Socialist Republic of Vietnam
Ministry of Industry and Trade (MOIT)
Ministry of Construction (MOC)

The Technical Cooperation Project

on

Electric Power Technical Standards Promotion in Vietnam

Project Completion Report

June 2013

Japan International Cooperation Agency

Electric Power Development Co., Ltd.
Shikoku Electric Power Co., Inc.
West Japan Engineering Consultants, Inc.

IL
JR
13-089

Table of Contents

List of Appendix

List of Tables

List of Figures

List of Abbreviations

Abbreviation	Description
ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Petroleum Institute
ASTM	American Society for Testing and Materials
BLR	Boiler
BOT	Build, Operation & Transfer
BS	British Standards
BTG	Boiler Turbine Generator
CFB	Circulating Fluidized Bed
COD	Commercial Operation Date
C/P	Counterpart
CRT	Cathode Ray Tube
CT/VT	Current Transformer/Voltage Transformer
DCS	Distributed Control System
DIN	Deutsches Institur fur Normung
DOIT	Department of Industry and Trade
DONRE	Department of Natural Resource and Environment
EMS	Energy Management System
EPC	Engineering, Procurement and Construction
ETC	Electrical Testing Center
EVN	Vietnam Electricity
FDF	Forced Draft Fan
FS	Feasibility Study
GB	Guo jia Biao zhun
G/L or GL	Guideline*[Note-1]
GOST	Russian Technical Standards
GT	Gas Turbine
GTCC	Gas Turbine Combined Cycle
HPP	Hydropower Plant / Hydropower Project
HRSG	Heat Recovery Steam Generator
IDF	Induced Draft Fan
IE	Institute of Energy
IEC	International Electric Commission
IEEE	Institute of Electrical and Electronic Engineers

Abbreviation	Description
IPP	Independent Power Producer
ISO	International Organization for Standardization
JCC	Joint Coordination Committee
JICA	Japan International Cooperation Agency
JIS	Japan Industrial Standard
JMC	Joint Management Committee
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MARD	Ministry of Agriculture and Rural Development
MCE	Maximum Credible Earthquake
MFT	Master Fuel Trip
MOC	Ministry of Construction
MOI	Ministry of Industry
MOIT	Ministry of Industry and Trade
MOLISA	Ministry of Labor, Invalid and Social Affairs
MONRE	Ministry of Natural Resources and Environment
MOST	Ministry of Science and Technology
MOT	Ministry of Transportation
NOx	Nitrogen Oxide
NLDC	National Load Dispatch Center
O&M	Operation & Maintenance
OBE	Operating Basis Earthquake
PCB	Poly Chlorinated Biphenyl
PDCA	Plan, Do, Check and Act
PECC	Power Engineering Consultant Company
PDM	Project Design Matrix
PFBC	Pressurized Fluidized Bed Combustion
PMF	Probable Maximum Flood
PO	Plan of Operation
PPA	Power Purchase Agreement
QCVN	National level regulation (mandatory standards) in Vietnam
R/D	Record of Discussion
RCC	Roller Compacted Concrete
RTU	Remote Terminal Unit
SCADA	Supervisory Control And Data Acquisition

Abbreviation	Description
SH	Super Heater
SOx	Sulfur Oxide
ST	Steam Turbine
STAMEQ	Directorate for Standards, Metrology and Quality
TBC	Thermal Barrier Coating
TBT	Technical Barriers to Trade
TCVN	National level standard in Vietnam
TCN	Industrial Standard
TPP	Thermal Power Plant
T/R or TR	Technical Regulation*[Note-2]
T/S	Technical Standards
USSR	Union of Soviet Socialist Republics
VTA	Vietnam Thermal Power Association
WG	Working group
W/R	Work Report
WS	Workshop
WTO	World Trade Organization

**Note 1: The term "Guidelines" used in this report means "voluntary standards" and equivalent or similar to "TCVN" in Vietnam.*

**Note-2: The term "Technical Regulation" used in this report means "mandatory standards" or "regulation" and equivalent to "QCVN" in Vietnam.*

Part 1 Introduction

"The Technical Cooperation Project on Electric Power Technical Standards Promotion in Vietnam" (hereinafter referred to as "the Project") is being conducted with the following counterpart organizations, the Ministry of Industry and Trade (hereinafter referred to as "MOIT") and Ministry of Construction (hereinafter referred to as "MOC") of the Socialist Republic of Vietnam (hereinafter referred to as "Vietnam") under the Record of Discussion (hereinafter referred to as "R/D", see Appendix-1) and its amendment mutually agreed between the Vietnamese Government and JICA on November 26, 2009 and July 20, 2012 respectively.

This Project Completion Report was prepared with cooperation of Vietnamese counterpart agencies and JICA Project Team and describes the record of activities and the result of the project activities throughout the Project implementation period from March 2010 to June 2013.

1. Project Framework

1.1 Background of the Project

The electric power technical regulations in Vietnam were prepared just after the unification of North and South Vietnam in 1976, or going back to the 1960s under support from the former Union of Soviet Socialist Republics. Following that, the original version of the current technical regulations was prepared in 1984, and had not been revised for more than 20 years. After that, JICA conducted "the Study on Technical and Safety Standards for Electric Power Industry in Vietnam" (hereinafter referred to as "the Previous Study") during the period from May 2006 to June 2007 to review and revise the previously existing technical regulations and to prepare safety regulations, and MOIT promulgated the revised technical regulations and safety regulations as the mandatory regulations (QCVN) in December 2008. The present state of preparation regarding electric power technical regulations is as shown in Table 1-1.

Table 1-1 Present Status of Electric Power Technical Regulations

Field	Hydropower		Thermal power		Network System
	Civil structures	Electro-mechanical and electrical equipment	Mechanical equipment	Electrical equipment	Transmission lines, substations and distribution lines
Design	— (MOC)	—	—	—	Volumes 1 to 4
Completion inspection	— (MOC)	Volume 5	Volume 5	Volume 5	Volume 5
Periodic inspection	Volume 5	Volume 5	Volume 5	Volume 5	Volume 5
Operation	Volume 6	Volume 6	Volume 6	Volume 6	Volume 6
Construction and installation	— (MOC)	—	—	—	Volume 7 (Steel towers by MOC)

Note) Volumes 1 to 7 are under the control of MOIT.

Under these circumstances, a request letter was issued by MOIT to JICA to promote operation and spread of the technical regulations under the new legal system in November 2007. In reply to this request, JICA conducted the missions for detailed evaluation studies in March and September 2009 (see Minutes of Meeting in Appendix-2 of Work Report), and the R/D was agreed between JICA and MOIT /MOC in November 2009 concluding the implementation of the Project.

1.2 Purpose of the Project

The Project was formulated to be conducted to promote the dissemination of electric power technical regulations in the whole of Vietnam. In this context, the following overall goal and project purposes were applied in the initial version of Project Design Matrix (hereinafter referred to as "PDM"),

- Overall goal (initial PDM):
  Improve reliability and safety of power supply by means of decreasing electric power disorders caused by failures in design, construction, operation and maintenance through disseminating technical regulations to the electric power industry in Vietnam.
- Project purpose (initial PDM):
  Electric power technical regulations will be enacted and operated effectively and efficiently through disseminating the technical regulations and guidelines to the electric power industry in Vietnam.

However, in the 4th JCC Meeting held on May 16 and 17, 2012, revision of PDM was agreed and the overall goal and the project purpose of the Project were amended in more practical manner as follows:

- Overall goal (PDM Ver.2):
  The Electric Power Technical Standards and Guidelines shall be enforced to ensure improvement of reliability and safety of power supply in Vietnam.
- Project purpose (PDM) Ver.2:
  The Electric Power Technical Standards and Guideline are authorized by the Vietnamese authorities.

Although the further revision of PDM to update objectiveluly verifiable indicators for the overall goal was agreed in the 5th JCC Meeting held on April 24, 2013, the overall goal itself and the project purpose of the Project were kept unchanged in the third version of PDM.

1.3 Output of the Project

The following documents are the principal output of the Project included in PDM.

(1) Review Report

Report of review on inconsistency of existing technical standards and its problems caused, and the necessities for improvement

(2) Draft of Electric Power Technical Regulations

Draft of mandatory Technical Regulations to be developed for the following volumes:

- Technical Regulation for design of network facilities
- Technical Regulation for design of thermal power facilities
- Technical Regulation for construction of network facilities
- Technical Regulation for operation of network and power plant facilities
- Technical Regulation for inspection of network and power plant facilities
- Technical Regulation for design and construction of hydropower civil works

(3) Guidelines:

Draft of voluntary Guidelines for each Electric Power Technical Regulation to be developed in the Project.

1.4 Scope of the Project

The Technical Regulations and their Guidelines are to be revised or developed in the Project for the technical fields and categories shown in Table 1.4-1 in order to disseminate and operate the Technical Regulations properly.

Table 1.4-1 Scope of Electric Power Technical Standards

Item	Hydropower		Thermal Power		Network System
	Hydropower civil structures and hydromechanical equipment	Hydropower electro-mechanical and electrical equipment	Thermal power mechanical equipment	Thermal power electrical equipment	Transmission lines and substations
Design	Newly developed (regulated by MOC)	Out of scope	Newly developed (regulated by MOIT) (New Volume 2)	Newly developed (regulated by MOIT) (New Volume 2)	Improve existing standards (Volumes 1 to 4) (New Volume 1)
Completion inspection	Newly developed (regulated by MOC)	Improve existing standards (Volume 5)	Improve existing standards (Volume 5)	Improve existing standards (Volume 5)	Improve existing standards (Volume 5)
Periodic inspection	Improve existing standards (Volume 5)	Improve existing standards (Volume 5)	Improve existing standards (Volume 5)	Improve existing standards (Volume 5)	Improve existing standards (Volume 5)
Operation	Improve existing standards (Volume 6) (New Volume 4)	Improve existing standards (Volume 6) (New Volume 4)	Improve existing standards (Volume 6) (New Volume 4)	Improve existing standards (Volume 6) (New Volume 4)	Improve existing standards (Volume 6) (New Volume 4)
Construction and installation	Newly prepared (regulated by MOC)	Out of scope	Out of scope	Out of scope	Improve existing standards (Volume 7) (New Volume 3)

Note 1) Volumes 1 to 7 are the existing QCVN under the control of MOIT.

Note 2) Renumbering was made on the existing Volumes 1 to 7 under MOIT as shown in the table.

1.5 Implementation Period of the Project

Implementation period of the Project was initially set to be three years from March 2010 to January 2013. However, in the 4th JCC Meeting held on May 16 and 17, 2012, extension of Project terms was agreed and officially confirmed by the amendment of R/D on July 20, 2012. In this context, the Project is to be conducted in 3.3 years from March 2010 to June 2013 according to the following four phases.

1) Work Report Phase: March to April 2010
2) Review Report Phase: April to July 2010
3) Technical Regulation Phase: August 2010 to July 2011
4) Guideline Phase: September 2011 to June 2013

1.6 Related Organizations of the Project

The Project has been conducted in cooperation with MOIT, which is the main counterpart agency of the Project, MOC, which is the other counterpart agency responsible for the technical regulation for design and construction of hydropower civil works, and Vietnam Electricity (hereinafter referred to as "EVN"). Also, the Ministry of Agriculture and Rural Development (hereinafter referred to as "MARD"), which is the ministry related to dams and reservoirs involved in hydropower plants, participated in the Project as the members of Working Groups .In addition, the Ministry of Science and Technology (hereinafter referred to as "MOST"), which controls enactment of legislations, will take a role for promulgation of Technical Regulations and Guidelines.

1.7 Organization Framework for Implementation of the Project

The Project has been conducted under the organization shown in Figure 1.7-1 and Table 1.7-1 to which JICA and Vietnamese organizations had agreed in R/D.

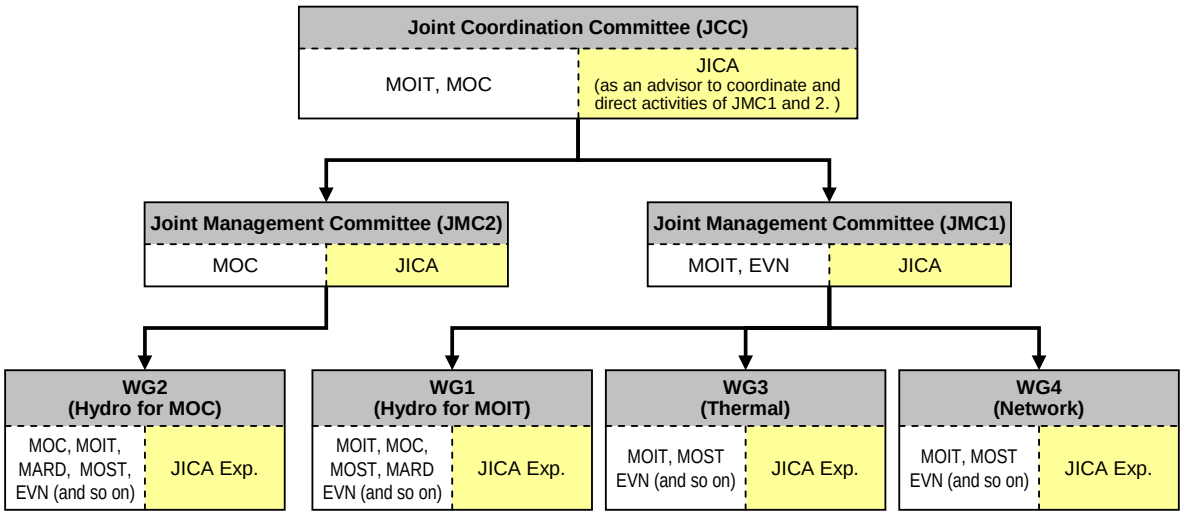


Figure 1.7-1 Organization Framework for Implementation of the Project

Table 1.7-1 Functions and Roles of each Organization

Organization	Function and role
JCC	1. To arrange required procedure for preparation of ministerial circulars. (Out of Scope of this Project) 2. To make coordination and direct activities of JMC1 and JMC2.
JMC1	1. To approve the annual work plan of the Project based on tentative schedule of implementation within the framework of the R/D. 2. To review results of the working group activities reports. 3. To monitor activities of WG 1, 3 and 4. 4. To review, coordinate, and approve the project output documents prepared by WG 1, 3 and 4.
JMC2	1. To approve the annual work plan of the Project based on tentative schedule of implementation within the framework of the R/D. 2. To review results of the working group activities reports. 3. To monitor activities of WG 2. 4. To review, coordinate, and approve the project output documents prepared by WG 2.
WG	1. To collect existing technical standards, related documents and information. 2. To review the existing technical standards and related documents. 3. To prepare the draft project output documents. 4. To finalize the project output documents reflecting comments for submitting JMC.

1.8 Project Design Matrix and Plan of Operation

The contents of original version of PDM and the Plan of Operation (hereinafter referred to as "PO") were agreed by JMC after discussion in the first JMC Meeting on March 15, 2010. Then, as stated in 1.2, the 2nd version of PDM as well as PO was agreed in the 4th JCC Meeting held on May 16, 2012. Furthermore, the 3rd version of PDM was agreed in the 5th JCC Meeting of April 24, 2013.

The original and revised PDM and PO are shown in Appendix-1 and Appendix-2 respectively.

