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ECONOMIC COMMISSION FOR AFRICA
Regional Symposium on the Training
of Personnel (at all levels)
for Power Production and Distribution
Addis Ababa, 10-20 December 1973

Training of Overseas Engineers in Japan

(Document prepared by the Delegation of Japan)

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TRAINING OF OVERSEAS ENGINEERS IN JAPAN

1. Training of Overseas Engineers in Japan

Since her participation in the Colombo Plan in 1954, Japan has been offering technical assistances mainly to Southeast Asian countries and, since 1958 when the budget appropriation was made by the Japanese Government for the expenses required for offering technical assistances to the countries in the Middle and Near East and also in Latin-America, she has been carrying out her technical assistance programs for nearly all the developing countries in the world.

Though the scope of technical assistance was originally limited to the reception of technical trainees in Japan, it was expanded afterward to include dispatch of technical experts and industrial development project feasibility survey teams, offering of machineries and equipments, setting up and maintenance of oversea technical training centers, offering medical assistances, industrial cooperation programs, etc.

In this report, description is made on the outline of the oversea technical trainee reception programs among the various technical cooperation programs now being carried out by the electric power companies in Japan.

There are two kinds of oversea technical trainee reception programs in Japan, namely those carried out by the Government, expenses necessary for training being borne mainly by it, and those conducted by the non-governmental organizations, expenses being depended mainly on the Government subsidies.

Reception of trainees by the electric power companies are done mainly on the former system.

In the Government operated trainee reception system, expenses necessary for training of oversea technical workers including return air fare, staying expense, domestic traveling expense, medical-care expense, outfit allowance, sundry expense, etc. are borne by the Japanese Government. The numbers of foreign trainees received were 1551 persons in 1971, 1761 persons in 1972 and will be 2100 persons in 1973.

The geographical breakdown of these trainees received in 1972 were 1187 persons from Asian areas, 287 from Middle and Near East and Africa, 277 from the Latin American countries and 10 from various areas other than the above.

It was in 1957 that the electric power companies began to receive oversea technical trainees, the number of trainees received in each year since then was, as shown in the table 1, 1 person in 1957, 2 in 1958, and, the number of them having been increased gradually, it reached 15 in 1959, 20 in 1960, and in more recent years nearly 40 persons have been received each year.

Table 1 Number of overseas electric technical trainees
received by year

Year No.	'57	'58	'59	'60	'61	'62	'63	'64	'65	'66	'67	'68	'69	'70	'71	'72	'73	Total
Total	1	2	15	20	39	11	24	19	19	39	35	39	43	34	39	36	29	443
Africa	0	0	0	0	1	0	2	0	0	2	0	4	3	2	1	0	0	15

As the number of trainees to be received is increasing gradually and in order to receive trainees from as many countries as possible and also to do it as effectively and systematically as possible, the system of group-training has been adopted.

The group-training system is implemented according to the training

programs prepared jointly by the Ministry of International Trade and Industry and the Electric Power Company concerned and, in 1973, following 4 training courses were prepared and carried out:

- (1) Hydro-Electric Power Engineering Course
- (2) Thermal-Electric Power Engineering Course
- (3) Electric Power Distribution Engineering Course
(Hereinafter these courses be called Hydro-course, Thermal-course and Distribution course respectively.)
- (4) Seminar on Management of Electric Power Industry

The number of trainees in each course and seminar was 10 persons. In and after 1974, these training courses will be carried out continuously.

The period of training in the course (1) ~ (3) is 3 months and in (4) one month.

Detailed description of group-training for the thermal course and distribution course is given below.

The training is divided into 3 phases. In the phase 1, lectures by the officials of the Ministry of International Trade and Industry are mainly given. The subjects of these lectures are:

- (1) History of Japan's electric power industry and its present situation.
- (2) Laws and Regulations pertaining to electric utility administration in Japan.
- (3) How to establish the electric power demand and supply plan in Japan.
- (4) How to establish the electric power development plan in Japan.
- (5) Hydro power stations in Japan.
- (6) Thermal power stations in Japan.

- (7) Nuclear power stations in Japan.
- (8) Transmission and distribution lines in Japan.
- (9) Electricity rates making.

In the intervals of these lectures, visits for study to the hydro stations and thermal stations and, at the end of the phase 1, to the manufacturing plants of generators, turbines, etc. are conducted.

