

**BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR
IMPROVEMENT OF EQUIPMENT
OF
BHUTAN BROADCASTING SERVICE CORPORATION
IN
THE KINGDOM OF BHUTAN**

MARCH 2008

JAPAN INTERNATIONAL COOPERATION AGENCY

YACHIYO ENGINEERING CO., LTD.

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PREFACE

In response to a request from the Government of the Kingdom of Bhutan, the Government of Japan decided to conduct a basic design study on the Project for Improvement of Equipment of Bhutan Broadcasting Service and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Bhutan a study team from August 29 to September 27, 2007.

The team held discussions with the officials concerned of the Government of Bhutan, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Bhutan in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Kingdom of Bhutan for their close cooperation extended to the teams.

March 2008

Masafumi Kuroki
Vice-President
Japan International Cooperation Agency

March 2008

LETTER OF TRANSMITTAL

We are pleased to submit to you the basic design study report on the Project for Improvement of Equipment of Bhutan Broadcasting Service Corporation in the Kingdom of Bhutan.

This study was conducted by Yachiyo Engineering Co., Ltd., under a contract to JICA, during the period from August, 2007 to March, 2008. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Bhutan and formulated the most appropriate basic design for the project under Japan's Grant Aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

Kiyofusa Tanaka
Project manager,
Basic design study team on
the Project for Improvement of Equipment of
Bhutan Broadcasting Service Corporation
Yachiyo Engineering Co., Ltd.

SUMMARY

SUMMARY

Overview of the County

The Kingdom of Bhutan (hereinafter called “Bhutan”) is a mountainous country situated in the eastern part of the Himalaya Mountains. The altitude varies by more than 7,000m from 100m in the south to 7,500m in the north. The country’s climate also varies with altitude from subtropical in the south to temperate in the highlands and polar-type climate in the north. It has a land area about the size of Kyushu, Japan with a population of around 670,000, most of which resides in scattered areas in the mountains while the rest lives in urban districts. The whole of Bhutan experiences the rainy season generally between June and October, during which transportation from the metropolitan area to local districts is often paralyzed as roads get cut off in many parts of the country by mudslides, landslides and rock-falls caused by prolonged rain. Bhutanese people are roughly divided into three ethnic groups and speak four different languages, including English and Dzongkha. Rural areas have been increasingly depopulated in recent years. Nearly 40% of the population has moved from rural areas to such urban districts as Thimphu and Chukha, causing under-population in rural villages and overpopulation in urban areas.

Background, History and Outline of the Requested Japanese Assistance

The Bhutanese government since the late 1990s has been carrying out national development programs under the country’s unique development concept called Gross National Happiness (GNH), which, as an ultimate goal, endeavors to build a society where all citizens can live with a sense of happiness. Under GNH as Bhutan’s fundamental development philosophy, the government in 1999 established the country’s first development principles titled “Bhutan 2020: A Vision for Peace, Prosperity and Happiness” toward the five long-term objectives of: 1) human resource development, 2) preservation of cultural heritage, 3) balanced, equitable development, 4) good governance, and 5) conservation of environment. Based on these objectives, the government has formulated and implemented a series of 5-year national development plans and a variety of associated programs.

Bhutan’s first radio broadcast commenced in 1973 as National Youth Association of Bhutan (NYAB). In 1979, the government took over NYAB and commissioned NYAB to provide Bhutan’s entire radio/TV broadcasting services under the jurisdiction of the Ministry of Communications. Subsequently in 1996, the station became a state-owned independent enterprise under the name “Bhutan Broadcasting Service Corporation (hereinafter called ‘BBSC’)”. BBSC has set a goal of “contributing to the provision of accurate information and the improvement of public education” in line with the 9th 5-Year National Plan (2002 – 2008) and is currently endeavoring to expand the service area nationwide and produce programs containing diverse, accurate information from various parts of the country. Also, the Bhutanese government regards BBSC’s broadcasting services as an important publicity/educational tool in implementing government programs in such vital sectors as health, education, and vocational training.

The international community, as well as Bhutanese people, is closely watching whether or not an

election-based democratic government can be realized in Bhutan, which suffers an illiteracy rate of 40% and wide disparities between urban and rural districts and between men and women. Broadcasting services will play a vital role in these circumstances. In order for BBSC to carry out its responsibilities as Bhutan's sole broadcasting station, it needs to become able to transmit nationwide objective, real-time information on the status and progress of Bhutan's democratization process based on news gathered independently by BBSC.

Currently, videotapes of news recorded at Regional Bureaus are transported by regular bus services, etc. to the Headquarters for nationwide broadcasting. However, extreme difficulties remain in transmitting information to and from local districts in a timely manner due to underdeveloped road and communication networks and many regions which need several days to transport the tapes in Bhutan, which recognizes the provision of equal access to information for the entire nation as one of the issues in its transition to a democratic state. Under these circumstances, the government of Bhutan requested the government of Japan to provide grant aid to procure transmission equipment for BBSC's Regional Bureaus for sending news and other materials to the Headquarters, as well as to upgrade the capacities of the Headquarters.

In response to the above request, the Japanese government dispatched a Preliminary Study Team from the Japan International Cooperation Agency (JICA) to Bhutan from January 28 to February 28, 2007 to examine the validity of the request and possible duplications with other assistance projects. The Study Team confirmed the necessity, urgency and validity of the Grant Aid Project. In addition, it acknowledged Bhutan had a strong request for enhancing BBSC's program production capabilities by improving the maintenance and operational capacities of the equipment introduced through the Project and the capacities for producing programs focused on local news of the Regional Bureaus.

Outline of the Study Results and Contents of the Project

Based on the findings of the Preliminary Study Team, the Japanese government decided to conduct a Basic Design Study. JICA sent a Basic Design Study Team to Bhutan between August 29 and September 27, 2007 to check the contents of the request and survey the proposed project sites, etc. Based on the study results and further analysis upon returning to Japan, the Basic Design Study Team examined the necessity and validity of the Project, and prepared a Draft Basic Design. The Study Team revisited Bhutan between January 30 and February 8, 2008 to discuss the Draft Basic Design with the Bhutanese counterpart, based on which this Basic Design Study Report was prepared.

The Study Team, based on the study results, established the objectives of this Project, which concentrate on the following two areas:

- i. Upgrading and reinforcement of the master control system (MCS) equipment of BBSC Headquarters in Thimphu so that it will be able to efficiently broadcast video images and other information sent from various parts of Bhutan thereby satisfying the needs of Bhutanese people.
- ii. Procurement of new transmission systems, 4WD SNG OB van, and news and production equipment for Bureaus so that a variety of information (events) from various parts of the country

can be transmitted speedily to the Headquarters, which then can provide information balanced between the suburb of the capital and local districts for the nation.

The Study Team discussed the above with BBSC personnel and confirmed their intention to modify the contents of their initial request and to place their focus on the upgrading/reinforcing of the MCS and the procurement of new 4WD SNG van, transmission devices and news and production equipment for Bureaus.