1.9 Assignment of JICA Project Team

The members of the JICA Project Team are as shown in the table below.

Table 1.9-1 List of JICA Project Team Members

	Name	Position	Company
		Long Term Expert	
(1)	Shigeru NAKAMURA	Team Leader / Hydropower Expert A	J-POWER
		Short Term Expert	
(2)	Yutaro MIZUHASHI Yasushi FURUYAMA	Hydropower Expert B (Civil Works)	J-POWER
(3)	Shuji UMESAKI	Hydropower Expert C (Hydromechanical Equipment)	J-POWER
(4)	Mototaro OKADA	Hydropower Expert D (Electrical Works)	J-POWER
(5)	Yoshio OOYAMA Masashi HIGO	Thermal Power Expert A (Mechanical Equipment A)	WESTJEC
(6)	Hiroshi IMAMURA	Thermal Power Expert B (Electrical Works A)	WESTJEC
(7)	Masaaki KOGA	Thermal Power Expert C (Mechanical Equipment B)	WESTJEC
(8)	Takeshi EGASHIRA	Thermal Power Expert D (Electrical Works B)	WESTJEC
(9)	Ken'ichi KUWAHARA	Network Expert A (Transmission System)	YONDEN
(10)	Toshio AKI	Network Expert B (Substation)	YONDEN
(11)	Yoshitetsu FUJISAWA Tsuguhiro YAMADA	Network Expert C (Distribution System)	YONDEN
(12)	Takayoshi MASUDA	Network Expert D (Grounding System)	YONDEN
(13)	Shigeo FUJINO	Network Expert E (Inspection)	YONDEN
		Others	
(14)	Ken'ichi KUWAHARA Takayoshi MASUDA Toshio AKI	Network Supporting Expert	YONDEN
(15)	Masafumi KANEKO Masahiro TANIMOTO	Coordinator	J-POWER

The actual field work assignment schedule of JICA Project Team is shown in Figs.1.9-1 and 1.9-2.

	Position	Name	Company	1st Stage 2010 3	4	5	6	7	8	9	10	11	12	2011 1	2	3	4	5	6	7	M/M 1st St. Field
Field Work in Vietnam	Team Leader / Hydropower Expert A	Shigeru NAKAMURA	J-POWER	0.500 15			0.967 29	0.930 28	0.970 29	0.630 19	0.830 25	0.300 9	1.030 31	0.930 28	0.730 22	1.030 31	0.500 15	0.770 23	0.470 14	0.300 9	10.90
	Hydopower Expert B (Civil Works)	Yuutarou MIZUHASHI Yashushi FURUYAMA	J-POWER	0.300 9			0.33 10	0.47 14			0.800 24					0.500 15			0.330 10	0.270 8	3.00
	Hydropower Expert C (Hydromechanical	Syuuji UMESAKI	J-POWER				0.33 10	0.47 14			0.33 10					0.500 15			0.330 10	0.270 8	2.23
	Hydropower Expert D (Electrical Works)	Mototarou OKADA	J-POWER	0.300 9			0.37 11				0.730 22	0.070 2				0.500 15			0.330 10	0.270 8	2.57
	Thermal Power Expert A (Mechanical Equipment A)	Yoshio OOYAMA	WESTJEC	0.300 9			0.33 10	0.97 29			0.730 22	0.070 2			0.230 7	0.570 17			0.330 10	0.270 8	3.80
	Thermal Power Expert B (Electrical Works A)	Hiroshi IMAMURA	WESTJEC	0.300 9			0.33 10	0.97 29			0.400 12					0.500 15			0.330 10	0.270 8	3.10
	Theramal Power Expert C (Mechanical Equipment B)	Masaaki KOGA	WESTJEC				0.33 10	0.47 14			0.730 22	0.070 2			0.230 7	0.570 17			0.330 10	0.270 8	3.00
	Thermal Power Expert D (Electrical Works B)	-	-																		0.00
	Network Expert A (Transmission System)	Kenichi KUWAHARA	YONDEN	0.300 9			0.33 10	0.97 29			0.800 24				0.230 7	0.570 17			0.300 9	0.300 9	3.80
	Network Expert B (Substation System)	Toshio AKI	YONDEN	0.270 8			0.37 11	0.97 29			0.730 22	0.070 2				0.300 9		0.500 15	0.330 10	0.270 8	3.80
	Network Expert C Distribution System)	Yoshitetsu FUJISAWA Tsuguhiro YAMADA	YONDEN				0.33 10	0.1 3			0.800 24							0.470 14	0.330 10	0.270 8	2.30
	Network Expert D (Grounding System)	Takayoshi MASUDA	YONDEN				0.37 11	0.43 13			0.400 12					0.500 15			0.330 10	0.270 8	2.30
	Network Expert E (Inspection)	–	–																		0.00
	Network Supporting	–	–																		0.00
	Coordinator	Masafumi KANEKO Masahiro TANIMOTO	J-POWER	0.500 15												0.500 15			0.330 10	0.270 8	1.60
	Field Work Total M/M (excluding Coordinator)			2.3			3.7	5.9	1.0	0.6	6.2	0.5	1.0	0.9	1.2	4.5	0.5	1.7	3.1	2.5	40.80

Figure 1.9-1 Assignment Schedule of JICA Project Team Experts (1st Stage)

	Position	Name	Company	2nd Stage 2011 8	9	10	11	12	2012 1	2	3	4	5	6	7	8	9	10	11	12	2013 1	2	3	4	5	6	MM 2nd St. Field	MM Total Field
Field Work in Vietnam	Team Leader / Hydropower Expert A	Shigeru NAKAMURA	J-POWER			0.867 26	1.000 30	0.800 24	0.400 12	0.967 29	1.033 31	0.567 17	0.833 25	0.300 9	0.800 24	0.800 24	0.633 19	1.033 31	0.533 16	0.933 28	0.833 25	0.333 10	0.733 22	0.900 27	0.233 7	0.233 7	14.77	25.67
	Hydopower Expert B (Civil Works)	Yuutarou MIZUHASHI Yashushi Furuyama	J-POWER				0.467 14						0.233 7		0.467 14			0.333 10	0.233 7		0.467 14		0.133 4	0.267 8		0.233 7	2.83	5.83
	Hydropower Expert C (Hydromechanical	Syuuji UMESAKI	J-POWER				0.300 9						0.467 14		0.233 7			0.300 9	0.200 6		0.367 11			0.133 4			2.00	4.23
	Hydropower Expert D (Electrical Works)	Mototarou OKADA	J-POWER				0.367 11						0.467 14		0.233 7			0.367 11	0.100 3		0.467 14			0.333 10		0.167 5	2.50	5.07
	Thermal Power Expert A (Mechanical Equipment A)	Yoshio OOYAMA	WESTJEC				0.467 14						0.600 18			0.333 10	0.233 7	0.367 11	0.233 7		0.400 12	0.167 5		0.333 10		0.200 6	3.33	7.13
	Thermal Power Expert B (Electrical Works A)	Hiroshi IMAMURA	WESTJEC				0.300 9											0.333 10	0.100 3		0.400 12	0.067 2		0.333 10			1.53	4.63
	Theramal Power Expert C (Mechanical Equipment B)	Masaaki KOGA	WESTJEC				0.467 14						0.600 18			0.333 10	0.233 7	0.367 11	0.233 7		0.400 12	0.167 5		0.333 10		0.200 6	3.33	6.33
	Thermal Power Expert D (Electrical Works B)	Takashi EGASHIRA	WESTJEC										0.467 14			0.100 3	0.233 7										0.80	0.80
	Network Expert A (Transmission System)	Kenichi KUWAHARA	YONDEN				0.400 12					0.200 6	0.400 12		0.300 9	0.167 5		0.367 11	0.100 3					0.367 11		0.233 7	2.53	6.33
	Network Expert B (Substation System)	Toshio AKI	YONDEN				0.333 10	0.100 3		0.133 4					0.567 17	0.367 11		0.367 11	0.100 3		0.467 14						2.43	6.23
	Network Expert C Distribution System)	Tsuguhiro YAMADA	YONDEN				0.167 5						0.400 12			0.200 6	0.033 1	0.367 11			0.467 14			0.533 16		0.233 7	2.40	4.70
	Network Expert D (Grounding System)	Takayoshi MASUDA	YONDEN				0.400 12						0.400 12		0.333 10			0.367 11	0.100 3					0.167 5			1.77	4.07
	Network Expert E (Inspection)	Shigeo FUJINO	YONDEN										0.400 12			0.200 6	0.033 1										0.63	0.63
	Network Supporting	Kenichi KUWAHARA Takayoshi MASUDA Toshio AKI	YONDEN														0.200 6			0.300 9	0.433 13		0.300 9	0.567 17	0.233 7		2.03	2.03
	Coordinator	Masahiro TANIMOTO	J-POWER			0.400 12											0.433 13	0.300 9	0.200 6								1.33	2.93
	Field Work Total M/M (excluding Coordinator)					0.87	4.67	0.90	0.40	1.10	1.03	0.77	5.27	0.30	2.93	2.50	1.60	4.57	1.93	1.23	4.70	0.73	1.17	4.27	0.47	1.50	42.88	83.68

Figure 1.9-2 Assignment Schedule of JICA Project Team Experts (2nd Stage)

1.10 Employment of Local Consultants

The JICA Project Team employed local consultant companies to implement following works.

(1) Collection and Review on the Existing Documents and Information Related to Electric Power Technical Regulations

(2) Baseline Surveys on accidents and power outages in electric power supply and degree of satisfaction to the Technical Regulations and Guidelines by technical staff in electric power industry

(3) Survey on the actual needs of Technical Regulations and Guidelines for electric power facilities in view of the current status, construction and installation conditions, and execution conditions of inspections and operation of electric power facilities

(4) Supporting the activities of Network Group for finalizing the draft of Technical Regulations and Guidelines

(5) Reporting of the results of each activity (reviews, surveys and investigations) in the meetings of Working Groups, Joint Management Committee (JMC, Joint Coordination Committee (JCC) and Workshops

The following local consultants were employed by the JICA Project Team in the Project:

<First Stage>

1) Subcontract 1A/2010-2011: Electrical Testing Center (ETC1 / present Northern Electric Testing Company) for the works of MOIT scope / Contract period: March 22, 2010 to July 25, 2011
2) Subcontract 1B/2010-2011: The Center For Water Research And Engineering Application (CRA) for the works of MOC scope / Contract period: from March 22, 2010 to July 25, 2011

<Second Stage>

1) Subcontract 2A/2011-2013: Northern Electric Testing Company (ETC1) for the works of MOIT scope / Contract period: from October 20, 2011 to June 15, 2013
2) Subcontract 2B/2011-2013: The Center For Water Research And Engineering Application (CRA) for the works of MOC scope / Contract period: from October 20, 2011 to June 15, 2013
3) Subcontract 2C/2012-2013: VINACONSULT, JSC for the works of Network Group under MOIT scope / Contract period: from September 13, 2012 to June 15, 2013

1.11 Undertakings from Vietnamese Counterpart Organizations

To implement the Project, the undertakings were provided for the JICA Project Team by Vietnamese counterpart organizations as listed below in accordance with the agreement in R/D of November 2009 and the Minutes of Meeting of September 2009.

- Assignment of counterpart engineers and officers, members of JCC, JMC and Working Group meetings,

- Provision of supporting staffs,
- Provision of office space and office facilities for the JICA Project Team,
- Provision of office furniture and communication equipment for the JICA Project Team,
- Undertakings for the JICA Project Team members for bringing baggage and their use, and
- Provision of other necessary undertakings for the JICA Project Team members.

1.12 Technology Transfer through OJT

During implementation of the Project, the JICA Project Team provided Vietnamese counterpart organizations with technology transfer aiming that the counterpart organizations would fully understand the contents of electric power technical regulations and their guidelines, to operate electric power facilities properly complying with the technical regulations, and to execute required revisions as occasion would demand. The following methods of technology transfer were undertaken in the Project.

(1) Technology Transfer though Working Group Activities

The JICA Project Team conducted technology transfer through activities in the four Working Groups established in the Project, discussions between members of the JICA Project Team and Vietnamese counterpart organizations, review of electric power technical regulations and draft guidelines by Vietnamese counterpart organizations, etc. Members of Vietnamese counterpart organizations presented the outcome of the Project in JMC and JCC meetings and Workshops under the guidance and cooperation of the JICA Project Team members as activities of OJT (On the Job Training), so that they could understand the contents of the technical regulations and guidelines through these activities.

(2) Counterpart Training in Japan

The JICA Project Team invited members of Vietnamese counterpart organizations to Japan and conducted the counterpart training in Japan. As the scope of the Project extended over the hydropower, thermal power and network system, the counterpart training was conducted separately in three times in the First Stage of the Project as shown in the following table.

Table 1.12-1 Plan of Counterpart Training in Japan

Training	Time	Subject	Target	Contents
First	Nov. 2010	Hydropower	Mainly member of Hydropower WG	Introduce electric power technical regulations in Japan and inspect sites of electric power facilities to provide information about maintenance and operation of facilities
Second	Apr. 2011	Thermal	Mainly member of thermal power WG	
Third	Apr. 2011	Transmission	Mainly member of transmission line WG	

The JICA Project Team introduced electric power technical regulations in Japan to the trainees, engineers of Vietnamese counterpart organizations, and took them to sites of electric power

facilities to provide them with information about maintenance and operation of the facilities. A target of the training was mainly the members of the working groups and also staff of counterpart agencies in order to strengthen an effect of technology transfer through implementation of the Project.

1.13 Self-capacity Building

Initially, the Project had set a target of "to improve reliability and safety of power supply by means of decreasing electric power disorders caused by failures in design, construction, operation and maintenance through disseminating technical regulations to electric power industry in Vietnam", and it is expected that related organizations involved in the Project will extend their experiences to all companies of the electric power industry after the Project. The JICA Project Team has given technology transfer and suggestions to the MOIT, MOC, EVN and other related organizations so that the Vietnamese government would extend the Project outputs to all electric power utilities by itself after the Project. At the present, the following measures are recommended to be conducted by the Vietnamese side:

(1) Establishment of subsidiary regulation for operation of electric power technical standards

The requirements on inspection stipulated in the Vol.5 of the existing electric power technical regulation only regulate the items and contents of inspections so that procedures, forms, implementation methods and other particulars shall be established separately to enforce them..

(2) Enactment of report on accidents in electric power facilities and establishment of subsidiary regulation

The existing regulations regulate an obligation to report accidents on electric power facilities for the operation of power grid. For extending the purpose of this regulation to the security of power facilities and for enhancing practical effect of periodic inspections, a subsidiary regulation for obliging the reporting of accidents to MOIT is recommended to be reviewed or established together with their code of practice.

1.14 Reports and Project Outputs

The reports and project outputs which were submitted to JICA and also counterpart organization are shown in Table 1.14-1.