In the phase 2, training is conducted in hydro, thermal and distribution courses by 3 different electric power companies, each of them taking charge of different course.

The training is composed of lectures and inspection tours.

The subjects of lectures are, in case of the thermal course, as follows:

- 1 Outline of Thermal Power Station
(Organization and Management plan)
- 2 Thermal Power Development Plan
- 3 Trial Calculation of Economical Development
- 4 Specification for Boiler and Turbine
- 5 Specification for Electric Equipment and Computer
for Thermal Power
- 6 Construction Problems (Schedule, Plant Layout, Tests,
Safety Measures, etc.)
- 7 Problems in Operation of Thermal Power Station
- 8 Power System Constitution and Transmission Lines
and Substation for Thermal Power Station
- 9 Outline of Nuclear Power Station
- 10 Fuel Management
- 11 Environmental Pollution Prevention
- 12 Technical Development and Present Situation

In the intervals of lectures and at the end of each course, study tours to inspect various thermal stations in operation or under construction, dispatching center (operation and maintenance of power system), technical research and development laboratories, etc. are conducted. Also, visit and practice at thermal power stations are made.

The subjects of lectures in the distribution course are as follows.

- 1 Outline of System planning
- 2 Outline of System Operation and Protection
- 3 Design, Construction and Maintenance of Transmission Lines
- 4 Operation and Maintenance of Substations
- 5 Distribution Facilities and Work
- 6 Indoor Wiring
- 7 Outdoor Wiring
- 8 Underground Distribution
- 9 Mechanization of Distribution Work
- 10 High Voltage Distribution (22 KV Overhead Distribution)
- 11 Environmental and Aesthetic Consideration

In the intervals of lectures, following on-the-spot study trips are made:

- 1 Operation and Maintenance of Substation
- 2 Maintenance of Underground Transmission Cables
- 3 Repair Work at Electrical Plants
- 4 Construction of Substations
- 5 Construction of Transmission Lines.

- 6 Central Load Dispatching Center and Central Communication Center
- 7 Central Testing Center

In addition to the above, following field studies are conducted.

on-the-job Training for Indoor and Outdoor Wiring,
on-the-job Training for Underground Distribution,
on-the-job Training for High Voltage Distribution
and Environmental Consideration

Since 1970, the group-training for geothermal power generation has been conducted under the joint project of the Japanese Government and UNESCO. The number of trainees received by Japan is shown in Table 2 below:

Table 2 Geothermal group-training

Year	1970	1971	1972	1973
Number of trainees	18	17	13	14
(African area)	1	1	3	6

Beside the group-training, reception of trainees in individual training programs is made.

The individual training is conducted according to the training program prepared for each trainee, taking into account the request made by the dispatching country, and, if necessary, modifying the program from time to time. In 1973, 20 trainees of this category will be received.

The main subjects of training conducted in 1971 ~ 1972 are such as protection of lightning from electric power equipments, power system planning, acceptance test and commissioning test of power stations,

designing of dams, maintenance of underground cables, etc. In addition thereto, study and training concerning analysis of survey materials, conclusion, recommendation, etc. made by the development project feasibility survey teams sent by the Japanese Government at the request of the foreign government were performed utilizing the survey reports as the texts.

Regarding the training of manufacture of electric machines, trainees are received, in addition to those received by the Government, by the electric machine manufacturing companies which have been granted subsidies by the Japanese Government. The number of these trainees is about 100 persons a year. As a matter of course, almost all of them are sent by the electric power companies or organizations who have imported or are going to import electric machines from Japan. The period of training of them is from 6 months to 1 year, including the period of study of Japanese language.

Training facilities:

As mentioned above, the reception of technical trainees in the field of electric power industry is made on the Government basis, and they are received by the Overseas Technical Cooperation Agency (OTCA) and accommodated in the Tokyo International Center (TIC) owned by the OTCA and other quarters.

The lectures and study trips are conducted utilizing facilities owned by the electric power companies.

2. Hydro Course Training

As aforesaid, electric power industry group-trainings on the technical cooperation programs of the Japanese Government are divided

into the hydro, thermal, distribution and electric power engineering management courses. The non-government reception body for technical trainees in the hydro course is the Electric Power Development Company (DENGEN KAIHATS), for thermal course the Tokyo Electric Power Company (TODEN), for distribution course the Kansai Electric Power Company (KANDEN) and for electric power engineering management course the Chubu Electric Power Company (CHUDEN).