Under these circumstances, the overall goal of this Grant Aid Project is “to provide accurate information for the nation at large and mitigate regional information disparities by actualizing nationwide broadcasting of high-quality programs.” Accordingly, the purpose of the Project is “to enhance BBSC’s program production capabilities by improving the capacities for producing programs focused on local news of the Regional Bureaus and establishing a system to send information from different regions in a timely manner.”

After returning to Japan, the Basic Design Study Team complied the results of their field surveys and discussions with the Bhutanese counterpart into the Basic Design, which consists of the following equipment:

Outline of the Basic Plan

	Item	Quantity
1.	4WD SNG OB Van	1 lot
2.	Master Control System	1 lot
3.	Transmission system	1 lot
4.	News and Production Equipment for Bureaus	1 lot
5.	Equipment for Continuity Studio	1 lot
6.	Maintenance Equipment and Tools	1 lot

In designing the Project, the Study Team tried to secure terrestrial links for transmitting daily news reports, as they are less expensive and more reliable with less susceptibility to weather and other conditions than satellite links, and decided to install transmission equipment to be connected to domestic telephone networks in five Regional Centers and Bureaus. To actualize diverse programs from mountainous and other remote areas where terrestrial transmission is not effective, an SNG OB van will be procured that can speedily transmit news and other materials. Each Regional Center and Bureau will be provided with editing and other production equipment so that they will be able to produce increasing numbers of programs by themselves. Also, to ensure smooth, stable broadcasting from the Headquarters by mitigating congestion caused by incoming news and other data from Regional Bureaus, the Headquarters’ master control system will be upgraded and reinforced as part of the basic plan. In addition, the Study Team discussed about future program scheduling with BBSC personnel and made suggestions on the recruitment, training, and financial plans.

Project Schedule and Estimated Project Cost

BBSC is the executing agency of this Project responsible for its implementation. In implementing the Project through Japan's Grant Aid scheme, the total cost of the Project to be implemented in accordance with the Japan's Grant Aid scheme will be determined before concluding the Exchange of Notes (E/N) for the Project. Tasks to be undertaken by the Bhutanese side include renting of satellite/terrestrial links and securing of space for installing the equipment. The project period, including detailed design and installation works, will be around 17 months.

Verification of the Relevance of Japan's Grant Aid Scheme

Procurement of the terrestrial transmission units, SVG OB van and other equipment through this Project will enable swift transmission of news gathered by Regional Bureaus to the Headquarters. Bhutan has over 10 years of experience in operating and maintaining broadcast equipment made in Japan and other countries, as well as in broadcasting live shows from Regional Bureaus to the Headquarters. Therefore, by giving proper on-the-job training at the time of equipment installation, Bhutanese engineers will be able to operate and maintain the new equipment without technical difficulties.

Implementation of this Project is expected to bring the following direct effects:

- This Project will build a network connecting BBSC's Headquarters and Regional Bureaus, thereby enabling speedy transmission of local news concerning disasters, politics, and other information more closely related to people's lives.
- Provision of an SNG van and terrestrial transmission system will expand the area of live broadcasting, which has been limited to the Thimphu area, and enable the transmission of video images from local communities to the entire country in a timely manner.

Also, it is expected to bring the following indirect effects:

- The enhanced production efficiency and establishment of the nation's trust for a public broadcasting service, which resulted from timely transmission of local news and the increase of outdoor live broadcasting programs, will increase the number of audience, thereby mitigating information disparities among different regions of the country.

This Project is expected to bring about significant benefits as stated above, as well as to facilitate the implementation of Bhutan's national development plans and mitigate information disparities among its people, which will lead to the improvement of their living conditions. Therefore, it is deemed appropriate to implement the Project as Grant Aid of the Japanese government. In addition, the recipient country is deemed to be capable of allocating sufficient human and financial resources to the operation and maintenance of the Project. There are no particular problems with the implementation of this Project.

In order to express and sustain positive effects, the Bhutanese side is required to perform the following issues:

- (1) In order to produce and provide high-quality programs for the nation, necessary manpower should be recruited and trained systematically to improve their skills to a sufficient degree. At the time of equipment installation by the Japanese suppliers, have them impart necessary knowledge and operational techniques to the relevant Bhutanese engineers so that they will be able to operate and maintain the equipment on their own and be prepared for future expansion. Make necessary arrangements to enable the engineers to participate in the training program.
- (2) Obtain necessary spare parts and replace old parts at proper intervals in order to prevent equipment failures during broadcast and prolong their service life. It is necessary to cooperate with the suppliers concerning satellite broadcasting and terrestrial broadcasting that are to be procured in the Project, and ensure to manage the operation and maintenance of the network between the Headquarters and the Regional Bureaus. Continue the present maintenance system to preserve the building. Also, provide good-quality power supply and air-conditioning to create an optimum environment for program production and equipment operation.
- (3) Reduce the rate of reruns and provide more up-to-date information for the nation by increasing the number of new programs. However, an inordinate increase of new programs would raise production cost, leading to financial crunch. Therefore, in planning and making new programs, efficient approaches should be taken to minimize the production cost by inviting participation by ordinary citizens and using volunteers, student-trainees, etc.

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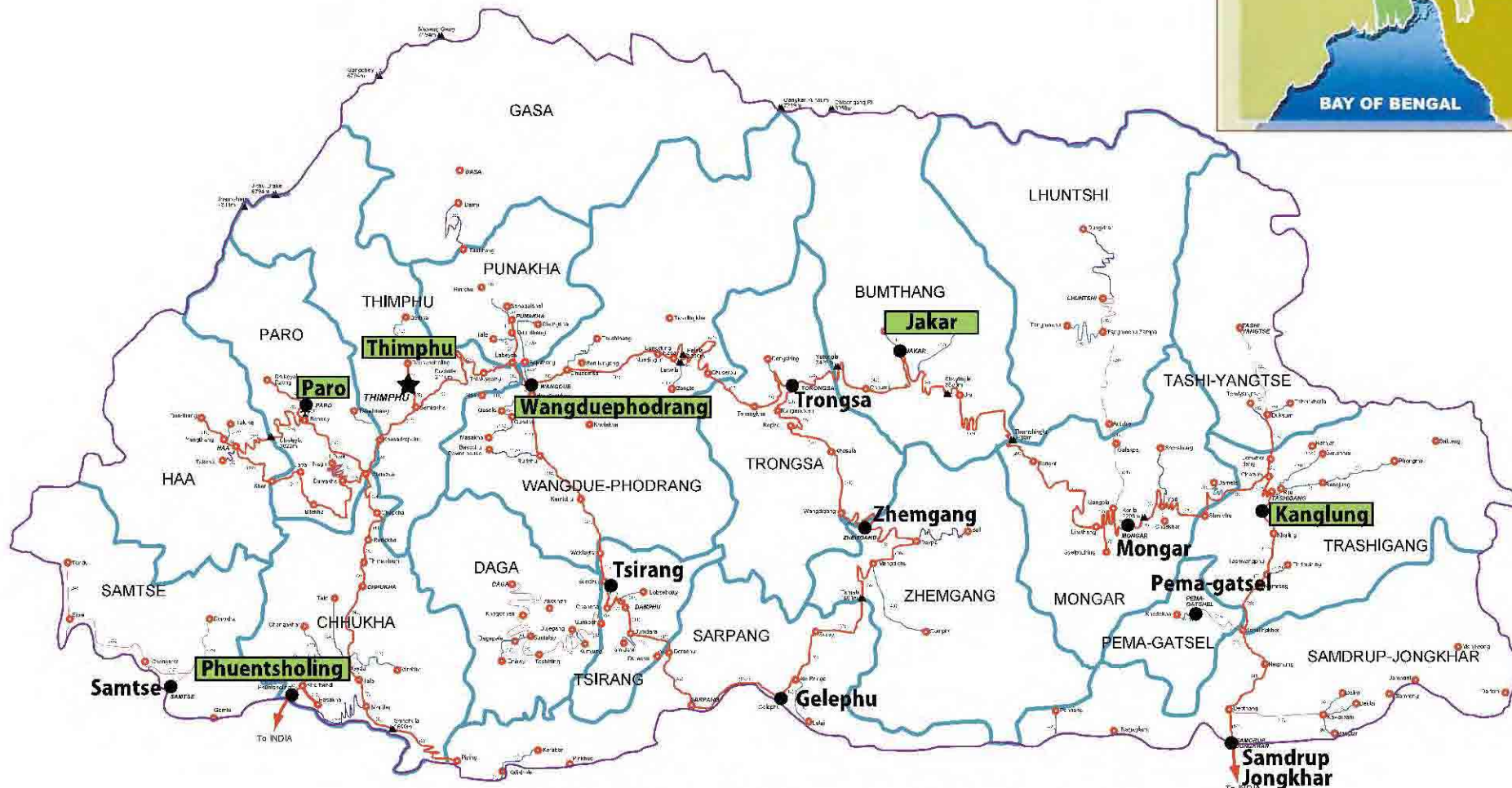
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LEGEND