Table 1.14-1 Submission Schedule and Number of Copies of Reports and Project Outputs

	Report Title	Language	Submission Schedule	Number of Copies		Form
				JICA	Counterpart	
1.1	Work Report (W/R) (The 1st Draft)	English	March 2010	2	13	Simple bookbinding
1.2	Work Report (W/R) (The Final)	English	May 2010	5	10	Simple bookbinding Electronic data on CD-ROM
2.1	Review Repot (The 1st Draft)	English	July 2010	2	23	Simple bookbinding
2.2	Review Repot (The Final)	English	August 2010	10	15	Simple bookbinding Electronic data on CD-ROM
3.1	Revised Electric Power Technical Regulations (The 1st Draft)	English / Vietnamese	November 2010	2	23	Simple bookbinding
3.2	Revised Electric Power Technical Regulations (The 2nd Draft)	English / Vietnamese	April 2011	2	23	Simple bookbinding
3.3	Revised Electric Power Technical Regulations (The Final Draft)	English / Vietnamese	July 2011 (English) August 2011 (Vietnamese) June 2013 (MOC scope)	10	15	Simple bookbinding Electronic data on CD-ROM
4	Project Progress Report (The 1st Interim Report)	English	July 2011	10	15	Simple bookbinding Electronic data on CD-ROM
5	Project Progress Report (The 2nd Report)	English	June 2012	10	15	Simple bookbinding Electronic data on CD-ROM
6.1	Guidelines for Technical Regulations (The 1st Draft)	English / Vietnamese	March to September 2012 for MOIT scope January 2013 for MOC scope	1 (CD)	12 -20	Simple bookbinding
6.2	Guidelines for Technical Regulations (The 2nd Draft)	English / Vietnamese	August 2012 for MOIT scope	1 (CD)	12 -20	Simple bookbinding
6.3	Guidelines for Technical Regulations (Final Draft for Approval)	English / Vietnamese	March 2013	1 (soft copy)	English:4-12 Vietnamese: 8-25	Simple bookbinding
6.4	Guidelines for Technical Regulations (Final Drat)	English / Vietnamese	June 2013	10	15	Simple bookbinding Electronic data on 2 CD-ROM
7	Project Completion Report	English Japanese	June 2013	5 – 5	5 15 –	bookbinding Simple bookbinding Simple bookbinding Electronic data on CD-ROM (English/Japanese)

The detailed information of submission of reports and documents listed in the table above and other optional documents developed throughout the Project are described below:

(1) Work Report

Work Report which describes the work program including the purpose, scope, organization, policy, activities and schedule of the Project as well as proposed initial version of PDM was developed in English. The draft Work Report was submitted in March 2010 and the final Work Report was submitted in May 2010.

(2) Review Report

Review Report which describes the result of review on inconsistency of existing technical standards and its problems caused, and the necessities for improvement was developed in English. The draft Review Report was submitted in July 2010 and the final Review Report was submitted in August 2010.

(3) The 1st draft, 2nd draft and Final Draft of Technical Regulations

English version and Vietnamese version of the 1st draft, 2nd draft and final draft of the Technical Regulations were prepared and submitted for the following volumes:

1) Revised Technical Regulation Vol.1-4 (Design of Network Facilities).
2) Revised Technical Regulation Vol.5 (Inspection of Network and Power Plant Facilities)
3) Revised Technical Regulation Vol.6 (Operation of Network and Power Plant Facilities)
4) Revised Technical Regulation Vol.7 (Construction of Network Facilities)
5) New Technical Regulation (Design of Thermal Power Facilities)
6) New Technical Regulation (Design, Construction and Completion Inspection of Hydropower Civil Works)

The 1st draft of the Technical Regulations was submitted to MOIT/MOC in November 2010.

The 2nd draft of the Technical Regulations was submitted to MOIT/MOC in April 2010.

The English version of Final Draft of the Technical Regulations except item (6) above was submitted to JICA in July 2010 and the Vietnamese version of them was submitted to MOIT in August 2010.

The Final Draft of item (6) was submitted to MOC and JICA in June 2013.

At the Final Draft, the numbering of each volume under MOIT scope was changed as follows:

New Vol. No.	Old Vol. No.	Category
Vol.1	Vol.1 to 4	Design of Network Facilities)
Vol.2	-	Design of Thermal Power Facilities
Vol.3	Vol.7	Construction of Network Facilities
Vol.4	Vol.6	Operation of Network and Power Plant Facilities
Vol.5	Vol.5	Inspection of Network and Power Plant Facilities

(4) Progress Report No.1

Progress Report No.1 was prepared in English describing the activities in the 1st Stage of the Project and submitted to JICA and MOIT/MOC in July 2011.

(5) Old-New Comparison Table for the revised Technical Regulations

The Old-New Comparison Tables were prepared in English and Vietnamese in order to clarify the changes between the existing Technical Regulations and the draft of revised Technical Regulations developed in the Project and submitted to MOIT in October 2011 for the following volumes.

1) Revised Technical Regulation Vo.1 (old Vol.1-4) (Design of Network Facilities).
2) Revised Technical Regulation Vol.5 (old Vol.5) (Inspection of Network and Power Plant Facilities)
3) Revised Technical Regulation Vol.4 (old Vol.6) (Operation of Network and Power Plant Facilities)
4) Revised Technical Regulation Vol.3 (old Vol.7) (Construction of Network Facilities)

(6) The 1st draft, 2nd draft and Final Draft for Approval of Guidelines

The English version and Vietnamese version of "1st draft", "2nd draft" and "Final Draft for Approval" of Guidelines for Technical Regulations were submitted to MOIT during the period from March to August 2012 and in March 2013 and to MOC in January 2013 as follows:

1) Guideline Vol.1 (Design of Network Facilities): 1st draft in Sep. 2012, Final Draft for Approval in March 2013
2) Guideline Vol.2 (Design of Thermal Power Plant): 1st draft in Mar. & Apr. 2012, 2nd draft in Aug. 2012, Final Draft for Approval in March 2013
3) Guideline Vol.3 (Construction of Network Facilities): 1st draft in Mar. 2012, 2nd draft in Aug. 2012, Final Draft for Approval in March 2013
4) Guideline Vol.4 (Operation of Network and Power Plant Facilities / Common part): 1st draft in Aug. 2012, Final Draft for Approval in March 2013
5) Guideline Vol.4 (Operation of Network and Power Plant Facilities / Hydropower part): 1st draft in Mar. 2012, 2nd draft in Aug. 2012, Final Draft for Approval in March 2013
6) Guideline Vol.4 (Operation of Network and Power Plant Facilities / Thermal Power part): 1st draft in Aug. 2012, Final Draft for Approval in March 2013
7) Guideline Vol.4 (Operation of Network and Power Plant Facilities / Network part): 1st draft in Mar. 2012, 2nd draft in Aug. 2012, Final Draft for Approval in March 2013
8) Guideline Vol.5 (Inspection of Network and Power Plant Facilities / Hydropower part): 1st draft in Mar. 2012, 2nd draft in Aug.2012, Final Draft for Approval in March 2013
9) Guideline Vol.5 (Inspection of Network and Power Plant Facilities / Thermal Power part): 1st draft in Apr. 2012, 2nd draft in Aug. 2012, Final Draft for Approval in March 2013

10) Guideline Vol.5 (Inspection of Network and Power Plant Facilities / Network part): 1st draft in May 2012, 2nd draft in Aug.2012, Final Draft for Approval in March 2013
11) Guideline for Hydropower Civil Works: 1st draft in January 2013

(7) Conclusion Table of Comments on Final Draft Technical Regulation

Based on the results of discussions in the WG Meetings in May 2012 on the comments received from MOIT in early April 2012, the English version and Vietnamese version of Conclusion Table of Comments on Final Draft Technical Regulations was prepared and submitted to MOIT in May 2012 as follows:

1) Conclusion Tables for Hydropower issues (for Vol.4 and Vol.5)
2) Conclusion Tables for Thermal Power issues (for Vol.2, Vol.4 and Vol.5)
3) Conclusion Tables for Network issues (for Vol.1, Vol.3, Vol.4 and Vol.5)

(8) Progress Report No.2

Progress Report No.2 was prepared in English describing the activities in the 1st half of 2nd Stage of the Project and submitted to JICA and MOIT/MOC in June 2012.

(9) Revised Final Draft of Technical Regulation

The Final Draft of Technical Regulations developed and submitted to MOIT in August 2011 were updated based on the conclusions in the WG Meetings in May 2012 and the English version and Vietnamese version of the revised Final Draft Technical Regulations were submitted to MOIT in June 2012 (soft copies) and in September 2013 (hard copies), then further updating was made in parallel with the development of draft Guidelines during the 2nd stage and submitted to MOIT in June 2013 as follows:

1) Revised Final Draft Technical Regulation Vol.1 (Design of Network Facilities).
2) Revised Final Draft Technical Regulation Vol.2 (Design of Thermal Power Facilities)
3) Revised Final Draft Technical Regulation Vol.3 (Construction of Network Facilities)
4) Revised Final Draft Technical Regulation Vol.4 (Operation of Network and Power Plant Facilities)
5) Revised Final Draft Technical Regulation Vol.5 (Inspection of Network and Power Plant Facilities)

(10) Final Draft of Guidelines

The English version of Final Draft Guidelines for Technical Regulations was submitted to JICA in June 2013 for the following volumes:

1) Final Draft Guideline Vol.1 (Design of Network Facilities)
2) Final Draft Guideline Vol.2 (Design of Thermal Power Plant)
3) Final Draft Guideline Vol.3 (Construction of Network Facilities)
4) Final Draft Guideline Vol.4 (Operation of Network and Power Plant Facilities)
5) Final Draft Guideline Vol.5 (Inspection of Network and Power Plant Facilities)

6) Final Draft Guideline for Hydropower Civil Works

The Vietnamese version of the above volumes was submitted to MOIT/MOC in June 2013.

(11) Project Completion Report

Project Completion Report was prepared in English describing the overall activities in the Project and the draft report was submitted to JICA and MOIT/MOC in the beginning of June 2013.and the final report was submitted to JICA in the end of June 2013.

1.15 Overall Workflow

The actual overall workflow of activities performed in the Project is shown in Fig.1.15-1.

1.16 Record of Project Input

Record of Project input is shown in Apprndix-8 for the following contents:

- Appendix 8.1: Input of Japanese Experts
- Appendix 8.2: Provision of Equipment from Japanese Side
- Appendix 8.3: Local Cost borne by Japanese side
- Appendix 8.4: List of Vietnamese Counterparts

1.17 Dispatching Record of JICA Project Team Experts

Dispatching record of experts of JICA Project Team is shown in Figs.1.9-1 and 1.9-2.

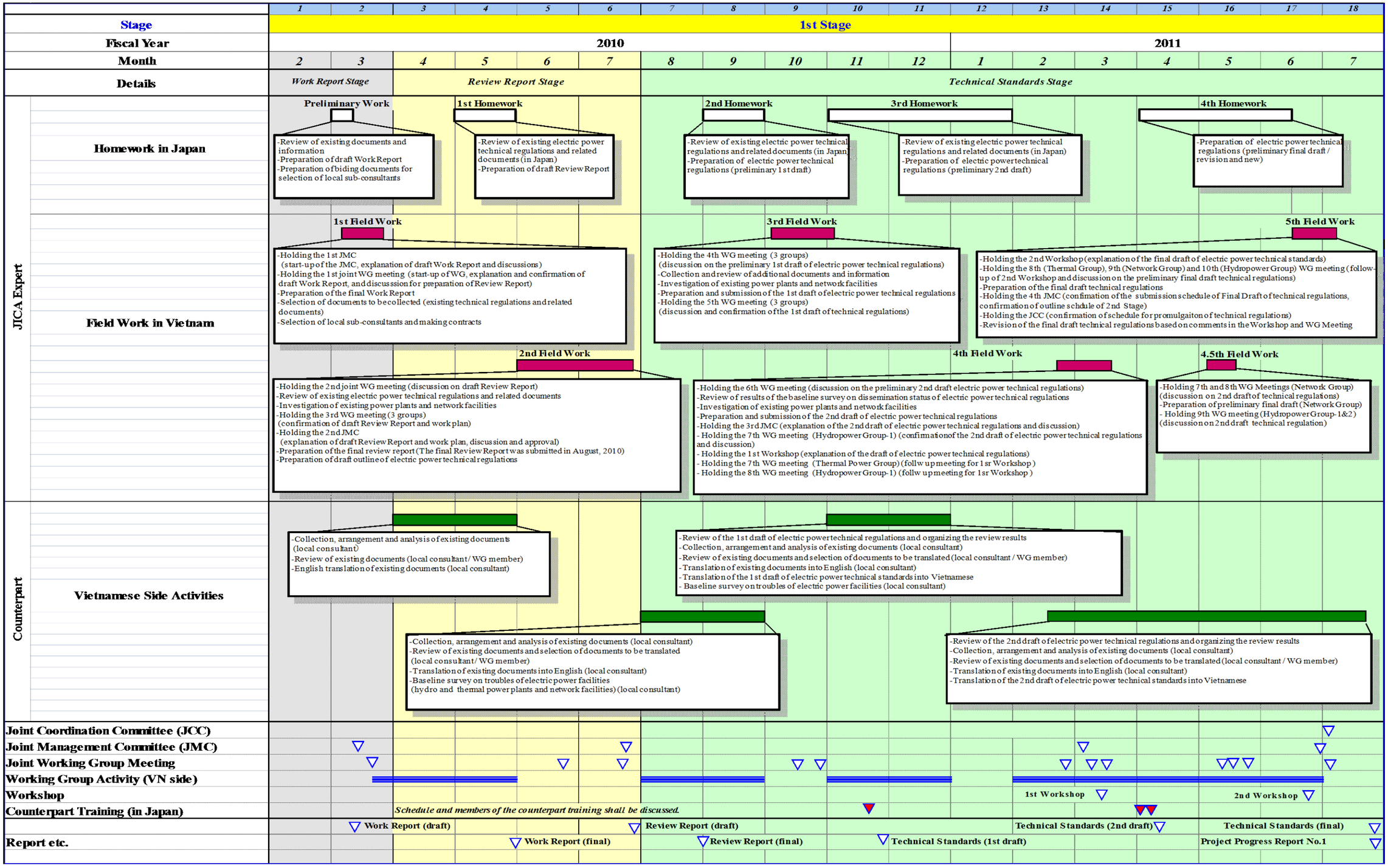


Figure 1.15-1 Overall Workflow (1st Stage)

