHK), 2-2-1 Jinnan, Shibuya-ku, Tokyo 150-8001, Japan, kayanuma.k-hi@nhk.or.jp

Keywords: broadcasting, TV, building, transition, energy, technology, development

### Summary

The digitalization of television broadcasts is advancing rapidly in Japan. Television is being transformed into a medium of high-resolution pictures, high quality sound and multifunctional, interactive communications services. The changes are expected to contribute much to society. There are, however, associated problems of energy consumption. The history of the broadcasting station buildings of the Japan Broadcasting Corporation's buildings is a story of adaptation to remarkable service developments. This paper takes the example of television broadcasting in describing this process of adaptation with regard to the expansion of energy-related needs.

## 1. About the Japan Broadcasting Corporation

### 1.1 History

The Japan Broadcasting Corporation was established as a public broadcasting corporation in 1950, but its antecedent had launched radio broadcasting in Japan in 1925. Today's Japan Broadcasting Corporation is the largest broadcaster in Japan and is currently celebrating the 80th anniversary of broadcasting in this country. Table 1 provides an outline of its history.

Table1 History of the Japan Broadcasting Corporation

Year	Item
1950	Established as a public broadcasting corporation under the Broadcasting Law
1953	TV broadcasting starts
1960	Full-scale color TV broadcasting starts
1963	Broadcasting Center opens
1989	Full-scale satellite broadcasting starts
2000	Full-scale digital satellite broadcasting starts
2003	Full-scale digital terrestrial broadcasting starts

### 1.2 Media

The Japan Broadcasting Corporation performs domestic broadcasting in the media shown in Table 2 (as of 2005).

Table2 Media

Media	
<i>Terrestrial Broadcasting</i>	<i>Satellite Broadcasting</i>
General TV Channnel	Satellite TV Channnel 1
Educational TV Channnel	Satellite TV Channnel 2
Digital General TV Channnel	Hi-Vision Channnel
Digital Educational TV Channnel	Digital Satellite TV Channnel 1
Radio Channnel 1 (mediun wave)	Digital Satellite TV Channnel 2
Radio Channnel 2 (mediun wave)	Digital Hi-Vision Channnel
FM Radio Channnel (frequency modulation)	

### 1.3 Broadcasting Station Buildings

The broadcasting station buildings of the Japan Broadcasting Corporation are facilities for the performance of all processes from program production to release. The corporation currently operates such broadcasting station buildings in 54 locations in Japan, as of 2005. These are shown in Figure1, and the building completion dates in Table 3. The broadcasting station buildings are subdivided into the headquarters station building in Tokyo, 7 base station buildings, and 46 regional station buildings. Table 4 describes representative building structures.