Among these courses, the training program of hydro course is as follows:

The trainees in hydro course is divided into 2 groups namely the A group - to be received in accordance with the technical cooperation programs for the countries of Southeast Asia, Middle and Near-East and Africa - and the B group - to be received in accordance with the technical cooperation programs for the countries of Latin America. Trainees of each group are received to Japan in alternate years, for example, if A group is received in 1974, the B group be in 1975.

The training program for hydro course is as follows:

The period of training is about 3 months, the time being fixed usually from August to October so as to avoid the cold season in Japan. A group of trainees is composed of about 10 members. In the first week, general orientation is given at the OTCA (a Government subsidy organization which is in charge of reception of trainees on the Government technical cooperation programs). In this phase, necessary basic informations such as the outline of Japan, treatment of trainees, matters to be observed by trainees, etc. In the following 2 weeks (Part I), lectures are given by the officials of the sections concerned of the Ministry of International Trade and Industry on the electric power situation in

Japan, present and future situations of Japan's electric power industry, electric power rates, demand and supply of electric power, electric power development plan, national policy for electric power, etc.

After giving the basic knowledges concerning electric power situation in Japan as above, training is conducted in the Electric Power Development Company for 7 weeks (PART II). The Electric Power Development Company, which is a semi-governmental body established in 1952 in accordance with the Electric Power Resources Development Promotion Law, has an ample experience in the planning, development, maintenance and operation of hydro, thermal power stations, distribution of power, power systems, etc. Especially, it maintains the highest technological level in Japan concerning the hydro electric power. For 7 weeks, lectures are given taking various projects as the tests and on-the-spot studies are conducted on the hydro electric power, in which survey, planning, various studies, designing, construction work supervision, maintenance and operation of facilities are included.

In the last 2 weeks (PART III), training program is completed by study trips to the various plants, laboratories, etc. pertaining to the electric power industry, and trainees are ready to return to their homelands with the new technical knowledges and skills they acquired through the training courses.

About the details of training programs, reference be made to Appendix A (PROGRAMME FOR GROUP TRAINING - Hydroelectric Course).

Followings are the problems to be considered in the future regarding the group-training in the hydro course:

- (i) The hydro course contains everything concerning the hydro electric power generation technologies, and, therefore, it is afraid that

some trainees who wish to have deeper and more detailed knowledges in the different fields of civil engineering technology, electric technology, etc. pertaining to the hydro electric power generation technology might be dissatisfied with the course.

- (ii) When the technical levels of trainees from various countries differ too much, the receiving part feels difficulty in deciding the level of training - that is should it be fixed at higher, average or lower level of trainees.

APPENDIX A

1973 - PROGRAMME FOR GROUP TRAINING (Hydroelectric Course)

July 29 (Sun.) Arrive in Japan

30 (Mon.)-
Aug. 4 (Sat.) Orientation (OTCA)

Part I

6 (Mon.)	Programme Meeting (MITI) Lecture: History of Japan's Electric Power Industry and its Present Situation
7 (Tue.)	Lecture: Laws and Regulations Pertaining to Electric Utility Administration in Japan (MITI)
8 (Wed.)	Lecture: Establishment of Electric Power Demand and Supply Plan in Japan (MITI)
9 (Thu.)	Lecture: Establishment of Electric Power Development Plan in Japan (MITI)
10 (Fri.)	Lecture: Hydro Power Stations in Japan (MITI)
13 (Mon.)- 14 (Tue.)	Visit: Okutadami Hydro Power Station (360MW) of Electric Power Development Co., Ltd. (EPDC)
15 (Wed.)	Lecture: Thermal Power Station in Japan (MITI)
16 (Thu.)	Visit: Yokosuka Thermal Power Station (2,630MW) of Tokyo Electric Power Co. (TEPCO)
17 (Fri.)	Lecture: Nuclear Power Stations in Japan (MITI)
20 (Mon.)	Lecture: Transmission and Transformation System and Distribution Lines in Japan (MITI)
21 (Tue.)	Lecture: Electricity Rates Making (MITI)
22 (Wed.)	Visit: Tsurumi Factory of Tokyo Shibaura Electric Co., Inc. (Toshiba)
23 (Thu.)- 24 (Fri.)	Visit: Hitachi Factory of Hitachi Works, Ltd.