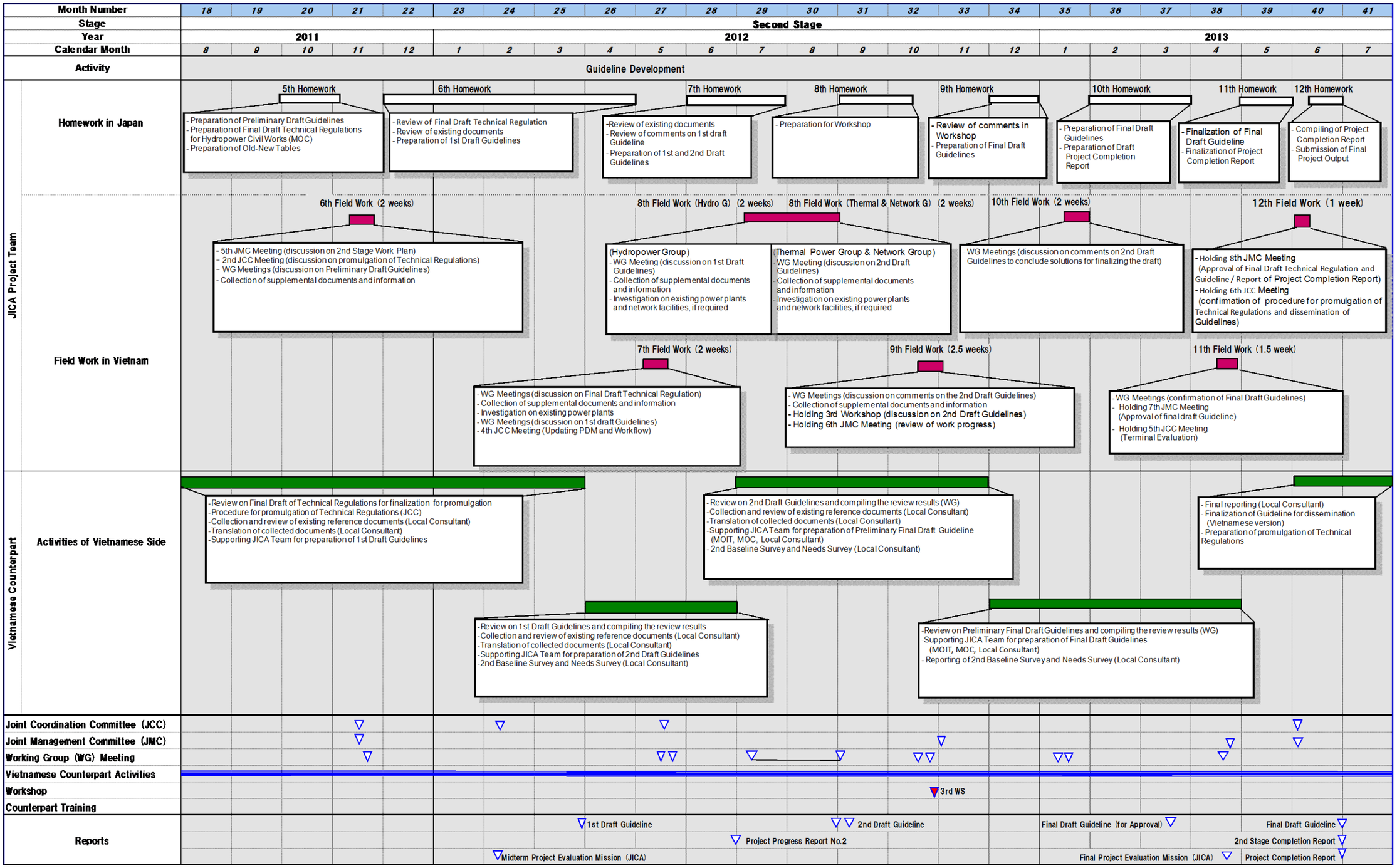


Figure 1.15-2 Overall Workflow (2nd Stage)

2. Basic Issue and Policy for Implementation of the Project

2.1 Understandings of Current Status of Electric Power Technical Regulations

(1) Current Condition of Electric Power Technical Regulations in Vietnam

Electric Power Technical Regulations are basically regulated by MOIT, while MOC is responsible for the safety of the construction work such as civil structures and steel towers including promulgation of Technical Regulations for these facilities.

In the "Law on Standards and Technical Regulations (hereinafter referred to as "Standardization Law")" which was enforced in January 2007, the subject of reform is clearly distinguished between "Regulation" and "Standard". The "Regulation" defines, as the mandatory regulation, the basic requirements, the principle and the concept. On the other hand, "Standard" defines, as the voluntary standard, the detailed procedure and the detailed specification. And, there are two types of "Regulations": the national-level (QCVN) and the province-level (QCDP). Also, there are two types of "Standards": the national-level (TCVN) which are applied broadly in general in Vietnam and the industry-level (TCCS) which shall comply with TCVN.

In view of the above-mentioned classifications by the Standardization Law, Vols. 1 to 4 of the existing Technical Regulations, which were developed by the Vietnamese experts, involve the contents of both basic requirements which shall be stipulated in mandatory technical regulations and the detailed specific issues which shall be described in voluntary standards. On the other hand, Vols. 5 to 7 of the existing Technical Regulations, which were drafted by JICA's Previous Study, were formulated as mandatory technical regulations regulating the basic and performance-based requirements in principle. However, as the existing Technical Regulations Vols. 5 to 7 were prepared during the transition period from old style to new stale, it was difficult at that time to completely reform the old version. Therefore, they still contain some specific details which shall not be included in mandatory regulations in general.

In the above context, the existing Technical Regulations are not the documents which have been developed in compliance with the classification stipulated in the Standardization Law. Accordingly, it is necessary to enhance the systematization of the current Technical Regulations by rearranging the contents into two categories, namely "the performance-based mandatory regulations" and "voluntary guidelines".

(2) Background of the Current Electric Power Technical Regulations

From April 2006 to June 2007, JICA conducted the Study for Development of Existing Electric Power Technical Standards employing the policy that "Proposed new Technical Regulations and Safety Regulations should describe basic requirements in the manner of performance-based content as much as possible and should not describe detailed numerical specifications". However, the actual situation in Vietnam shows that they are still developing specifications without appropriate manuals or methods. Therefore, if the detailed numerical specifications

were eliminated from the Technical Regulations, the problems could occur in such manner that concrete and specific measures and processes are unclear in some cases.

Under the above circumstances, to ensure the effectiveness of the regulations, it was necessary for the Technical Regulations to include a certain level of specific numerical criteria and tangible processes to flexibly apply the Technical Regulations to the actual condition. Accordingly, the contents of Technical Regulations drafted by JICA in 2006/2007 and promulgated by MOIT in 2008 partly include the specific and detailed requirements of a guideline level.

The methodology and result of review and revision on Volumes 1 to 4 and Volumes 5 to 7 of the Technical Regulations conducted by JICA's Development Study in 2006/2007 are summarized respectively as follows:

1) Technical Regulations Vol. 1 to 4
   The existing Technical Regulations Vols. 1 to 4 regarding the designing of power network facilities, of which the revision was started by Vietnamese counterpart organizations in 2000, was established as a ministerial ordinance in June 2006. At that time the previous JICA Study investigated the problems and provided the Vietnamese counterparts with useful information concerning Vols. 1 to 4 based on the result of a review aiming at appropriate revision by the Vietnamese side.

2) Technical Regulations Vol. 5 to 7
   The Previous Study of JICA in 2006/2007 proposed the revision on Vols. 5 to 7 of the Technical Regulations taking into consideration not only the result of review on the existing regulations but also the fact that Vols. 5 to 7 are the mandatory ministerial ordinances of MOIT. The basic policy for developments of Technical Regulations in the previous JICA Study was as follows:

   a) The generalization and minimization of the specific contents of Technical Regulations
      The revisions of Technical Regulations basically aimed to arrange them to be performance requirement-based mandatory regulations. It was necessary to revise them with a step-by-step approach because the previously existing Technical Regulations in Vietnam regulated specific numerical values as if they were guidelines and there was no clear policy regarding autonomous actions for safety. As a result, the revised Technical Regulations consisted of basic requirements in general but still contained the specific numerical stipulations.

   b) Confirmation of the consistency among Vols. 5 to 7 and other regulations
      Regarding the stipulations described in various volumes, they were unified and described in one main volume and these contents were mentioned just for references in the other volumes.

c) Addition of necessary items in the clauses

As there are some cases that the power plant owned by the private companies other than EVN are constructed and operated nowadays, it was important for MOIT to have its own Technical Regulations to regulate the operation and periodic inspections of power facilities. Accordingly, new provisions were prepared in the Technical Regulations.

2.2 Necessity of Rearrangement of Technical Regulations in each Field of Power Sector

Based on the current status of technical regulations in Vietnam described in Section 2.1 and the current situation of its electric power sector, the necessity for rearrangement and development of technical regulations and guidelines for each of the hydropower facilities, thermal power facilities and network system facilities is recognized as stated below:

(1) Necessity of Technical Regulations for Hydropower Facilities

The development of hydropower plants is currently on-going at many sites in Vietnam and this situation seems to be reaching a peak. The development of hydropower plants by private investors would have the potential to increase more in the future, while the overall hydropower development would enter into a decreasing phase after several years. Therefore, it is desired to promptly prepare technical regulations for the categories of design, construction and completion inspection of hydropower facilities, which have not been prepared by MOC so far. The technical regulations of these categories are under control of MOC but not MOIT which was the solo counterpart in the Previous Study of JICA. In this context, the involvement of MOC in the Project is required to develop new technical regulations for the categories for which no technical regulations are currently available. It is noted that, in the categories regulated by MOC, the various voluntary standards (TCVN and TCXDVN) have been prepared under MOC with cooperation of MARD while no mandatory regulations have been prepared so far.

On the other hand, since the hydropower projects to be constructed from now will involve not only the projects invested by EVN but also those developed by private investors, it is required to operate hydropower facilities safely and stably with a base of common technical regulations. In this context, besides the promotion of technical regulations themselves, the preparation and dissemination of guidelines are required as a measure for proper use of technical regulations.

(2) Necessity of Technical Regulations for Thermal Power Facilities

The annual rate of power consumption in Vietnam has shown very strong growth, increasing by 14% in recent years, and is expected to be 2.7 times in 2010 and 6.6 times in 2020 compared with 2000.

In such situation, the construction of multiple coal-fired power plants and gas combined cycle power plants has been planned for the future. Some of them may be developed in a traditional

manner by EVN and others by IPP groups such as Petro Vietnam and Vinacomin with domestic private capital as well as by foreign investers under BOT shceme..

Meanwhile, being focused on technical regulations related to construction and operation of thermal power plants, inspection and operational regulations have been developed, but the design-related technical regulations have not been developed so far. And their guidelines describing how to achieve a concrete implementation of the stipulated requirements have not been developed at all. There is a need to develop technical regulations and guidelines systematically.

As the national electricity demand is increasing significantly in Vietnam, it is necessary to improve and maintain a more stable power supply and environmental conservation in the future by means of developing thermal power plants by both EVN and private capital (IPP or BOT). Under these circumstances, to perform appropriate design and operation of the power plants, it is desirable to ensure improvement of the technical regulations and steady dissemination of guidelines throughout Vietnam.

(3) Necessity of Technical Regulations of Power Network Facilities

In Vietnam, as electric power demand is increasing because of high economic growth, the power network facilities have been strengthened to satisfy this demand.

The power network system in Vietnam consists of the power plants from north to south, trunk transmission lines which connect main cities, distribution network around the urban area, and the substations which connect these facilities. There are development plans for the new power plants and the distribution facilities that supply power to the expanded demand area. Considering this situation, the power network facilities should be strengthened continuously. Regarding the development of these power facilities, their designing and planning should be decided according to the electrical power demands and the expansion of the distribution area. Therefore, it is necessary that the engineers of the electrical power sector in Vietnam can carry out the design work by themselves, such as the study of the specifications of electrical equipment. This is the reason why the technical regulations and their guidelines for the electric power system are indispensable for the development of the electric power sector in Vietnam.

When the power network system covers a broad area, the requirement for high reliability and safety of the electric power supply is expected more than ever. In this situation, it is necessary to prevent damage to power facilities and injuries to members of the public caused by inadequate design. From this viewpoint regarding the development of the technical regulations for the electric power system, it is important that technical regulations and guidelines are developed to secure the appropriate design of the electric power system in addition to its operation and maintenance.

2.3 The Approach for achievement of Project Purpose

The Project was conducted with four implementation phases shown in Fig. 2.3-1 as the approach for achievement of project purpose.

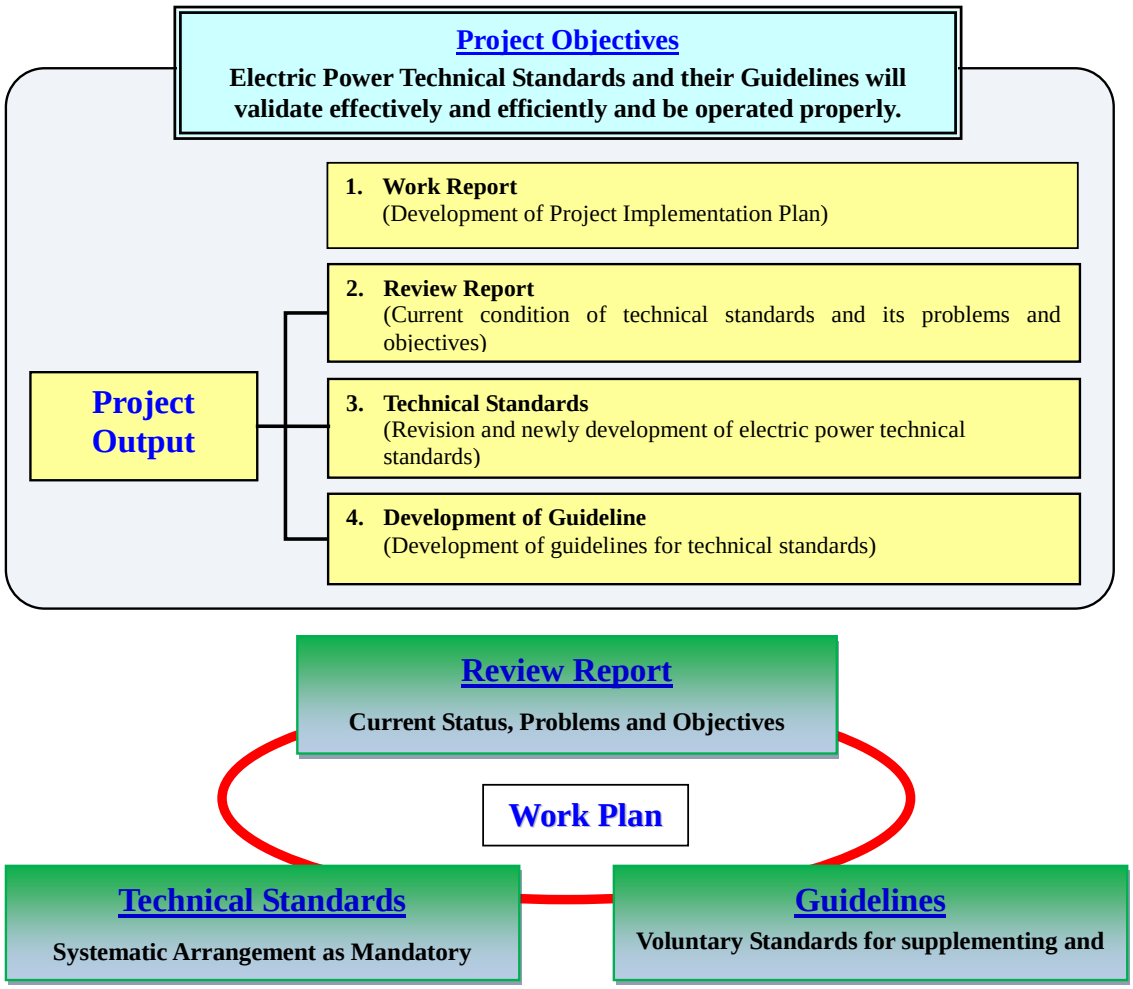


Figure 2.3-1 The Approach for achievement of Project Purpose

2.4 Basic Policy for Development of Electric Power Technical Regulations

The basic policies for the revision of the existing technical regulations and development of the new technical regulations employed in this Project are described as follows:

Basic Policy for Development of Technical Regulations

① **Development of Technical Regulations for Design, Construction and Completion Inspection of Hydropower Civil Works**

Technical Regulation for design, construction and completion inspection of hydropower civil works under the responsibility of MOC will be newly developed in the Project. This also covers hydromechanical equipment and the dams and reservoirs particularly constructed for hydropower generation in principle.