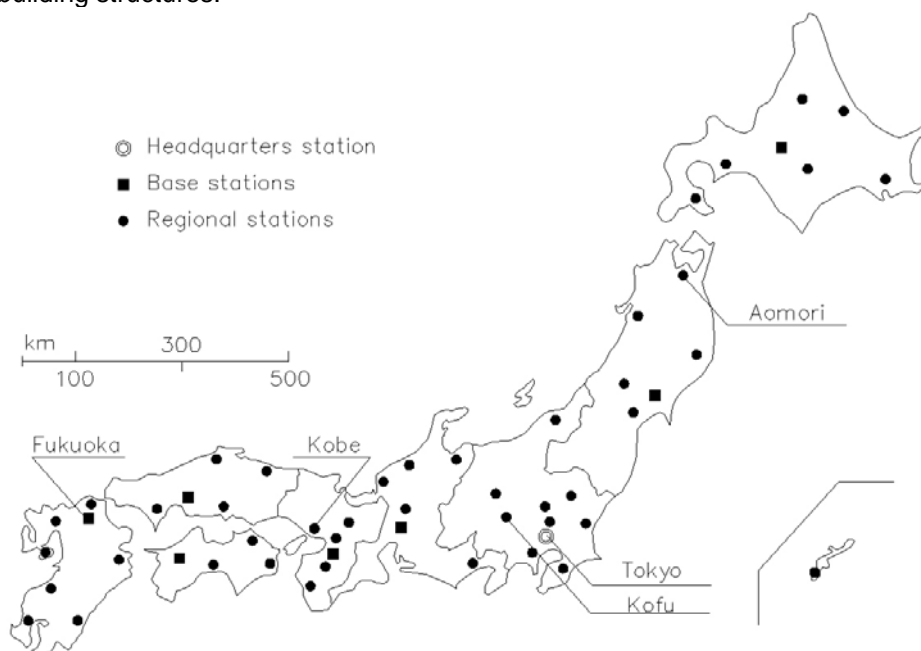


Figure1 Location of Broadcasting Station Buildings in Japan

Table3 Dates of Completion of Broadcasting Station Buildings

Age	1950's	1960's	1970's	1980's	1990's	2000's	Total
Number	1	28	8	2	5	10	54

Table 4 Representative Broadcasting Station Building Structures

Type	Place	Completion	Site Area	Total Floor Area	Structure
Headquarters Station	Tokyo	1965 (East Building)	82,650m <sup>2</sup>	256,600m <sup>2</sup>	Reinforced Concrete Frame, Steel Frame
		1968 (West Building)			
		1972 (Hall)			
		1972 (Main building)			
		1988 (North Building)			
Base Station	Hukuoka	1992	9,240m <sup>2</sup>	20,400m <sup>2</sup>	Reinforced Concrete Frame
Regional Station	Kobe	2004	2,470m <sup>2</sup>	5,200m <sup>2</sup>	Steel Frame

#### 1.4 Headquarters Station

The Broadcasting Center is the headquarters station of the Japan Broadcasting Corporation. It is the corporation's biggest broadcasting station building with 26 TV studios, one 1,200m<sup>2</sup> large, and 22 radio studios. The latest broadcasting technologies have been introduced at the Broadcasting Center one after another, and broadcasting services enhanced, since completion of the east building in 1965, but at the cost of rising energy consumption. Figure 2 shows how the Broadcasting Center's electric power consumption has more than doubled in the past 20 years with the improvement of broadcasting services.

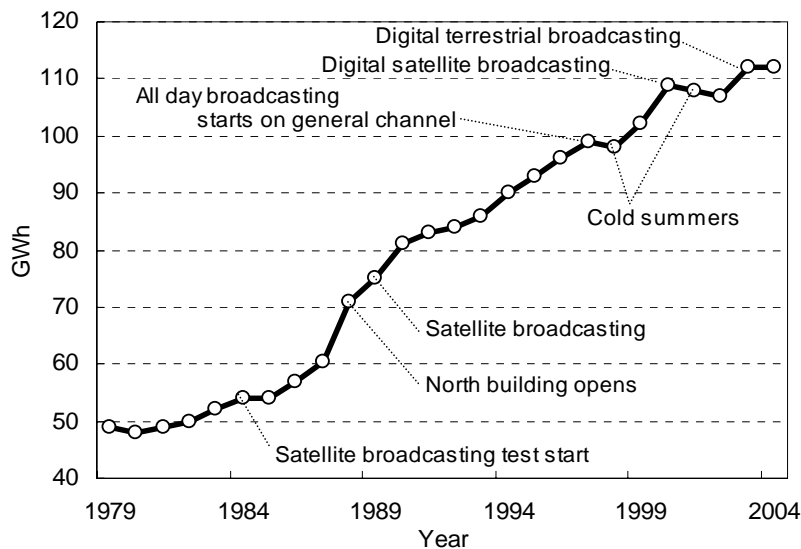


Figure 2 Electric Power Consumption at the Broadcasting Center



Picture1 Broadcasting Center, the Headquarters Station

## **2. Change in TV Broadcasting and Broadcasting Station Buildings**

### **2.1 The fifties and sixties**

The fifties and sixties were the pioneering period of TV broadcasting in Japan. Full-scale monochrome TV broadcasting began in 1953, and color TV broadcasting in 1960. The first priority was to bring television broadcasts to every part of Japan, and many broadcasting station buildings were built for this purpose.

The buildings were located in places with core urban functions, for the convenience of coverage, transport, etc. This was, however, a period of rapid economic change and growth, which made it difficult to predict which locations would be the most suitable in the long term. Buildings with a relatively short service life were selected.