- International Boundary
- District Boundary
- Main Road
- District Road
- Feeder Road
- Town
- Pass
- BBSC's Headquarter
- BBSC's Bureaus
- Project Site



Location Map of Royal Bhutan and Site of the Project

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ABBREVIATIONS

AJ	Audio Jack
AVR	Auto Voltage Regulator
BBSC	Bhutan Broadcasting Service Corporation
BGAN	Broadband Global Area Network
BICMA	Bhutan Information Communication and Media Authority
BPC	Bhutan Power Corporation Ltd
BST	Bhutan Sales Tax
BT	Bhutan Telecom
CCD	Charge Coupled Device
CCU	Communication Unit
CS	Communications Satellite
DANIDA	Danish International Development Agency
DRC	Department of Revenue and Customs
DVB	Digital Video Broodcasting
ENG	Electric News Gathering
E / N	Exchange of Notes
FM	Frequency Modulation
FPU	Field Pickup Unit
GDP	Gross Domestic Product
GNH	Gross National Happiness
GSM	Global System for Mobile Communications
ICT	Information and Communications Technology
IT	Information Technology
ITU	International Telecommunication Union
MCR	Master Control Room
MSO	Multi Service Operator
NYAB	National Youth Association of Bhutan
ODA	Official Development Assistance
OJT	On the Job Training
OPGW	Optical Ground Wire
SNG	Satellite News Gathering
TVRO	Television Receive Only
UHF	Ultra High Frequency
UNESCO	United Nations Educational Scientific and Cultural Organization
UPS	Uninterrupted Power Supply
UV	Ultraviolet
VU	Volume Unit

CHAPTER 1

BACKGROUND OF THE PROJECT

CHAPTER 1

BACKGROUND OF THE PROJECT

Bhutan has a steeply mountainous terrain with over 7,000-meter difference in altitude between the highest and lowest points of the country. Although 75% of the land is covered by forests, 80% of the country's working population is engaged in agriculture using farmland that accounts for only 7.7% of the total land area (External Advisory Meeting on ODA Evaluation, "Country Assistance Evaluation of Bhutan", 2007). The country's basic infrastructure that supports its economy and people's livelihood is underdeveloped, which, combined with the severe geographic conditions, constitutes a major hindrance to the development of the nation.

Bhutan's economy has seen a substantial growth during the last some ten years driven by electricity export (to India) through hydroelectric power development based on the country's abundant water resources, and owing to the development assistance from India, Japan, and other countries, as well as the Bhutanese government's commitment to national development. However, income disparities are growing among Bhutanese people with one out of three persons still live in poverty (Royal Government of Bhutan, Poverty Analysis Report, 2004). Disparities are widening, especially between the urban and rural areas, as the vast majority of the poor are living in the eastern region, where roads, electricity, communication, and other infrastructural facilities are underdeveloped.

Under these circumstances, the Government of Bhutan is placing emphasis on the development of rural areas, along with the improvement of the health and education (including vocational training) sectors and road network, with a special focus on the use of mass media for educational purposes by increasing people's access to information.

Incidentally, the Government of Japan, with respect to assistance to Bhutan, is placing priorities on the following areas:

Rural and agricultural development (development/diffusion of agricultural techniques, mechanization, expansion of agricultural roads, etc.)

Infrastructure development (roads, bridges, local electrification, communication, etc.)

Social development (creation of employment, improvement of educational, health, and medical services, etc.)

Good governance (decentralization, etc.)

The above correspond to the expected outcome to be accomplished by the Project. Therefore, implementation of the Project is of a great significance, as its objectives are in direct alignment with the national development policies and plans of the Bhutanese government, as well as with the assistance policies of the Japanese government.

CHAPTER 2

CONTENTS OF THE PROJECT

CHAPTER 2

CONTENTS OF THE PROJECT

2-1 Basic Concept of the Project

(1) Overall Goal and Project Objectives

Bhutan is a steeply mountainous Himalayan country about the size of Kyushu, Japan with a population of around 670,000, most of which is concentrated in urban areas with the rest living in scattered places in the mountains. More than 70% of the land is covered by forests. These geographical constraints are a major hindrance to the development of Bhutan's basic infrastructure.

When the Bhutanese government enacted the First Five Year Plan in 1961, its primary focus was placed on agriculture-based self-sufficiency. Since then, Bhutan has been expanding its economy through export of electricity to India by utilizing the country's abundant water resources for hydroelectric generation while preserving its unique cultural heritage and natural resources under the country's innovative development policy called Gross National Happiness (GNH). Construction and startup of new hydroelectric power plants, which are the largest contributor to the Bhutanese economy, have led to the development of the surrounding areas (construction of roads, electrification, facilitation of physical distribution, etc.) as well.

Recent years have seen a migration of population, especially among the youth, from rural to urban areas, leading to disparities between increasingly underpopulated rural villages and overpopulated, polluted urban centers due to problems of disposal of waste, etc. Bhutanese government has been promoting decentralization and, as part of this process, endeavoring to prevent the concentration of educational facilities in Thimphu and other cities to keep young people from migrating to urban areas. Such decentralization efforts include the handing over of the project preparation facilities of Tala Hydro Project Authority to the Royal University of Bhutan to establish a college of business studies to be launched in 2008, as well as the opening of a vocational school in Chumey in the central region. Full-scale development of rural communities has yet to take place in Bhutan, and the government is still emphasizing the importance of rural development in its Ninth Five Year Plan.