On the other hand, technical regulations for design and installation of hydropower electric equipment are out of the scope of the Project as agreed with the Vietnamese side, because the need for them is relatively low. Moreover, the environmental regulations regulated by MONRE (Ministry of Natural Resources and Environment) are out of the scope of the Project except the basic issues directly related to the design and operation of dams.

Here, the issues regulated by MOC and the issues regulated by MOIT will be adjusted with each other in order to solve any problems attributed to individual control by two different ministries

② **Development of Technical Regulations for Design of Thermal Power Plants**

The new Technical Regulations under MOIT will be developed for the design of coal fired thermal power and gas combined cycle power plants. At the moment, environmental preservation and the application of large-scale power plants shall be considered. However, development of the environmental technical regulations and, civil and architectural technical regulations is out of the scope of the Project.

③ **Revision of Existing Technical Regulations Vols.1 to 4 for Design of Network Facilities**

The reform of existing Technical Regulations should be conducted revising the contents systematically and also reflecting the latest technology and international standards. Additionally, it is also needed to remove the stipulations to be described in voluntary standards to guidelines, to eliminate unnecessary clauses and to add necessary clauses.

④ **Revision of Existing Technical Regulations Vols.5 to 7 regarding Inspection, Operation and Construction**

Both the newly developed technical regulations and the revised existing Technical Regulations Vol.1 to Vol.4 mentioned above will be coordinated and reorganized. Additionally, it is also needed to reorganize them by removing some detailed stipulations to Guidelines and by adding necessary clauses.

It should be also considered to add the obligation of reporting of power failures, human accidents and facilities accidents in the Technical Regulation Vol.6 in order to secure greater safety.

Regarding the network facilities, the development of technical regulations for civil structures such as towers, poles and their foundations and house wiring for public consumers are out of the scope of the Project, because they are regulated by MOC and the needs of them is not so high.

(1) Policy for Development of Technical Regulation on Hydropower Civil Works

The draft of Technical Regulation on Hydropower Civil Works was developed taking into account the following issues:

1) Adjustment of Issues Related to Different Ministries

Currently, MOC is accepting individual design standards or design criteria on a project basis to secure the safety of each individual project and is not applying a common regulation to all of the hydropower projects. Accordingly, for example, the arrangement of instrumentation, which is important for operation and maintenance of major structures such as dams, is different among projects, and this situation is one of the obstacles against forming a rational system of periodic inspections. Therefore, the basic requirements in the design of hydropower civil works were examined from a viewpoint of safe operation and maintenance of hydropower plants such as equipment for monitoring, which is regulated by MOIT, and the technical regulation for design of hydropower civil works, which is under the scope of MOC, was developed reflecting such requirements of MOIT as much as possible.

2) Adjustment to the Existing Standards and Regulations

There are design standards and regulations for hydraulic works issued and promulgated by MOC in cooperation with MARD so far. Therefore, it is necessary to maintain consistency between the new mandatory technical regulations for hydropower civil works and the existing standards and regulations. Taking account of this point, the new mandatory technical regulation for hydropower civil works was developed in a systematic manner as much as possible.

3) Scope of Technical Regulations for Design, Construction and Completion Inspection of Hydropower Civil Works

The scope of technical regulations related to dams and reservoirs is limited to ones for hydropower generation. Regarding environmental issues, the detailed environmental standards are out of the scope of the Project as they fall under responsibility of MONRE. However, stipulation of the basic environment requirements directly related to the design and operation of hydropower civil works, such as the minimum river maintenance flow, was discussed in the course of development of new mandatory technical regulations under MOC.

(2) Policy for Development of Technical Regulations for Thermal Power Facilities

The development of draft of technical regulations for thermal power facilities was executed taking into consideration the following issues:

1) Development of New Design Technical Regulations

The stable supply of electric power and environmental preservation depend on the steady operation of thermal power plants, and the proper design of thermal power plants is required as a fundamental for the execution of operation. Thus, it is clear that the technical regulations for design are important for the operation of thermal power plants.

However, it is impossible to evaluate the design documents due to the absence of design-related technical regulations for the thermal power facilities. Accordingly, the development of technical regulations for design of coal fired and combined cycle power plants is urgently required.

2) Separation of Technical Regulations with Guidelines

In the Previous Study of JICA, the formulation policy of Technical Regulations Vol.5 (inspection), that is “the issues at the EVN's internal standards level are not prescribed in the technical regulations,” and the formulation policy of Vol.6 (operations), that is “non-standard and unimportant terms are generalized or expelled,” were applied.

The Vietnamese side also considered that basically the technical regulations should stipulate the minimal requirements (performance rules) and should set forth the guidelines as specific documents supplementing the technical regulations stipulating comprehensive methods and interpretation of provisions in the technical regulations in order to achieve their requirements. However, there has been a possibility that the matters to be stated in the guidelines still remain in the existing technical regulations.

So, in the revision of the existing technical regulations, it was required to clearly separate the matters to be described in the technical regulations and guidelines and to arrange them so as not to have a mixture of them in each document.

3) Response to Environmental Conservation

Environmental conservation is being addressed in many countries and is equally important in Vietnam. Thus, the design and operation of environment-related facilities and equipment (including ash handling equipment) to prevent air, noise, vibration, water and soil pollution were carefully considered.

4) Response to Large-Scale Thermal Power Plant

In consideration of the growth of electricity demand in Vietnam, it is expected that the construction of thermal power plants will increase in the future, particularly with further progress of large-scale power plants.

However, in the current situation, it has been confirmed that the existing technical regulations are not fully covering the latest technology such as large thermal power plants (coal-fired thermal, gas combined cycle).

Thus, especially in the coal-fired thermal sector, it is necessary to continue to support technologies for further scaling-up of plants in Vietnam including the water quality management concept and a supercritical pressure boiler that are currently the standards for larger boilers.

5) Coordination with Existing Regulations and Laws

As the responsible ministry, MOIT has already developed and promulgated laws and regulations related to thermal power facilities. Accordingly, in the course of developing the

technical regulations, a detailed study on the existing relevant documents and their contents were required. In addition, coordination of the contents of each document was essential to promote the integrity of the contents of the technical regulations with related documents.

(3) Policy for Development of Technical Regulations for Power Network Facilities

The draft of technical regulations for the power network system were developed considering the following:

1) The Revision of Existing Technical Regulations from Vol.1 to Vol.4 for the Design of Network Facilities

Regarding the revision of existing technical regulations for the design of network facilities, it is necessary for Vietnamese engineers to produce designs by themselves following the growth in power demand.

For example, specific cable and conductor sizes are mentioned in the existing technical regulations Vol.1 to Vol.4, but there are no totally clear clarifications in the regulations and there will be problems in terms of the inflexibility of the regulations. In addition, the existing technical regulations would not be good in relation to actual conditions after a number of years because they are not suitable for more advanced technology, e.g. inventions with up-to-date materials.

In this way, there should be a focus on both conceptual design requirements and systematic arrangements for the revision of the existing technical regulations Vol.1 to Vol.4, and the design of up-to-date technology such as 500kV facilities, CV cables, digital wattmeters and Gas Insulated Switch Gears should be included. Additionally, the results of review on the previous technical regulations Vol.1 to Vol.4 conducted by the Previous Study of JICA were also referred to in the revision of the technical regulations.

The one of the characteristics of the power network system including transmission, substation and distribution facilities is that the facilities are located in areas used by the general public, compared with generating facilities, and measures preventing injuries to the general public and damage to the facilities caused by system malfunctions are the most important issues. Especially the contents of the provisions for ground earthing and lighting protection facilities have some problems regarding correct design such as discrepancy between regulations and actual conditions and over-specified criteria. On the other hand, for example, there are no regulations and rules for lighting protection for transmission facilities and these problems causes mistrips and malfunctions in the protection relay that leads to poor reliability in the power supply.

In this way, regarding the revision of existing technical regulations Vol.1 to Vol.4, the contents of provisions for ground earthing and lighting protection facilities should have been revised with the appropriate data and its criteria considering the actual condition of the

electric facilities in Vietnam, while also making a comparison with standards in Japan and international standards.

2) The Revision of Existing Technical Regulations Vol.5 to Vol.7 for the Inspection, Operation and Construction of Power Network Facilities

Although the existing technical regulations Vol.5 to Vol.7 are revised in the Previous Study by JICA and have already been validated by the legal system, when they need to be revised again regarding the contents, additional revisions should have been conducted during this Project. Both technical regulations Vols.1 to 4 and Vols.5 to 7 should have been revised and restructured from the viewpoint of entirety.

3) Coordinating with Relevant Regulations and Preventing Conflicts with Existing Legal System

It is important when developing technical regulations for power networks to include proper facility planning. And it is also necessary to consider the future liberalization of the Vietnamese power market and to have high levels of versatility in conformity to international standards. On the other hand, Vietnamese power utilities are already operating in compliance with their own company's rules and manuals. It was necessary to study the contents of existing rules and reflect them in newly proposed technical regulations in order for them to be appropriate to the current condition of the power industry.

2.5 Basic Policy for Development of Guidelines for Technical Regulations

The basic policies for the development of the Guidelines for technical regulations employed in this Project are described as follows:

Basic Policy for Development of Guidelines

① The scope of the development of the Guidelines

The Guidelines will be newly developed for both the new Technical Regulations and the revised version of existing Technical Regulations Vol.1 to Vol.7.

② The purpose of the Guidelines

The Guidelines will be developed as voluntary guidance to complement and guide the use of the Technical Regulations which are the mandatory regulations stipulating the basic requirements.

③ Contents of the Guidelines

Guidelines describe the background and the meaning of provisions in Technical Regulations as well as the specific examples of detailed applications, because it is difficult to understand the implication of provisions in the Technical Regulations only by reading their stipulations of basic requirements.

(1) Policy for Development of Guidelines for Hydropower Facilities

The Guideline for hydropower facilities was developed taking into account the following:

1) Guidelines for Vol.5 and Vol.6 of Technical Standards

Vol.5 and Vol.6 of the currently existing Technical Regulations (QCVN) promulgated in 2008 involve some detailed provisions which shall preferably be stipulated in voluntary standards. Accordingly, such detailed provisions should have been moved to the Guidelines which are newly prepared in the Project as voluntary standards. The Guidelines were developed as documents which support the operation of Technical Regulations taking account of consistency with the existing Technical Regulations.

2) Guideline for New Technical Regulation under MOC

The Guideline for the technical regulation under MOC that are newly developed in the Project was prepared referring to the existing regulations and standards in Vietnam and Japan, practical guides for technical standards or codes in the USA which are widely applied throughout the world, etc. On the other hand, conformity with the existing regulations and standards used in Vietnam should have been maintained in the Guideline.

There are design standards and regulations related to civil works including dams and reservoirs issued and promulgated by MOC in cooperation with MARD so far. Therefore, it is necessary to maintain consistency between them and the Guideline for technical regulations for hydropower civil works prepared in the Project in principle. Taking into account this point, the Guidelines for technical regulations for hydropower civil works was developed in a systematic manner as much as possible by means of discussions in WG meetings, workshops hold by JICA Team and MOC, etc.

(2) Policy for Development of Guidelines for Thermal Power Facilities

The development of Guidelines in the thermal power sector was executed taking into consideration following issues:

1) Generality of Contents of Guidelines

The provisions in the Guidelines, as a supporting document to the technical regulations, shall be considered as an alternative to the concrete implementation of the requirements specified in the mandatory technical regulations. In other words, it seems that the Guidelines are directly linked to the practical operation of power plants compared with the mandatory technical regulations.

Therefore, if items such as internal rules at a particular plant or equipment were included, the Guidelines may be more difficult to apply for the operation of many power plants.

Also, in some power plants, although manufacturers are different from plant to plant, plant owners create their own operational manuals referring to the manufacturer’s reference material. Therefore, the content of the Guidelines needs to accommodate a certain variety of views while not focusing only on a certain plant and equipment or manufacturer.

2) Separation of Technical Regulations with Guidelines

It is expected that the Guidelines covering a wide range of views are compared with the mandatory technical regulations. So, it is necessary to create the Guidelines so as to be not only consistent with the contents of the technical regulations which are at an upper level, but also to promote consistency and coordination within the contents of the Guidelines themselves.

3) Response to Environmental Conservation and Large-scale Thermal Power Plants
The design and operation of environment-related facilities and equipment (including ash handling equipment) to prevent air, noise, vibration, water and soil pollution should be carefully considered in the Guidelines as the same shall be done for the technical regulations.

Also, the Guidelines for large-scale thermal power plants (coal-fired, gas combined cycle), as the technical regulations, shall be supported in the Project.

4) Coordination with Existing Regulations and Laws
In creating new Guidelines, it shall be noted that the related standards and regulations as well as technical regulations have already been promulgated by MOIT. In creating new Guidelines, detail studies on the existing relevant documents and their contents are needed, and coordination is essential to promote the integrity of the contents of the Guidelines and related documents.

(3) Policy for Development of Guidelines for Power Network Facilities

Although the Guidelines for the power network system should have been developed according to the aforementioned way regarding the development of the technical regulations, it was necessary for the development of the Guidelines to especially consider the following items:

1) Coordination among the Guidelines Vol.1 to Vol.5
The Guidelines Vol.1 to Vol.5 should be developed in accordance with the framework of the Technical Regulations Vol.1 to Vol.5. In the development of the Guidelines, it is important to organize each provision of the Guidelines in a systematic order.

2) Contents of the Guidelines
It is sometimes difficult to gain an understanding by referring only to the clauses of Technical Regulations that describe conceptual and functional issues. Therefore, the Guidelines should describe both the background and the meaning of the provisions in technical regulations and should involve useful stipulations such as examples of practical applications. The reason is that the technical regulations basically show the basic requirements as mentioned before. Regarding the Guidelines for the power network system especially, it is necessary that these Guidelines enable electric power engineers in Vietnam to make rules and manuals for their organizations, because they need to carry out the entire process of engineering including facility design, construction, inspection, operation and maintenance by themselves.

2.6 Basic Issues confirmed in the Project Activities

The basic issues confirmed in the course of project activities in relation to the development of Technical Regulations and Guidelines are described as follows:

2.6.1 General Issue

(1) Status, Contents and Structure of Guideline

Regarding the status and contents of the Guidelines, it was confirmed in the 5th JMC Meeting on November 17, 2011 to prepare the Guidelines with stipulations of only voluntary provisions relating to the mandatory requirements in the corresponding Technical Regulations. The concept of relationship between Technical Regulation and Guideline is shown in Fig.2.6.1-1 below.