Part II

Aug. 27 (Mon.)	Lecture: Orientation and Outline of Electric Power Development Co., Ltd. (EPDC)
	Film Show: Mihoro Dam, Chushi Trunk Tie Line, Sakuma Frequency Converting Station, etc. (EPDC)
28 (Tue.)	Visit: Central Load Dispatching Station and Central Communication Station (EPDC)
29 (Wed.)	Visit: A. C. Network Analyzer and Computing Center (EPDC)
30 (Thu.)	Lecture: Present Situation and Future Prospects of EPDC and Technical Cooperation by EPDC (EPDC)
31 (Fri.)	Visit: Training Institute of EPDC and Civil Engineering Laboratory (EPDC)
Sept. 3 (Mon.)	Lecture: Economic Feasibility of Hydro Power Development Plan (EPDC)
4 (Tue.)	Lecture: Forecast of Electric Power Demand (EPDC)
5 (Wed.)	Lecture: Electric Power System Engineering (EPDC)
6 (Thu.)	Lecture: Design of Okukiyotsu Power Station (under Construction) (EPDC) Leave Tokyo for Koide
7 (Fri.)	Visit: Construction Sites of Okukiyotsu Power Station (EPDC)
10 (Mon.)	Lecture: Power Rate and Preparation of Fund for Power Development (EPDC)
11 (Tue.)	Lecture: Survey of Hydro Electric Project Sites (EPDC)
12 (Wed.)	Lecture: Planning of Hydro Electric Projects Sites (EPDC)
13 (Thu.)	Lecture: Geological Survey of Hydro Electric Projects Sites (EPDC)
14 (Fri.)	Visit: Minami Kawagoe Substation (EPDC)
17 (Mon.)	Lecture: Design and Construction of Concrete Gravity Dam and Arch Dam (EPDC)
18 (Tue.)- 19 (Wed.)	Visit: Fukushima Nuclear Power Station of Tokyo Electric Power Co., Ltd. (TEPCO)

Sept. 20 (Thu.)	Lecture: Design and Construction of Rockfill Dam (EPDC)
21 (Fri.)	Lecture: Layout and Construction of Hydro Power Station and Waterway (EPDC)
24 (Mon.)	Lecture: Layout and Construction of Buildings, etc. for Hydro Power Station (EPDC)
25 (Tue.)	Lecture: Layout and Construction of Electric Facilities for Hydro Power Station (EPDC)
26 (Wed.)	Lecture: Design and Construction of Distribution Lines (EPDC)
27 (Thu.)	Lecture: Design and Construction of Substation (EPDC)
28 (Fri.)	Lecture: Design and Construction of Transformation Facilities (EPDC)
Oct. 1 (Mon.)	Leave Tokyo for Sakuma
2 (Tue.)	Visit: Sakuma Hydro Power Station (EPDC)
3 (Wed.)	Visit: Shintoyone Hydro Power Station (EPDC)
4 (Thu.)	Visit: Funagira Hydro Power Station Construction Sites (EPDC)
5 (Fri.)	- ditto -
6 (Sat.)	Leave Funagira for Tokyo
8 (Mon.)	Lecture: Civil Engineering for Civil Engineer and Electric Engineering for Electric Engineer (EPDC)
9 (Tue.)	- ditto -
11 (Thu.)	- ditto -
12 (Fri.)	Meeting on the Training at EPDC

Part III

Oct. 15 (Mon.)	Leave Tokyo for Kyoto
16 (Tue.)	Visit: Nisshin Electric Co., Ltd.
17 (Wed.)	Leave Kyoto for Takasago Visit: Takasago Factory of Mitsubishi Heavy Industries Co., Ltd.
18 (Thu.)	Leave Takasago for Tadanoumi Visit: Chushi Trunk Tie Line of Electric Power Development Co., Ltd. Leave Tadanoumi for Hiroshima
19 (Fri.)	Visit: Small Scale Hydro Power Station in Hiroshima
20 (Sat.)	Leave Hiroshima for Tokyo
22 (Mon.)	Visit: Fuji Electric Co., Ltd.
23 (Tue.)	Visit: Ebara Manufacturing Co., Ltd.
24 (Wed.)- 25 (Thu.)	Report Making and Preparation for Leaving
26 (Fri.)	Closing Ceremony
27 (Sat.)- 28 (Sun.)	Leave Japan