Bright lighting was needed in the TV studios because of low camera sensitivity. The studio lighting loads were 300W/m<sup>2</sup> for monochrome and 600W/m<sup>2</sup> for color TV. The method of TV program production changed considerably with the practical introduction of a VTR device in 1958. Live production gave way in many cases to recording, causing daytime TV studio utilization rates to rise and, as a result, higher energy consumption peaks in the buildings. The effective distribution of the energy load became a big theme with important cost ramifications for the broadcasting station buildings at that time.

Attention was attracted by a new thermal storage air-conditioning system that was just being introduced in Japan. This compact system was installed at the Fukuoka broadcasting station building in 1959 and achieved significant energy saving.

The thermal storage technology is now a key element of air-conditioning design at all broadcasting station buildings of the Japan Broadcasting Corporation. In 1998, with a combined domestic thermal storage tank capacity of 40,822m<sup>3</sup>, we had reduced carbon dioxide emissions by about 1,000t a year, electric power consumption by about 550,000 kWh a year, and the electric power consumption peak by about 13,000kW. In power cuts, too, as in times of disaster, the thermal storage air-conditioning system offers the advantage that the remaining heat in the thermal storage tank can still be used.



Picture2 Kofu Broadcasting Station Building, completed in 1965

### **2.2 The seventies and eighties**

Broadcasting technology made great advances in the seventies and eighties.

NHK began satellite broadcasting in 1984, thereby bringing TV broadcasts to every part of Japan. The services diversified, with the introduction of sound multiplex broadcasting in 1978, emergency warning broadcasts in 1985, and teletext in 1985. This diversification also placed new power loads on the broadcasting station buildings.

The Middle East war of 1973 precipitated a global energy crisis and drew fresh attention to the importance of energy saving in Japan. Various energy-saving technologies were introduced to broadcasting station buildings due to both rising consumption and social need. These included the use of waste heat recovery techniques, alternative energy technology with heating and cooling by external air etc., and extremely efficient heat exchange technologies. Highly efficient heat storage tanks were studied and installed.



Picture3 Aomori Broadcasting Station Building, completed in 1981

### **2.3 The nineties to the present**

The introduction of new services accelerated with the progress of digital technology from the nineties.

NHK commenced digital satellite broadcasting in 2000, and digital terrestrial broadcasting in 2003. The digital broadcasting services provide high-resolution images, high sound quality, and multifunctional, interactive communications. The nature of broadcasting has changed in many ways with these further developments of broadcasting technology.

Environmental protection measures have also taken off in Japan since the Kyoto Protocol (COP3) of 1997, with the growing domestic awareness that the environment is everybody's problem.

Within the broadcasting station buildings, the securing of new space for the digital broadcasting equipment become a problem, and this led to a wave of renovation and new construction.

The start of digital broadcasting again caused the energy consumption of broadcasting equipment to rise. A broadcasting station building of the Japan Broadcasting Corporation today consumes about 4-5 times the electric power of a general office building in Japan of the same scale. The effective control of load has been a continuing theme for these buildings ever since the fifties.

NHK is actively introducing the latest appropriate environmental protection measures in order to minimize harmful emissions.

The design concepts and goals of the Kobe broadcasting station building, completed in 2004, were the control of load gain, improvement of energy efficiency, use of alternative energy, concern for the local environment and proper use and processing of materials. Energy consumption is about 10% lower as a result and carbon dioxide emissions have been reduced by about 100t a year.



Picture4 Kobe Broadcasting Station Building, completed in 2004



Picture5 Kobe Broadcasting Station Building, completed in 2004

### **3. The Future**

The 20th century has been called the century of the visual image. Various broadcasting technologies born in the 19<sup>th</sup> century developed locally and then internationally on the global scale and even reached out into space. Broadcasting has become an important part of the infrastructure that underpins the modern lifestyle, politics, economy, society, and culture. It is expected that broadcasting services will continue to progress in association with the development of new technology that fuses broadcasting and telecommunications in the near future.

Broadcasting, too, is a social system that must be designed for global sustainability. Broadcasting station buildings do have high power consumption at our present technological level, but savings are being achieved. The broadcasting station building may be regarded as a key part of the infrastructure of not only broadcasting but also the sustainable society.