Bhutan has already decided to bring in representative democracy in 2008 and is in the process of establishing various political procedures for electing representatives for the Upper and Lower House. Presently, in the absence of developed roads and communications network, timely interactive transmission of news reports between remote regions and the capital city is extremely difficult. Provision of equal access to information for the entire nation is urgently needed in Bhutan as it transforms to a democratic society. In this regard, information transmitted by Bhutan Broadcasting Service Corporation (hereinafter referred to as "BBSC") is of vital importance for the nation, and BBSC is expected to broadcast significant/pertinent information.

Under these circumstances, the overall goal of this Grant Aid Project is “to provide accurate information for the nation at large and mitigate regional information disparities by actualizing nationwide broadcasting of high-quality programs.” Accordingly, the purpose of the Project is “to enhance BBSC’s program production capabilities by improving the capacities for producing programs focused on local news of the Regional Bureaus and establishing a system to send information from different regions in a timely manner.”

(2) Outline of the Project

Table 2-1-1: Contents of Cooperation

Item		Quantity
1.	4WD SNG OB Van	1 lot
2.	Master Control System	1 lot
2.1	Master Control System	1 lot
2.2	Power Supply System	1 lot
3.	Transmission system	1 lot
3.1	TX Equipment	5 sets
3.2	RX Equipment	1 set
4.	News and Production Equipment for Bureaus	1 lot
4.1	For Jakar, Phuentsholing, Kanglung Regional Centers	3 sets
4.2	For Wangduephodrang and Paro Bureaus	2 sets
5.	Equipment for Continuity Studio	1 lot
6.	Maintenance Equipment and Tools	1 lot

2-2 Basic Design of the Requested Japanese Assistance

2-2-1 Design Policy

(1) Basic Policy

BBSC’s Regional Centers and Bureaus, which are located in scattered towns in the mountainous regions, are presently sending news materials to the Headquarters by bus. From Jakar Regional Center, for instance, it takes a 7.5-hour drive along a 260-km mountain path to get to Thimphu. In case of emergency, short video clips of low resolution are sent via the Internet, or reports are made via telephone to the Headquarters. Thus, BBSC is not capable of speedily reporting urgent news to the nation.

This Project intends to establish an expanded broadcasting system for broadcasting local news and events to the nation in a timely manner by building transmission system for links for sending programs from the Regional Bureaus and by enhancing the equipment of the Headquarters.

1) Policy on Program Transmission Equipment

Terrestrial Transmission

The Telecommunications Network Project of Bhutan Telecom (BT), which was initially constructed with ODA from the government of Japan in 1991 – 1998, provides Bhutan a backbone for communication running east and west across the country. The subsequent diffusion of the Internet, an increasing number of subscribers, and other changes have created a need for optic cables and other systems for transmitting larger-volume data at higher speed, and Bhutan is in the process of expanding the telecommunication project. Accordingly, BT is extending its optical network based on the optical ground wire (OPGW) technology that will be laid alongside the power transmission lines currently under construction. Both terrestrial and satellite transmission lines are available for transmitting video images.

Terrestrial transmission has the following advantages:

- More reliable than the satellite transmission line.
- Easy to operate.
- Less expensive than SNG.

On the other hand, it has the following disadvantages:

- It would be difficult to install transmission equipment on a permanent basis within BBSC's Regional Centers and Bureaus, because they are not owned by BT. Instead, the transmission terminals need to be set up inside the facilities of BT.
- Since transmission terminals are set up in BT facilities, the places that can transmit data are limited.
- Audio/video tapes need to be physically brought in from BBSC to BT, requiring extra time for transportation.

In view of the above, we have decided to use via terrestrial links for transmitting daily news programs, as they are relatively inexpensive to operate and stable in transmission even during the rainy seasons. The terrestrial system will be actualized basically by using three E1 lines (2 Mbps/line). We confirmed that the network connecting BT's Headquarters and Bureaus can also be utilized for the Project. The following Regional Centers and Bureaus are available for installing the transmission equipment:

Jakar, Kanglung, Phuentsholing, Wangduephodrang and Paro

Each of the Regional Centers and Bureaus of BBSC and their corresponding BT Bureau are located in the same town within a 10-minute drive from each other, it would not be a problem to send materials for daily programs. Survey of each BT Bureau confirmed that they maintain a good environment for installing new equipment. In the Headquarters in Thimphu, five sets of receiver equipment will be installed to ensure efficient reception of materials sent from the Regional Bureaus and Centers.

Thus, the Project will build a terrestrial network in the configuration (draft) illustrated below:

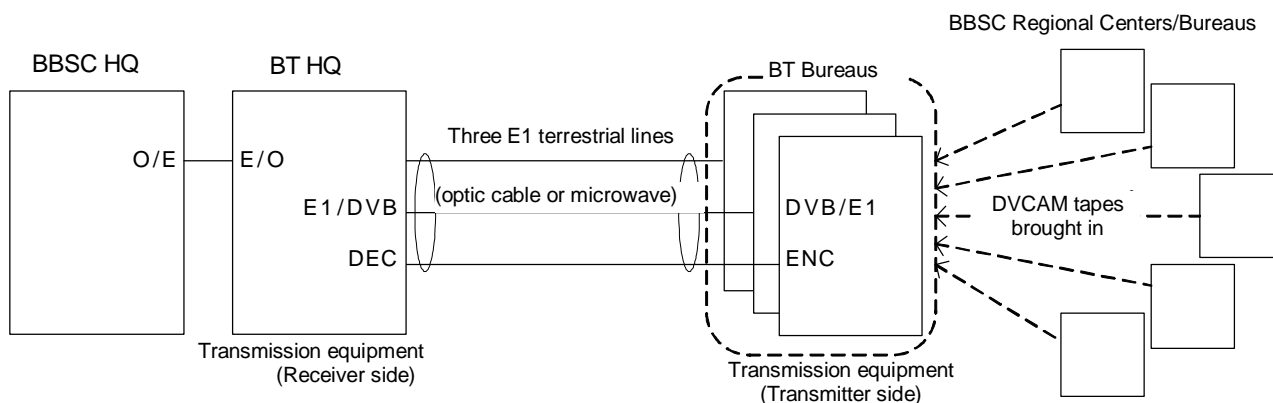


Figure 2-2-1: Network Configuration (draft)

Satellite Transmission

Terrestrial transmission of live programs from remote areas that are further into the mountains than the Regional Centers and Bureaus will be very difficult. Emergency broadcasting, etc. from such areas will become possible by mobilizing a 4WD SNG OB van and sending information via satellite. Taking into account the road conditions of Bhutan, the Project will procure a 4WD SNG OB van installed with satellite transmission equipment. The van will be installed with an auto-tracking device, news-gathering camera, etc. to enable operation and broadcasting with limited personnel and within a limited timeframe. Also, communications between the headquarters and the location of shooting are very important during a live broadcast. Although setting up a receiver equipment in the Thimphu HQ is the responsibility of the Bhutanese side under the Project, their existing device is for reception only and does not have a communication line (intercom) that allows 2-way interactions between the HQ and the location of shooting. Therefore, a satellite telephone system will be included in the Project's equipment list to enable communications during a live broadcast. The recipient side is responsible for procuring small satellite play-out devices to receive program contents. For satellite links, C-band and Ku-band, which BBSC is currently using for distributing programs to cable TV stations, are available.