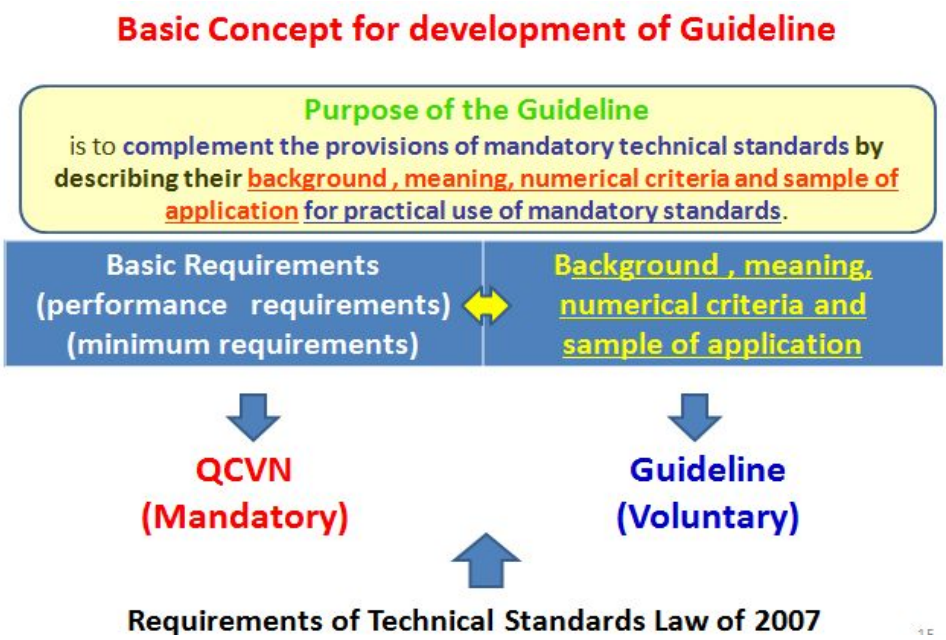


Figure 2.6.1-1 Conceptual Status of Guideline

Regarding the structure of Guidelines, JICA Project Team proposed to arrange the articles in Guidelines corresponding to each article of Technical Regulations (article by article) as shown in Figure 2.6.1-2 below, and the proposed structure of Guidelines was agreed among the parties concerned in principle.

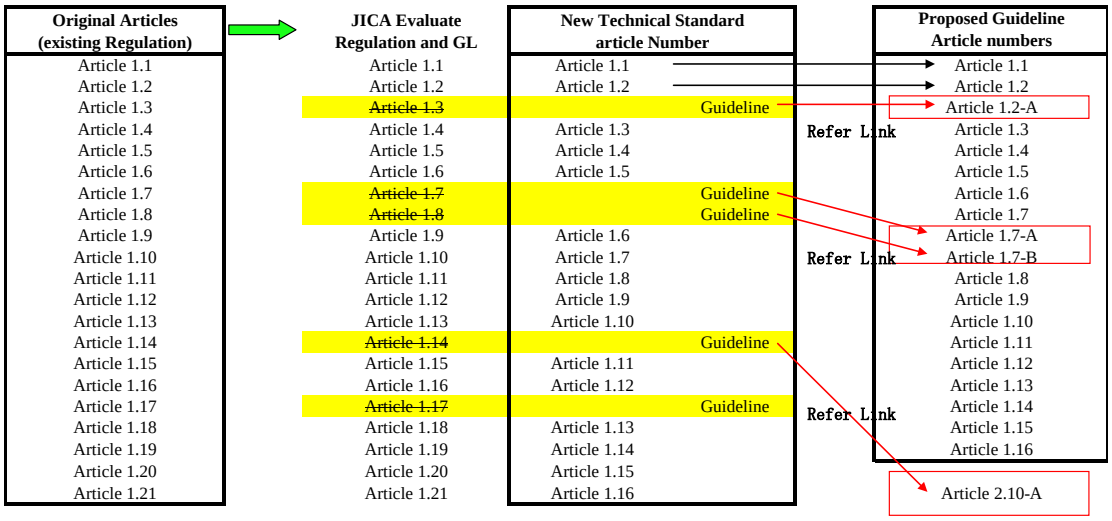


Figure 2.6.1-2 Arrangement of Article Numbers in Technical Regulations and Guidelines

(2) Scope of Output

Vietnamese side requested JICA Project Team to prepare detailed documents and manuals in the Guidelines. In this regard, JICA Project Team confirmed that administrative manuals including the following were out of scope of the Project;

- Manual of completion inspections
- Manual of remaining plant life assessment for electric power facilities
- Manual of daily and periodic inspections
- Test procedures under construction
- Standards of plant efficiency and auxiliary power ratio etc.

The above detailed documents and manuals should be prepared by EVN or private companies by themselves.

(3) Responsibility of final translation into Vietnamese

In the 3rd and 4th JMC Meetings held on March 04, 2011 and July 05, 2011 respectively, the JICA Protect Team reconfirmed that the official output of the Project was English version and that the Vietnamese side should take responsibilities for translation of the output into Vietnamese for their promulgation. The Vietnamese side participants confirmed that they fully understood this matter.

(4) Renumbering of Volumes of the existing Technical Regulations

In the 4th JMC Meetings held on July 05, 2011, it was agreed to rearrange the volume number for the existing Technical Regulations under MOIT incorporating the new Technical Regulation as follows:

New Volumes	Old (current) Volumes
Vol.1: Design of network facilities	← Vol.1 to Vol.4: Design of network facilities
Vol.2: Design of Thermal Power Facilities	-
Vol.3: Construction of Network Facilities	← Vol.7: Construction of Network Facilities
Vol.4: Operation of Power Facilities	← Vol.6 Operation of Power Facilities
Vol.5: Inspection of Power Facilities	← Vol.5 Inspection of Power Facilities

(5) Old-New Comparison Tables

The Vietnamese side requested the JICA Team to prepare Old-New Comparison Tables in order to show how the existing Technical Regulations have been revised and how the opinion of Vietnamese side have been reflected in the revisions. The JICA Project Team agreed to prepare Old-New Comparison Tables and submitted the English version and Vietnamese version of them to MOIT on October 31, 2011 as follows:

- Technical Regulation Vol.1 (for combined version of the existing QCVN Vols. 1 to 4)
- Technical Regulation Vol.3 (for the existing QCVN Vol.7)
- Technical Regulation Vol.4 (for the existing QCVN Vol.6)
- Technical Regulation Vol.5 (for the existing QCVN Vol.5)

(6) Finalization of Draft Technical Regulation for promulgation

1) Technical Regulations under MOIT

In the Midterm Evaluation Workshop held on February 13, 2012, the Vietnamese side insisted that there were still inconsistencies related to the structure in the Final Draft Technical Regulations submitted in August 2011 and these inconsistencies should be corrected in the final version of Technical Regulations in the 2nd Stage.

As the result of discussion in the 3rd JCC Meeting held on February 17, 2012, MOIT and the JICA Team agreed that the both sides conduct comprehensive reviews on the drafted Technical Standards of the MOIT scope and compile comments and counteroffers how to improve and refine the draft by the end of March, 2012. In this process, it was agreed that the JICA Team should be responsible for the quality of the draft in English and practical advices for the Vietnamese side from the technical aspect, and MOIT should be responsible for refining and finalizing the draft in Vietnamese for promulgation.

Based on the results of the reviews complied in the comment tables , the both sides of MOIT and JICA Team discussed and concluded the solutions in the Working Group meetings held in May 2012. Then, as the result of discussion in the 4th JCC Meeting held on May 16, 2012, it was agreed that JICA Team would submit the revised Final Draft by the end of July 2012, and that MOIT would review and refine the revised Final Draft by September 2012.

Furthermore, in the 6th JMC Meeting held on November 01, 2012, it was agreed that JICA Team will provide Vietnamese side with technical support for their further refining of Final Draft Technical Regulations.

Finally, in the 7th JMC Meeting held on April 24, 2013, it was agreed that JICA Team would submit the revised Final Draft of Technical Regulations to MOIT by June 2013, and JMC receive them in the 8th JMC Meeting held on June 5, 2013.

2) Technical Regulation under MOC

In the 2nd Stage, MOC organized internal workshops in August 2011, December 2011 and May 2012 to correct the comments of experts for finalizing the drat Technical Regulation on Hydropower Civil Works to be promulgated by MOC. JICA Team has updated the draft several times based on the comments of experts participated in the workshops from time to time. In the workshop held in May 2012, the draft proposed by JICA was basically accepted subject to further revisions for some inappropriate contents including the translation and used technical terms.

After the above, however, MOC reported the comments of MOC's leader which requested further review and revisions taking into consideration the problems occurred at the existing Song Tranh 2 dam in the central region of Vietnam, of which the causes were attributed to design and construction of dam structure. Then, after plenty of reviews and discussions with MOC and Vietnamese experts employed by MOC, JICA Team submitted the Final Draft of Technical Regulation on Hydropower Civil Works to MOC at the beginning of June 2013, and JMC receive it in the 8th JMC Meeting held on June 5, 2013.

(7) Promulgation of Technical Regulations

In the 2nd JCC Meeting held on November 17, 2011, MOIT proposed that the Technical Regulations and Guidelines for Vol.1 to Vol.5 would be promulgated simultaneously as the both documents were closely related each other and it would be necessary to revise Technical Regulations during preparation of Guidelines. This issue was discussed and agreed in the JICA's Interim Project Review Mission in February 2012 as the revision of PDM was required for the change of promulgation schedule with regard to the evaluation index for achievement of the Project Purpose.

On the other hand, in the 2nd JCC Meeting, MOC expressed its intention to promulgate Technical Regulations under MOC by the end of 2012 without waiting for the promulgation of Guideline.

(8) Dissemination of Guidelines

In the 7th JMC Meeting held on April 24, 2013, JICA Project Team provided the Vietnamese side with the recommendations to disseminate the Guidelines through proper publishing measures by defining its status clearly as a voluntary reference document.

Vietnamese side explained the policy for dissemination of Guidelines as follows:

1) MOIT

MOIT recognizes that Guidelines will be helpful for EVN and IPP groups such as PVN and VINACOMIN as well as operators of power plants and network operation units. However, the measures for the dissemination of Guidelines which shall conform to the relevant laws and regulations are still under consideration.

2) MOC

MOC recognizes necessity of Guideline. The Guideline for Hydropower Civil Works to be proposed in this Project will be informative and helpful for MOC as a material for defining the specification of the project and also be useful for human resource development in Vietnam.

2.6.2 Hydropower Issue

(1) Scope of Application of Technical Regulation Vol.4 and Vol.5

It was agreed that the current scope of application for the civil works stipulated in the existing Technical Regulations Vol.5 and Vol.6, in which the hydropower plants with the special dams with the reservoirs over 1,000,000,000m^3 defined by Government Decree No.143/2003/ND-CP were excluded, was revised so as to apply the provisions of revised Technical Regulations Vol.4 and Vol.5 (former Vol.6 and Vol.5) also to the hydropower plants with special dams.

Also, after the discussions in the WG Meetings, the following scope of application was proposed by JICA Project Team in the Final Draft of Technical Regulations Vol.4 and Vol.5:

"This regulation applies to civil works and electrical equipment of all hydro power plants located in Vietnam and connected to the National Grid."

(2) Scope of Technical Regulations for Design, Construction and Completion Inspection of Hydropower Civil Works

It was agreed that the scope of the Technical Regulations on Hydropower Civil Works under MOC was limited to ones for hydropower generation, and, regarding the environmental issues, the detailed environmental regulations and standards were out of the scope of the Project as they are under responsibility of MONRE.

Also, it was agreed that the Technical Regulation on Hydropower Civil Works should apply to the hydropower plants forming reservoirs and hydropower plants without reservoir with installed capacity equal to or greater than 30 MW, but it was it was allowed to apply the technical regulation to the hydropower plants with installed capacity less than 30 MW depending on the judgment of the investor of each hydropower plant.

2.6.3 Thermal Power Issue

(1) Absence of Recourse and Legal Force

1) This is the major issue of application of the mandatory regulation. If the new regulation is applied to the power plant with COD after 2009, the old mandatory regulation shall be applied to the old power plant. If the new regulation is applied to all plants going back to past, the old regulation shall be treated as just a voluntary standard. MOIT should consider the absence of recourse and the regal force of the technical regulations and decide how to treat it as Law and Regulation.
2) The application of the three technical regulations shall be considered in the process of legislation by MOIT. JICA Thermal Power Team recommended applying design technical regulation to the plant excluding the existing ones and the plants which are under installation. The QCVN-5&6 have already been promulgated and MOIT says to apply to all power plants. In case of existing IPP or BOT, it may depend on how it had been contracted at the time the project was approved.
3) It is the worldwide common sense, unless it immediately affects people's safety and health, the new law and regulations is not applied to existing facilities like building codes. However, the improvement and correction to meet the new regulations by multiplying the cost of care at the discretion of the Owner is recommended. This is a big issue, and MOIT should consider in the process of legislation.

(2) Performance Requirement Type Technical Regulation

1) The standard law No. 68 clearly says the role of mandatory regulation and the role of voluntary standard. The technical regulation is required to stipulate safety, environmental and hygiene requirements. It is not required to stipulate how to calculate the thickness of turbine casing, what kind of material to apply to gas turbine blade, how to operate steam turbine, how to maintain control equipment and when to conduct the major overhaul. All counterparts should understand the philosophy of standard law.
2) It is impossible to originally to establish the detailed criteria which can be applied to all existing power plants in Vietnam. It is necessary to throw away the narrow idea only to conform to the detailed rules as set forth by states. It is necessary to consider what to do for their power plants by themselves in mind of the minimum requirements of technical regulations. It is necessary to understand that the old “specification requirement type technical regulation” has been replaced with “performance requirement type one”.

(3) Voluntary Security and Independent Safety Measures

1) The generation companies who installs electric facilities shall, in order to ensure safety of the construction, maintenance and operation of electric facilities, pursuant to the provision of Electricity Law, Ordinance and Technical Regulation, establish the safety regulations (administration manuals) for each organization in charge of the electric facilities of which should be secured uniformly.
2) The technical regulation stipulates “to implement major inspection once in no longer than 6 years”. It means that the kind and interval of inspection shall be decided and

conducted by each power station depending on the status of power facility. The advanced power generation facility which has little trouble may conduct major inspection every 6 years, on the other hand, the old power facility which has a lot of troubles may conduct major inspection every year. If it is failed to conduct required inspections and the unplanned outages increased due to more problems, it causes the loss of mission as power generation companies. The frequency of major inspection will be decided to depend on the economic principle, such as revenue reduction due to unplanned outage or increased cost of periodic inspection, etc. The counterpart should understand the heavy responsibility of voluntary security.

(4) Relation between Technical Regulation, Voluntary Standard and Guideline

1) The technical regulation is the minimum and technical requirement required from the view point of safety and security, and the voluntary standard is the reliable source of means, procedures and criteria to achieve them. TCVN, international standards, regional standards, industry standards, manufacturer's standards, etc. are applicable to them as shown in following Fig-2.6.3-1 and Fig-2.6.3-2. It is the Owner's contractual selection to apply any kind of standard as long as they are met the technical regulation.
2) The relation between technical regulation and guideline is not "concept and summary" and "detail manual and procedure". The technical regulation is "minimum requirement or goal", and the safety regulation or administration manual is "specific implementation procedure", and the guideline is "reference which shows points and an example for implementation".
3) Unless otherwise specified in the particular technical regulations, the guidelines are the same way as the position of another standards including the manufacturer's O&M Manual, international standards, Old Norms and EVN group norms and do not include mandatory issues. In order to achieve the matters required by technical regulations, Owner is used to select international technical standards. If the technical regulation said "shall be manufactured of appropriate materials and with appropriate construction", "ASME formula applied to the structure investigation and JIS materials used to ensure adequate strength" is explained by voluntary standards. The guiding and instruction how to use them is the role of guideline.
4) Though the establishment of TCVN is not our duty, it might be misunderstood because of the description of "special TCVN" which JICA Team used to explain the status of Guideline as a voluntary document. The guidelines are intended to help and develop safe regulations when teaching an introduction to relevant international standards should be the interpretation of technical regulations and references. There are many related standards, it is impossible to copy and divert even if the whole or part because of the copyright and reference fees. It can only introduce the title and summary. The power station shall purchase related standards itself and establish the administration manuals with reference to these guidelines.