Bureau(s) not covered by the Project can send materials to the HQ by taking videotapes to another Bureau covered by the Project, or using the BGAN donated by a grass-root project. This will lead to significant time saving compared to using bus to transport videotapes to Thimphu.

2) Policy on the Equipment for Regional Bureaus

The main focus of the Project is to augment local news by encouraging the Regional Centers and Bureaus to produce news programs as much as possible to reduce the workload on the Headquarters. The Regional Centers and Bureaus will become able to produce their own programs more

independently, leading to the improvement of their techniques and the production of increasingly more elaborate programs, if provided with a decent set of equipment.

Therefore, the Project will provide BBSC's Regional Centers and Bureaus with equipment for producing and transmitting news materials and programs, and the Headquarters with editing equipment and other items that will enhance the function of the Headquarters while reducing its workload to produce programs.

Editing System

Generally, video editing employs either a non-linear or linear editing process. BBSC uses a linear system for editing news programs by attaching a microphone or sound-input terminal for inserting narration and voiceover in order to speedily produce news programs for reporting disasters and other urgent information. The non-linear editing system, which can manage shot video images from a server or another single location, is widely used for producing general programs because of its high maneuverability and speed in video editing with composite images and other special effects. As the price of personal computers and other devices dropped in recent years, the price of non-linear editing systems is also following a downward trend. Since the focus of the Project is to enable BBSC to effectively edit news materials gathered by the Regional Centers and Bureaus, the non-linear system is more suitable for the Project because of its high functionality and expandability.

News Gathering Equipment

- Bureaus with 2 or less personnel: Camera (including rain jacket and other accessories), wireless microphone, etc.
- Centers with 3 or more personnel: Camera (including rain jacket and other accessories), wireless microphone, fish pole, microphone, handy light, etc.

Video Format

Each broadcasting equipment manufacturer uses its own video format. For the Project, which plans to procure the Master Control system and other equipment, it is essential that all new devices conform to the same video format as that of the existing system to ensure hardware compatibility and work efficiency. Since BBSC has adopted DVCAM, a video format designed for professional applications, as its standard, the Headquarters and the Regional Bureaus will use the same format for recording news materials. Third-country products will be considered to allow for a sufficient degree of competition.

3) Policy on the Equipment for BBSC HQ

Master Control System

Broadcasting companies in Japan and other advanced countries have successfully adopted a server system to automate and stabilize their transmission operations to save cost and labor. Bhutan has also procured a similar server system through the assistance of India. Many TV stations have

switched from analogue to digital systems for transmitting audio/video signals, as the latter is easier to edit and more advantageous for storage because of little susceptibility to magnetic deterioration.

Our design policy on the equipment for the Master Control System to be covered by the Project is focused on the digitization of the system to ensure smooth maintenance and management well into the future.

Specific guidelines are as follows:

- AV master switcher will be of digital type.
- AV signals used in the existing BBSC studios will be composed in a way to allow analogue/digital conversion in the Master Control System.
- The master switcher system will be configured in a way to allow input from relay stations, as well as input/output of digital signals from the studios of the new complex.
- Output signals will conform to the ITU standard to retain video quality, allow international video distribution and program exchanges, and prepare for future systems expansions.
- Redundancy with the server system of the new complex should be avoided. By eliminating elements incompatible with the interface, stable broadcasting will be actualized.

Equipment for Continuity Studio

BBSC is currently working on program scheduling with an aim to reduce reruns of news programs as much as possible and broadcast more timely news reports instead. BBSC is also considering expanding such programs as traffic and weather reports, emergency disaster information, and government publicity, for which a continuity studio that functions efficiently as an annex to the Master Control System will be needed. A continuity studio undertakes certain tasks for transmitting news programs, such as capturing incoming feeds and inserting subtitles. It can also be used as a studio for producing short programs of public announcements, advertisement, etc, and as a backup studio of the news studio to be constructed in the new complex.

If a continuity studio is to be set up, the most suitable place will be inside the existing master control system. The space is currently occupied by radio master equipment (SW/FM program production/transmission studio equipment), which needs to be relocated by the recipient country as part of its undertakings under the Project.

4) Policy on Other Equipment

Maintenance Equipment and Tools

The requested maintenance tools, including specialized measuring instruments, are essential items for any broadcasting station. In order to ensure effective utilization of the equipment to be procured through this Grant Aid Project on a continuous basis, a minimum set of maintenance equipment and tools need to be in place also. However, since BBSC already has some of the measuring instruments requested, the Project will procure a video analyzer and a few other items for maintaining the

minimum quality of the digitized systems.

5) Policy on the Procurement Conditions Including Third Countries

The equipment to be procured by the Project, such as the 4WD SNG OB van, Master Control System, transmission system, news and production equipment for Bureaus, and measuring devices, are not manufactured in Bhutan. While these items can be procured from Japan or third countries, few American/European manufacturers are able to provide follow-up technical support needed in case of accident, equipment failure, replacement of spare parts, etc.

However, because cost reduction and a certain degree of competition are required by the Grant Aid Scheme, American/European manufacturers will be considered as potential suppliers as well. To ensure stable operation and maintenance by BBSC, which is a state-owned broadcasting institution shouldering significant social responsibility, the equipment should come as a whole package designed by a single Japanese manufacture, but individual items will be procured from most advantageous suppliers including those of third countries. Compatibility of the devices will be tested to assure the performance of the entire system.

BBSC's news gathering cameras and VTRs procured in the Project are widely distributed in Bhutan and available through several local dealers and thus do not necessarily have to be sourced from Japan. In order to secure an adequate level of competition in the bid process, we will estimate the equipment cost based on the assumption that the products will be procured from Japan or third countries.

6) Policy on Equipment Grade

Broadcast equipment are roughly divided into consumer grade, professional grade, and broadcast grade. Broadcast-grade models are expensive because they are designed for continuous operations with reduced risk of failure, high circuit reliability, and optimum redundancy. Taking into account BBSC's current operations, the Project will select such core equipment as the 4WD SNG OB van, Master Control System, and transmission system from broadcast-grade models, and, such recording equipment as the editing system and measuring instruments from professional models.

7) Policy on Procurement Method and Construction Period

Equipment from Japan or third countries will be shipped to Bhutan mostly via ocean. Since Bhutan is a landlocked country, the equipment will be discharged at Kolkata Port of India, and from there transported mainly by container truck to the customs office at the Indo-Bhutan border in Phuentsoling and then to the Headquarters or Regional Centers/Bureaus of BBSC. It will take approximately 45 days to transport the equipment from Japan (or third countries) to the target sites of the Project.