5) The example and reference of the detailed definition, interpretation, procedure, criteria and reference standard, etc. will be introduced as guideline. However, it shall be paid attention that they are not detailed stipulation like voluntary standard and manuals.

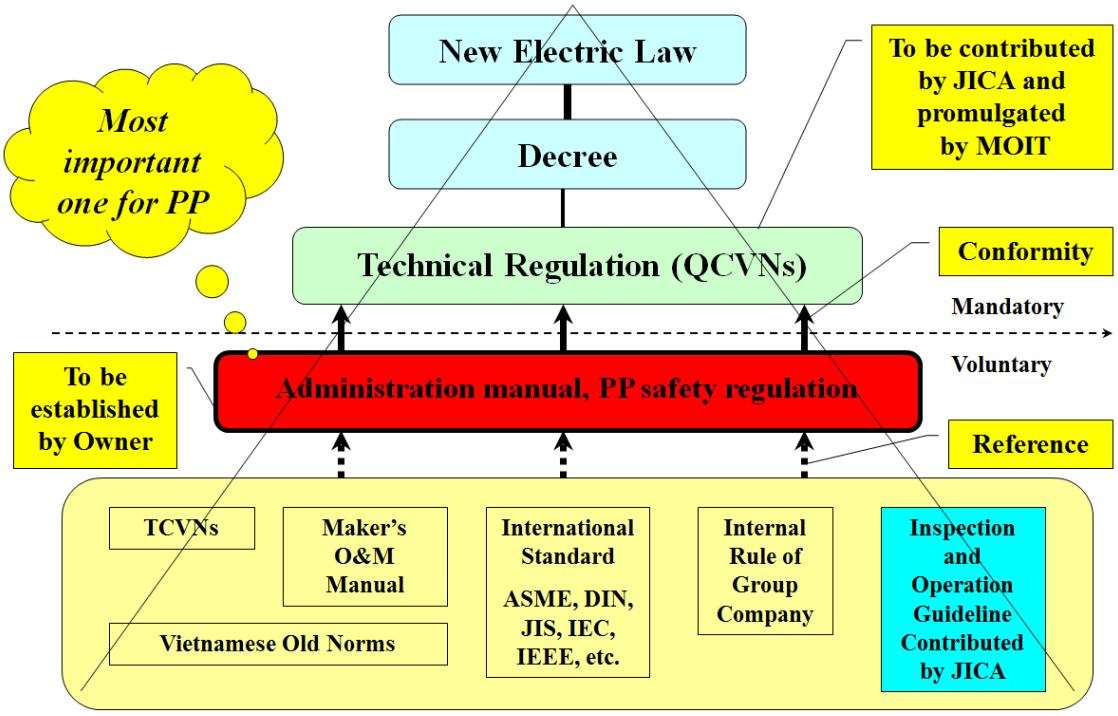


Figure 2.6.3-1 Conceptual legal pyramid for inspection and operation

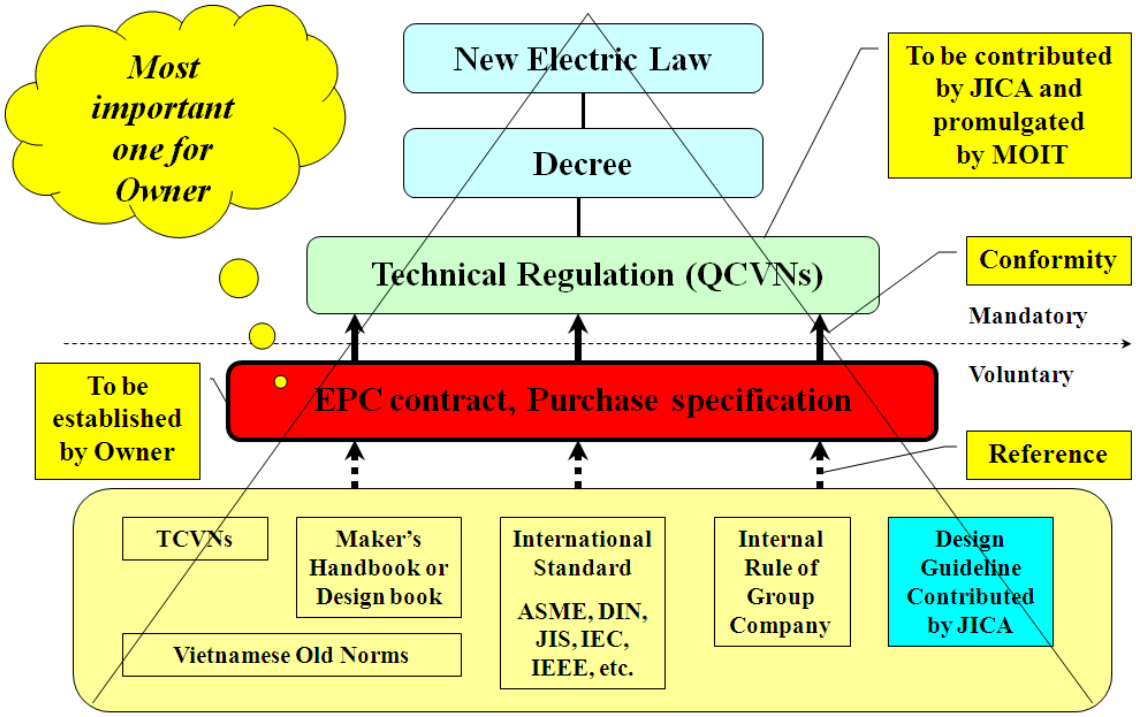


Figure 2.6.3.-2 Conceptual legal pyramid for design

(5) Scope of Development of Technical Regulation

1) The technical regulations stipulate minimum technical requirements, and do not cover all equipments and functions. Contents such as technical instructions, manuals, and procedures and how to use should not be stipulated in the technical regulation, however, the necessary items are considered to be provided in the guideline.

2) In the case of thermal power plant, the minimum unit which NLDC is capable to control may be the minimum output of unit-type facility and combined output of combined-type facility. The application scope of generation facility shall be defined in the technical regulation.

3) We added measuring and protection equipment, monitoring and alarm equipment provision in the design technical regulation, although they are out of original scope of this project. It is impossible to stipulate of control equipments in design, operation and inspection technical regulation uniformly, because it has much manufacturer's know-how and the rapid progress of technologies.

2.6.4 Network Issue

(1) To arrange the framework of Guidelines corresponding with the Technical Regulations

In the project activities of network, the most of the articles in Technical Regulations are simplified and revised as basic concepts and, on the other hand, detailed descriptions will be developed in Guidelines as separated volumes. The important things for proposed Technical Regulations and Guidelines are easiness for anyone at anywhere as references on the site. Both Technical Regulation and Guideline are corresponding each other and new Guidelines for Vol.5 to Vol.7 should be referred by existing company’s manuals.

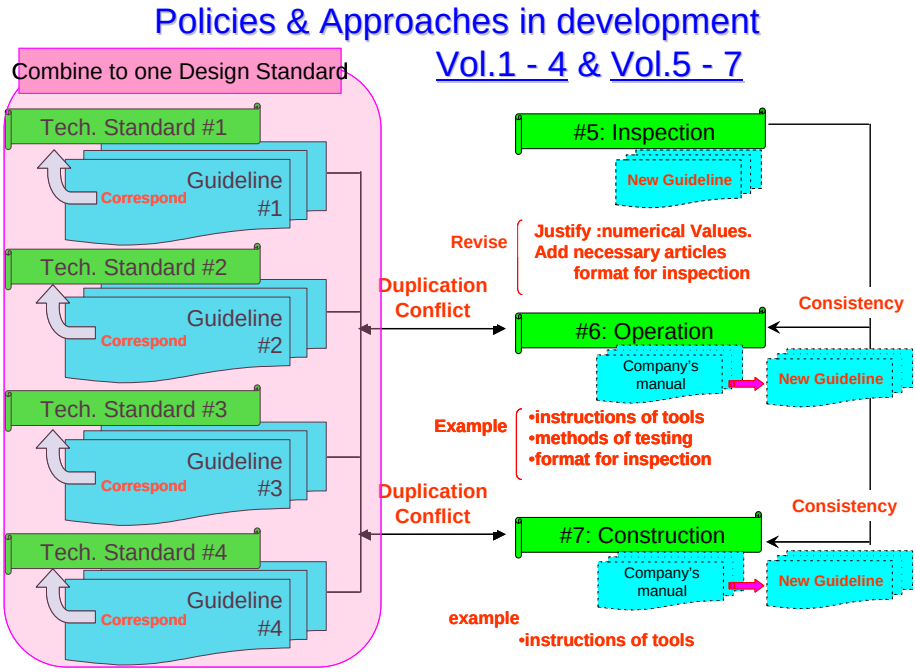


Figure 2.6.4-1 Policies and approaches in developing Technical Regulations and Guidelines

(2) Rule for numbering and name of the volume

JICA conducted the consultation of entire Technical Regulation and restructured appropriate lineup of the regulation. After discussion with Vietnamese side, both side agreed to develop Technical Regulation in the volume as listed below.

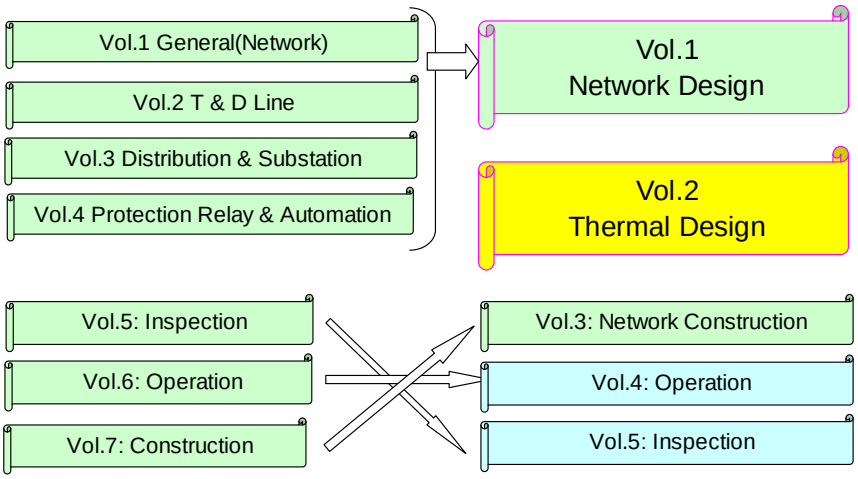


Figure 2.6.4-2 Proposed Structure of Technical Regulations

(3) To define "National Grids"

In the existing Technical Regulation, there are many definitions and similar word that is unclear. For example "National Gird" is defined as follows,

"National gird is the electrical power system composed of power generating stations, transmission and distribution lines, power transformers and other relevant equipment, which is operated nationwide in order to manage and control supplying electrical power."

Part 2 Project Activities in the 1st Stage

3. Result of Review Report

3.1 Hydropower Issues Regulated by MOIT

3.1.1 Problems in the Existing Technical Regulations, Voluntary Standards and Related Documents

Based on the current status of Technical Regulations in Vietnam and the current situation of its electric power sector, the problems and necessity of rearrangement and development of Technical Regulations and Guidelines for hydropower facilities were recognized as stated below:

(1) Vol.5 Article 74 Definitions

Article 74 provides a definition of a pumped storage project. In this context, the revised Vol.5 and Vol.4 (former Vol.6) shall provide provisions related to structures and equipment for a pumped storage power plant currently planned in Vietnam.

(2) Status for Inspections in Vol.5

Both “Chapter 3 In progress Inspection” and “Chapter 4 Completion Inspection” in Vol.5 can be classified basically by the inspection situation, such as a “dry test” and “wet test” taking the condition of filling water in the turbine into consideration. In this context, the contents of inspections should be rearranged in the revised Vol.5.

(3) Provisions for Pumped Storage Power Plant

Both of Techncial Regulations Vol.5 and Vol.4 (former Vol.6) and their Guidelines shall be provided with provisions concerning the inspection and operation for the pumped storage power plant.

(4) Missing issues in Vol. 5

The major missing issues in the existing documents of Vol.5 were detected as follows:

1) The inspection item for the electrical equipment of the generator main circuit, such as the main circuit breaker, disconnecting switches, and the main transformer
2) The operation test for a braking system and oil lifting device of the generator
3) The inspection item for the protective relay test of the electrical equipment
4) The inspection item for the input test and input rejection test of the pumping mode
5) The inspection item for a condenser operation for the generating and pumping mode.

(5) Crossing over of contents in Vol.4 (former Vol.6)

Many Articles have provisions crossing over the fields of hydropower, thermal power and network facilities. In this regard, the structure or cross reference system of Articles in Vol.4 should be discussed among each group during the course of modification of Vol.4.

3.1.2 Structures of the Technical Regulations

It was concluded that Technical Regulations Vol.5 would be updated maintaining their scope covering the completion inspection and periodic inspection of the entire power facilities excluding the completion inspection for civil structures and all inspections for foundations and towers of transmission lines, distribution lines and substations. Also, it was concluded that additional provisions would be provided for particular inspections for the equipment of the pumped storage power plant and for the missing issues in the current version of Vol.5 shown in Item (4) of Section 3.1.1 above subject to conclusion of discussions in the WG Meetings.

As for Technical Regulation Vol.4, it was concluded to update it maintaining its scope covering the operation of the entire power facilities, and to provide additional provisions for particular issues in the operation of the pumped storage power plant.

3.1.3 Policies and Approaches in Revisions to the Existing Technical Regulations Vol. 5

Technical Regulations Vol.5 “Inspection” provides the necessary matters concerning the in-progress inspection, completion inspection and periodic inspection for network facilities and power plants. It was concluded that Vol.5 would be updated by moving such provisions that were not suitable for technical regulations to the Guidelines so that the updated Technical Regulations should cover only the basic performance requirements for power facilities to comply with the policy of the Standardization Law of MOST.

3.1.4 Policies and Approaches in Revisions to the Existing Technical Regulations Vol. 6

The existing Technical Regulations Vol.6 “Operation Power Plants and Grid” provides technical requirements to be fulfilled during the operation and maintenance of network facilities, hydropower plants, and thermal power plants. It was concluded that the existing Vol.6 would be updated by moving such provisions that were not suitable for technical regulations to Guidelines so that the updated Technical Regulations would cover only the basic performance requirements for power facilities to comply with the policy of the Standardization Law of MOST.