To cross district-borders within Bhutan, it is required to show a transit permit at each checkpoint. Because of this requirement, our study team asked BBSC, and it agreed, to afford necessary facilities for the issuance of the permit according to the request of the equipment supplier and/or shipping

company.

8) Policy on the Operation and Maintenance System

BBSC's suddenly increased personnel are generally inexperienced and not functioning adequately despite its size. In order to utilize the employees more effectively and improve the quality of broadcasting, a new personnel deployment plan (project execution system) needs to be formulated.

The operation/maintenance system will be established based on the following guidelines:

- i. Take into account BBSC's multiple-duty system.
- ii. Respect BBSC's daily production procedure.
- iii. Work out a plan based on the program schedule currently being developed.
- iv. Duties that require a work shift arrangement need to be examined in light of the broadcast and equipment operation hours to see if they would affect the present work shifts. If necessary, increase the number of shifts, and incorporate the new arrangement in the operation/maintenance system.
- v. Work out a system to fully utilize all equipment.
- vi. Take things into consideration so as not to create an increase in working hours.
- vii. Recruit personnel in such a way that they will receive systematic training necessary for maintaining and improving their skills and techniques.
- viii. Recruit personnel that meet the minimum technical qualification.

Based on the above, we will propose necessary numbers of employees to recruit and training seminars in specific figures under Section 2-4-2.

9) Policy on the Financial Plan

BBSC's financial plan needs to be examined from a public accounting perspective. BBSC's ordinary revenues come from the three major sources of: 1) operational income, 2) government subsidy, and 3) foreign aid. As indicated by the 2006 record, more than 80% of the steady operational income came from the government and Multi Service Operation (MSO) (about 70% of the advertisement fees was from the government).

In order to formulate a specific financing plan based on accurate projections of ordinary revenues, the following matters need to be taken into account:

- i. BBSC's target to increase advertisement revenues at an annual rate of 20% will be taken into account from increase rate of revenues for fiscal 2006, etc. It is uncertain whether the target will be achieved, however, the revenue record for fiscal 2007 will be maintained from 2008 to 2019.

- ii. As for income from MSO, only 50% of the total sales will be accounted for (sales revenues will be equally divided between BBSC and Cable TV).
- iii. MSO revenues will be added from 2011 on.
- iv. Additional personnel cost estimated by examining the operation/maintenance system will be taken into account.
- v. Training cost estimated by examining the operation/maintenance system will be allocated.
- vi. An increase in the number of programs based on the new production schedule will be taken into account.
- vii. Increase/decrease in the program commissioning cost due to the new operation/maintenance system will be taken into account.
- viii. Communications fees (satellite transmission fees, etc.) necessary for sustaining broadcast will be allocated.
- ix. Cost for operating/maintaining the equipment to be procured by the Project will be taken into account.
- x. Cost for operating/maintaining the new complex, facilities, and equipment will be taken into account.
- xi. Amortization cost of facilities and equipment procured through Grant Aid by various donors will be taken into account.
- xii. Provision for the upgrading of the facilities and equipment after a certain time period will be made to ensure independent operation/maintenance by the recipient side.

Based on the above guidelines, we will recommend specific items under Section 2-4-2, for which funds need to be allocated.

(2) Outline of the Project

This Project intends to establish a broadcasting system for promptly transmitting local news and events to the nation by building a network for transmitting program materials from BBSC's Regional Bureaus and upgrading the broadcasting equipment of the Headquarters. The schematic diagram of the Project is shown in Figure 2-2-2 below.

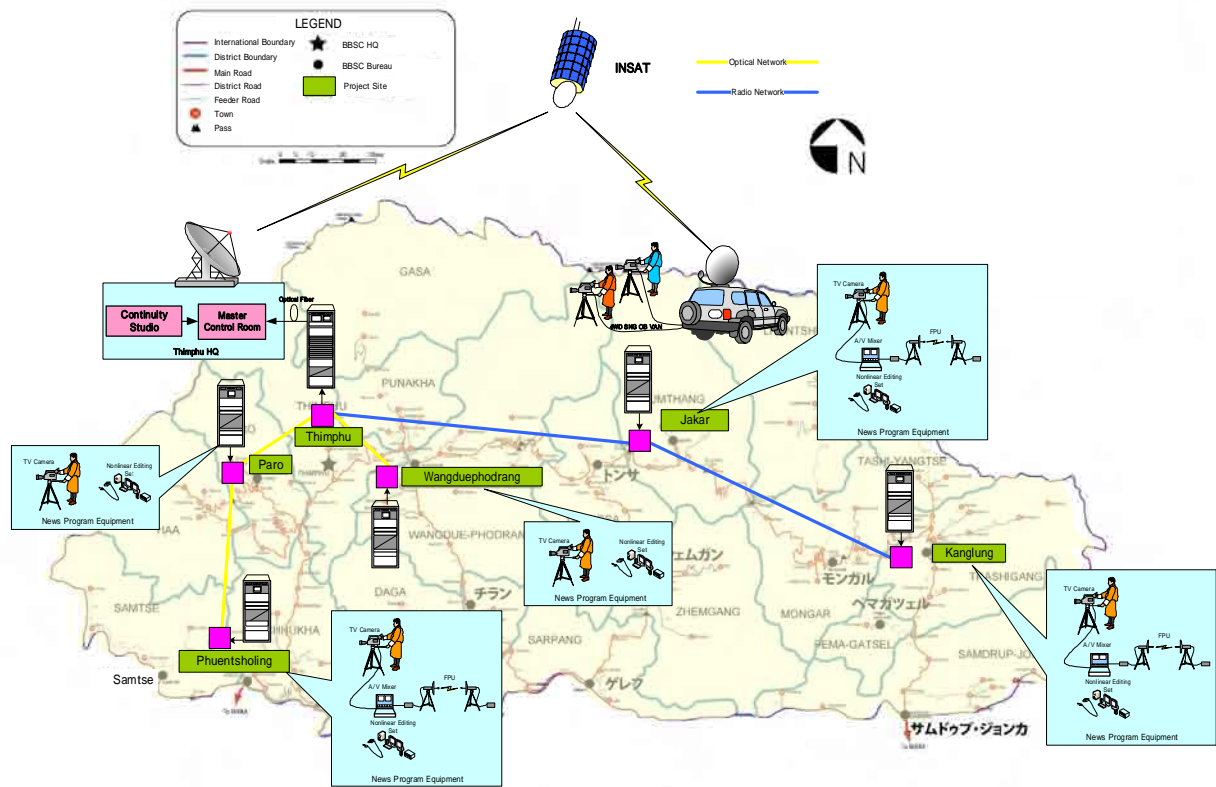


Figure 2-2-2: Schematic Diagram of the Project

(3) Layout of Broadcasting Equipment

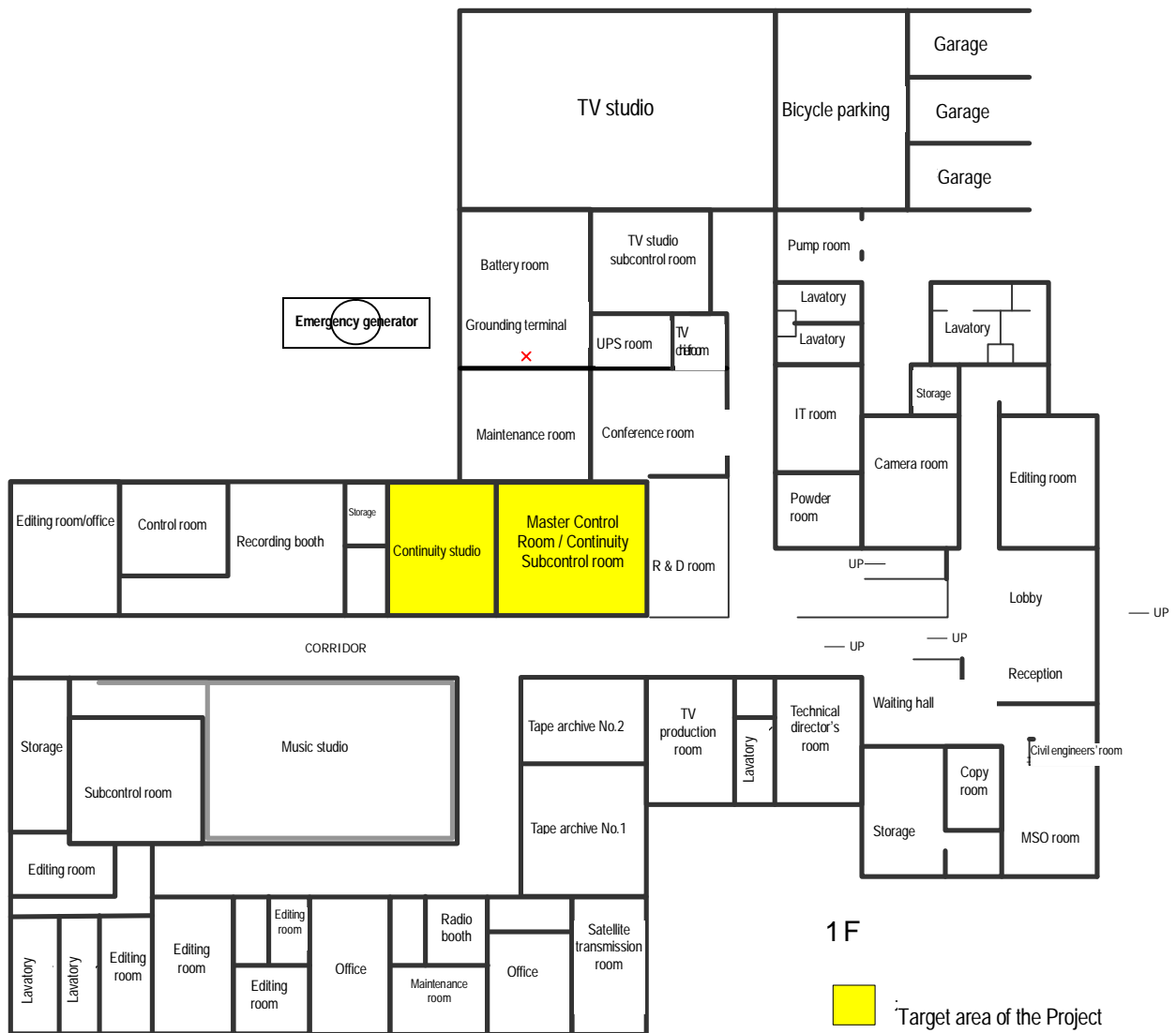


Figure 2-2-3: Layout of Broadcasting Equipment

(4) Electric / HVAC Facilities

1) Electric Facilities

The Study Team measured the voltages of the electrical systems of BBSC's Headquarters and five Regional Bureaus under the following conditions:

BBSC Headquarters (Thimphu)

Place of measurement: The following 2 electrical systems within the Master Control Room (MCR)

General outlet circuit

UPS system for broadcasting equipment

Time period: September 13, 2007 (14:41) – September 14, 2007 (14:39)

Result: General outlet circuit See Figure 2-2-4.
UPS system for broadcasting equipment See Figure 2-2-5.

Consideration: BBSC Headquarters is equipped with four units of UPS (Uninterrupted Power Supply with automatic voltage regulator). Its electrical systems consist of circuits for satellite transmission equipment (10kVA x 2) and broadcasting equipment (20kVA x 2), as well as for general outlets that are not connected to the UPS. The Study Team measured the voltages of the circuits for general outlets and the UPS system connected to the broadcasting equipment. According to the measurements recorded, the voltage of the general-outlet circuit stayed around 200V, which is lower by more than 10% than the rated voltage of 240V (single phase) of Bhutan. However, this level of voltage is tolerable by general electric appliances designed for 220 – 240V. The voltage of the UPS circuit was measured around 230V, showing that the low input voltage is properly adjusted for the operation of the broadcasting equipment. The above indicates that the existing UPS system is operating properly and has a sufficient capacity to supply power to the new equipment to be installed in the BBSC Headquarters by the Project. Therefore, it will not be necessary to provide an additional voltage regulator for the new broadcasting equipment

BBSC Bureaus

Place/time of measurement: The following three Regional Bureau / Centers:

Jakar Center: September 1, 2007 (10:42) – (12:22)

Kanglung Center: September 3, 2007 (10:00) – (12:45)

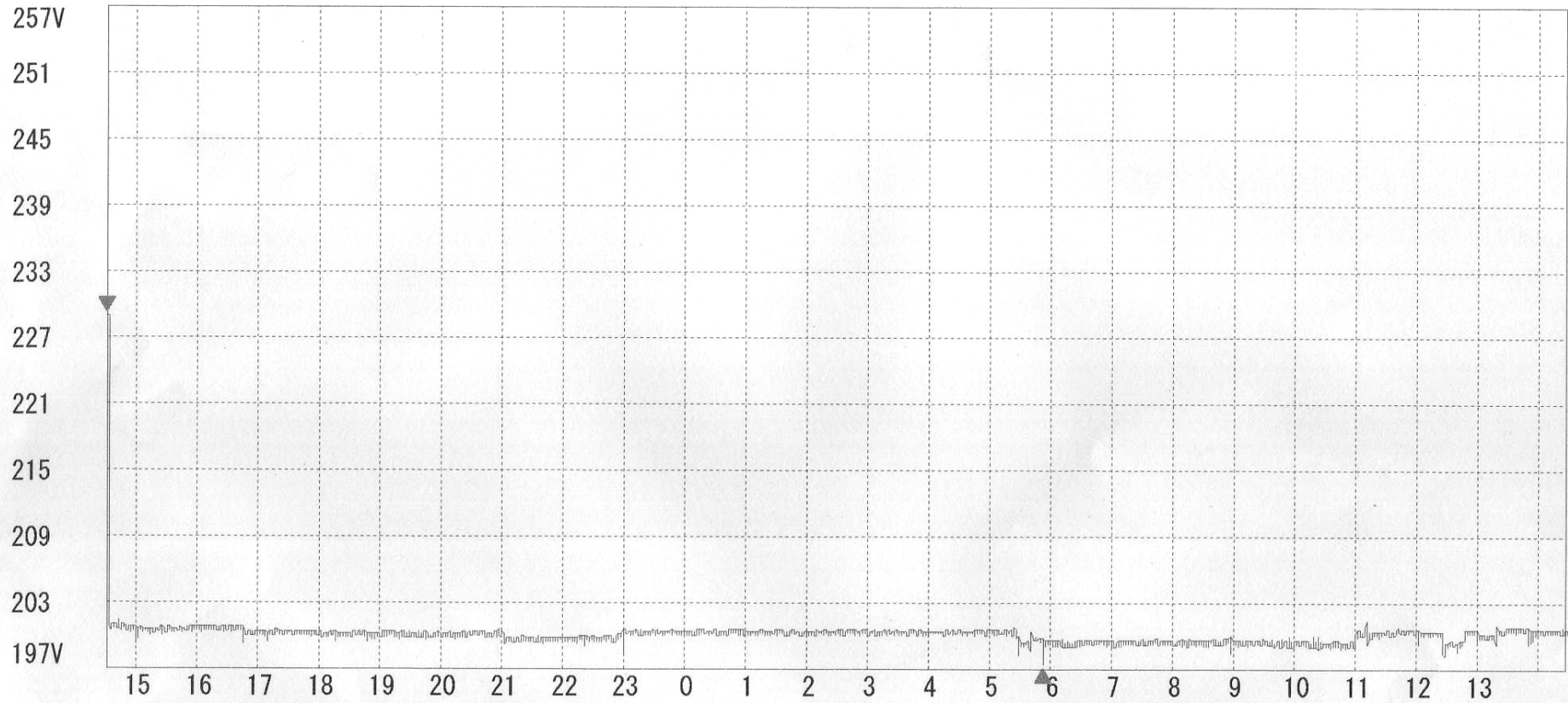
Wangduephodrang Bureau: August 31, 2007 (09:39) – (11:29)

Result: Jakar Center: See Figure 2-2-6
Kanglung Center: See Figure 2-2-7
Wangduephodrang Bureau: See Figure 2-2-8

Consideration: Measurements taken at the above three Bureaus suggest that their voltages drop occasionally, not necessarily to a degree to cause a power outage, but below the allowable minimum voltage level. According to the Bureau staff, they often experience a few outages in a day, each lasting 2 – 3 minutes. Based on these findings, the Study Team decided to include UPS (with automatic voltage regulator) of a small capacity suitable for the power consumption of the new equipment to be installed in five Regional Bureaus of BBSC.

Display period: 14:30 September 13, 2007 – 14:28 September 14, 2007

2-13



Highest: 229.1V (at 14:32 September 13, 2007)

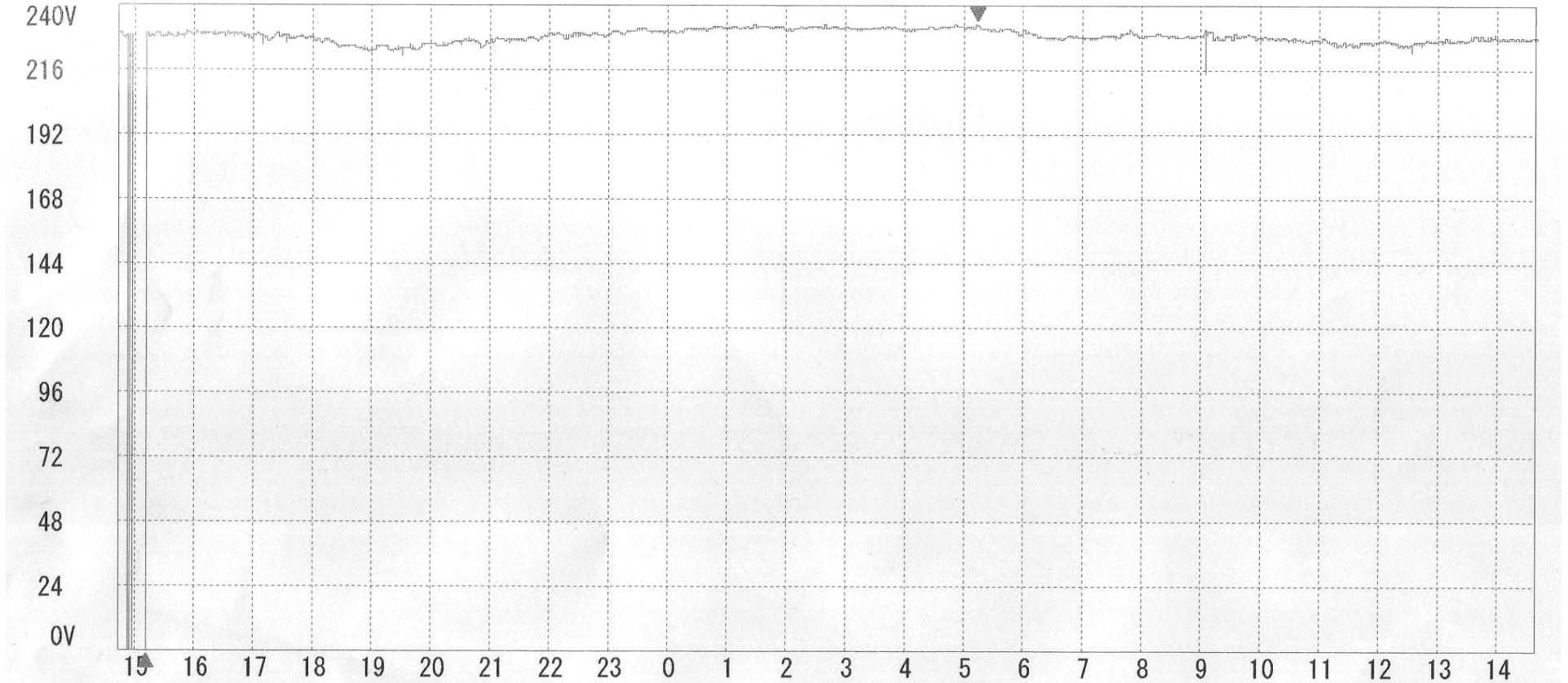
Lowest: 197.5V (at 05:53 September 14, 2007)

Place: MCR of BBSC Headquarters

Figure 2-2-4: Voltage Measurement at BBSC Headquarters (general outlet circuit)

Display period: 14:41 September 13, 2007 – 14:39 September 14, 2007

2-14



Highest: 232.9V (at 05:14 September 14, 2007)

Lowest: 215.9V (at 09:05 September 14, 2007)

Place: MCR of BBSC Headquarters

Figure 2-2-5: Voltage Measurement at BBSC Headquarters (UPS system)