3.2 Hydropower Issues Regulated by MOC

3.2.1 Problems in the Existing Technical Regulations, Voluntary Standards and Related Documents

The outline of the problems recognized in the existing Technical Regulations, voluntary standards and related documents are described as follows:

(1) TCXDVN 285:2002: Hydraulic Structures – The basic stipulation for design

TCXDVN 285:2002 is regarded as the core standard for hydropower civil structures. However, it involves the following notable issues:

1) There are differences in project classification criteria between TCXDVN 285 and the latest classification of the hydropower project provided in QCVN 03:2009/BXD.
2) Some criteria of the guarantee level of the water supply are not adequate for the demands of economic development, especially in the current conditions of global environmental change.
3) TCXDVN 285 does not stipulate specific articles regarding the flow discharge returning downstream after the construction of a reservoir to meet the productive requirements as well as the environment flow.

(2) Issues in Other Documents:

1) TCXDVN 335:2005: Son La Hydropower Project – Technical Design Standard
   This voluntary standard involves application of the technical standards of several countries including Russia and USA .

2) TCXDVN 315:2004: Son La Hydropower Project - Basic Stipulations for safety and stabilization of the construction - Design Standard for temporary works:
   This voluntary standard also involves application of the technical standards of several countries including Russia and USA.

3) 14 TCN-2004: Cua Dat Reservoir - Headworks - Design Standard in Technical Design and Construction Drawing Stage
   The design criteria of this industrial voluntary standard are too detail to adjust to other voluntary standards.

4) TCVN 8215:2009 Hydraulic Structures - Major regulations on installation design - observation equipment of water headworks
   This voluntary standard stipulates in detail the observation items for a dam and the arrangement of instruments and shall be used for reference for the arrangement of instruments which shall be left to the discretion of designers and/or dam owners.

3.2.2 Structure of Technical Regulations

MOC is responsible for the regulations on design, construction, installation, and completion inspection of hydropower civil structures. However, the particular Technical Regulations for the hydropower civil structures have not been prepared by MOC so far. In this context, Technical Regulation and Guideline shall be prepared for the scopes under MOC.

The structures of the Technical Regulations and Guidelines related to hydropower issues regulated by MOC were initially proposed in the Review Report as follows subject to modification during the course of the development of Technical Regulation for Hydropower Civil Works:

Part 1 General
  Chapter 1 General Provisions
  Chapter 2 Particular Provisions
    Section 1 Requirements for Project Implementation

Section 2 Exemptions
Part 2 Design
Chapter 1 General Provisions for Design
Chapter 2 Fundamental Requirements
Chapter 3 Dam
Section 1 Common Rules
Section 2 Concrete Dam
Section 3 Fill Dam
Section 4 Spillways and Other Discharge Facilities
Chapter 4 Waterway
Chapter 5 Powerhouse and Other Facilities
Chapter 6 Reservoir
Chapter 7 Downstream Area
Part 3 Construction
Chapter 1 General Provisions
Chapter 2 Examination and Inspection
Part 4 Completion Inspection
Chapter 1 General Provisions
Chapter 2 Examination and Inspection

3.2.3 Policies and Approaches in Development of the New Technical Regulations

The national voluntary standards (TCVN) refer to standards or calculation methods from foreign standards and manuals. However, this can cause problems because foreign standards may have individual ideas regarding safety factors, load factors, material strength, etc. depending on the nature of each country so that they may contradict one another. In this sense, it is important to take into account the national conditions in Vietnam even if foreign standards are accepted in general.

Taking into account the current status of the relevant Technical Regulations (QCVN), voluntary standards (TCVN) and other documents in Vietnam, it was proposed that the new mandatory Technical Regulations for design, construction and completion inspection would be developed with the following approach:

(1) General approach

As there are no particular mandatory Technical Regulations for the design, construction and completion inspection of hydropower facilities, a draft of new mandatory Technical Regulations for hydropower facilities (civil works and hydromechanical equipment) would be developed by further reviewing and referring the existing Technical Regulations and voluntary standards in Vietnam as well as major foreign standards.

(2) Flexibility of design approach

The design approach should be applicable more widely than the current approaches provided in TCVN documents. Specifically, if a designer could prove the equipment to be stable and safe, a design based on internationally accepted standards should be accepted. However, the policy of design, manufacturing and installation are related each other. In this sense, if the method of design and allowable tolerance were based on different policies, there would be a shortfall or mismatch against requirements so that the structure could not be guaranteed in regards to its safety or could be unnecessarily safe with over investment. This issue shall be taken into account in preparation of the mandatory Technical Regulations particularly for civil work structures.

(3) Consistency with Mandatory Technical Regulations under MOIT

Although the new mandatory Technical Regulations for the scope regulated by MOC is prepared separately from those under MOIT which covers periodic inspection and operation of hydropower civil works and hydromechanical works, there are some issues related to each other such as the requirements on inspection and monitoring of civil structures and the design of instrumentation equipment. Such issues shall be also taken into account in the process of development of new mandatory Technical Regulations.

3.3 Thermal Power Issues Regulated by MOIT

Prior to formulating the amendments of existing technical regulation and establishing the new draft technical regulation, JICA Thermal Experts has conducted related research about following items of each technical regulation according to the following policies. As the result of review work, JICA Thermal Experts organized the results as “Review Report” and reported to MOIT, MOC and JICA.

(1) Current Status of Technical Regulations and Guidelines Related to Thermal Power Regulated by MOIT

1) Investigation and Analysis of Laws, Ordinances and Standards Related to Power Activity

(2) Problems with Existing Technical Regulations, Guidelines and Related Documents

1) Issues with Existing Technical Regulations

(3) Proposed Structures of the Technical Regulations and Guidelines related to Thermal Power Regulated by MOIT

1) Latent danger in thermal power plants
2) Position of technical regulations within the legal system of Vietnam
3) Performance Provision of Technical Regulations
4) Reliable requirement by conforming to technical regulations
5) Relationship between mandatory regulations and voluntary standards

(4) Policies and Approaches in Review on the Existing QCVN-QTD-5:2009/BCT

1) Basic policies for review existing QCVN (promulgated by ministry)

2) Approaches for development
3) Conclusion

(5) Policies and Approaches in Review on the Existing QCVN-QTD-6:2008/BCT

1) Basic Policies for review existing QCVN (promulgated by ministry)
2) Approaches for development
3) Conclusion

(6) Policies and Approaches in Development of New Technical Regulations for Design of Thermal Generation Facilities

1) Basic policies for development
2) Approaches for development
3) Conclusion

(7) Policies and Approaches in Development of Guidelines for QCVN Vol.5

1) Basic policies for development
2) Approaches for development
3) Conclusion

(8) Policies and Approaches in Development of Guidelines for QCVN Vol.4 (existing Vol.6)

1) Basic Policies for development
2) Approaches for development
3) Conclusion

(9) Policies and Approaches in Development of Guidelines for New Design Technical Regulations

1) Basic Policies for development
2) Approaches for development
3) Conclusion

3.4 Network Issues Regulated by MOIT

(1) Restructuring of exising Technical Regulations Vols.1 to 4 and simplifying articles

Regarding the drafting of revised Technical Regulation, the Vietnam side agreed with JICA Team's recommendations of the combining the existing Technical Regulations Vol.1 to Vol.4. JICA Team submitted the draft of Technical Regulation after restructuring the volumes as follows.

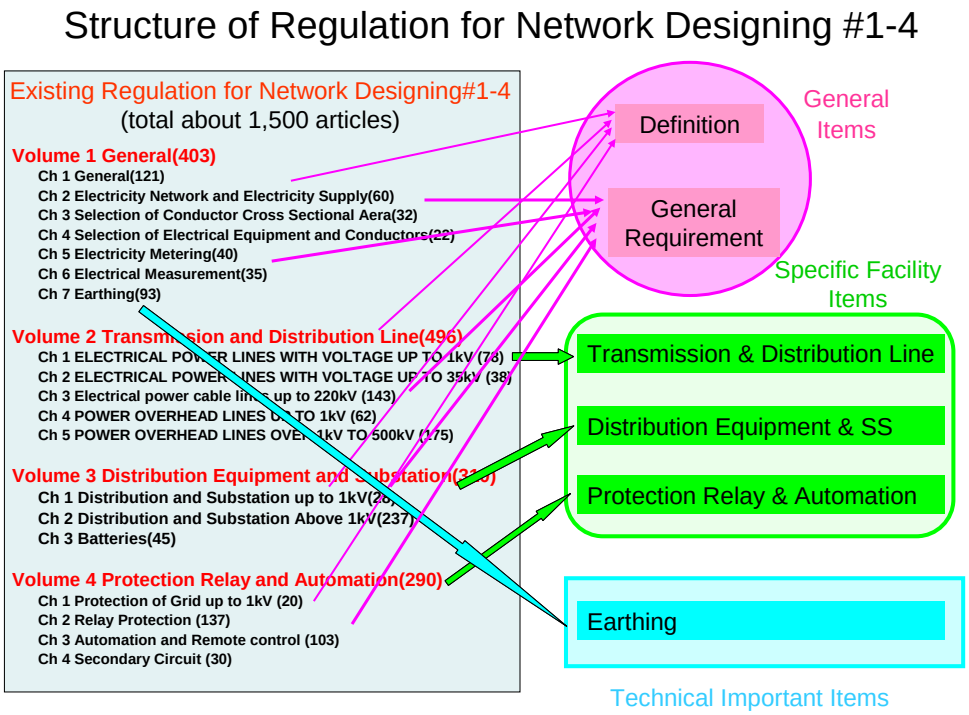


Figure 3.4-1 Restructuring of regulations Vol.1-4

(2) Shift the numerical requirements and judging criteria to Guideline

Regarding the articles which have numerical judgment criteria as technical requirement about specification, it will be undesirable and inconvenient to describe them as mandatory Technical Regulations in huge volume. In this situation, it will be supposed that some of the requirements cannot be conformed at actual design work, because the actual specifications about these requirements have to be determined case by case. Therefore it is necessary to have the flexibilities to conform all the requirements in the site condition.

The recommendation from JICA is that newly developed Technical Regulations should contain only basic performances and methods, and specific numerical requirement data will be shifted to Guidelines or manuals.

4. Project Activities of Hydropower Group

4.1 Working Group Meetings in the 1st Stage

4.1.1 Member of Working Group (Hydropower Group)

There are two Working Groups for Hydropower; WG1 (hydropower under MOIT) and WG2 (hydropower under MOC). The same members were assigned for both Working Groups as listed below:

1) Mr. Tran Viet Hoa (Science and Technology Dept. of MOIT)
2) Mr. Hien (Science and Technology Dept. of MOIT)
3) Mr. Hoang Quang Nhu (Dept. of Science, Technology and Environment, MOC)
4) Mr. Nguyen Cong Thinh (Dept. of Science, Technology and Environment, MOC)
5) Mr. Doan Trong Tuan (Vietnam Institute of Architecture, Urban and Rural Planning , MOC)
6) Mr. Le Huu Hoang (Power Generation Dept., EVN)
7) Mr. Tran Hong Tien (Power Generation Dept., EVN)
8) Mr. Dinh Vu Thanh (MARD)

4.1.2 Schedule of Working Group Meetings

During implementation of the 1st Stage, the Working Group Meetings (Hydropower) were held 10 times as listed below:

Table 4.1.2-1 Schedule of WG Meetings in the 1st Stage (Hydropower Group)

1st WG Meetings (3 Groups joint meeting)	March 16, 2010
2nd WG Meetings (3 Groups joint meeting)	June 22, 2010
3rd WG Meetings (Hydropower group-1 &2)	July 23, 2010
4th WG Meetings (Hydropower group-1 &2)	October 18,2010
5th WG Meetings (Hydropower group-1&2)	October 29, 2010
6th WG Meetings (Hydropower group-1&2)	February 28, 2011
7th WG Meetings (Hydropower group-1)	March 9, 2011
8th WG Meetings (Hydropower group-1)	March 16,2011
7th WG Meetings (Hydropower group-2)	May 19, 2011
9th WG Meetings (Hydropower group-1)	May 25, 2011
10th WG Meetings (Hydropower group-1)	June 30, 2011

4.1.3 Main Point of Discussions in Working Group Meetings

Main points of discussions in the 1st to 10th Working Group Meeting are summarized as follows:

(1) Discussions in the 1st Working Group Meetings (Hydropower-1&2)

The participants discussed preparation of a review report and electric power technical regulations and confirmed the following items in the 1st WG Meeting on March 16, 2010.

1) Works of Local Sub-consultants
2) Work Schedule
3) Documents regarding Electric Power Technical Regulations (related to MOIT)
4) Documents regarding Electric Power Technical Regulations (related to MOC)
5) Statistics of Electric Power Accidents for Baseline Survey
6) Baseline Survey on understanding of the technical regulations among the employees of electric power utilities

(2) Discussions in the 2nd Working Group Meetings (Hydropower-1&2)

The JICA Project Team proposed two kinds of status of a newly prepared guideline, a guideline is prepared as one of TCVN, or as an interpretation of QCVN at a different level of TCVN. It was agreed that the basic structure of the electric power technical standard and positioning of the guideline would be confirmed taking opinion of the Vietnamese counterpart.

The JICA Project Team explained an outline of a first draft of the Review Report Chapters 2 and 3 regarding hydropower structures.

The JICA Project Team proposed that items on inspections of equipment for a pumped storage power plant should be added to the existing technical regulations Vol.5 and Vol.6 under MOIT and that the items in the said regulations should be divided into QCVN and TCVN as those provisions include too detailed contents.

As for electric power technical regulation under MOC, the JICA Project Team proposed to review the existing TCVN including TCXDVN 285-2002 and other major standards.

(3) Discussions in the 3rd Working Group Meetings (Hydropower-1&2)

Main points of draft Review Report were presented by JICA Project Team for Chapter-2 “Hydropower under MOIT” and Chapter-3 “Hydropower under MOC”.

The following comments were stated by the Vietnamese side Working Group members:

1) Documents to be reviewed
   - 14-TCN-121 and new QCVN of MARD
   - New QCVN or Circular of MOIT
   - New QCVN of MARD (draft) prepared based on TCVDVN-285/2002
2) Classification

   Hydropower projects shall be classified by each of reservoir capacity, dam height and installed capacity, and the highest class among the classification of each criterion becomes the class of a hydropower project.

3) Overall framework and status of Technical Regulations and Guidelines
   - Overall framework of Technical Regulations and Guidelines including thermal power and network is to be discussed later.
   - Status of Guideline will be discussed and proposed in the JMC Meeting by the Vietnamese side.

(4) Discussions in the 4th Working Group Meetings (Hydropower-1&2)

JICA Team explained about the major revisions made on the existing QCVN Vol.5 and Vol.6 and major points of the new Technical Regulation on hydropower civil works including the following:

1) Revised Technical Regulation Vol.5
   - Replacement of term "standard" with "regulation"
   - Article 2: Scope of application for hydropower plants
   - Class of hydropower projects in Article 74 Definitions
   - Article 100: Frequency of periodic inspections
   - Article 120x (additional article): Water quality in reservoir
   - Revised arrangement of articles related to inspection on electrical equipments

   Vietnamese WG members provided the following comments regarding Vol.5:

   - Part 3 of Vol.5 stipulates only for turbine/generator. The stipulation regarding transformer, exciter, switchgear, switchyard equipment, protection system and control system, etc. shall be considered.

2) Revised QCVN Vol.4 (former Vol.6)
   - Article 2 Scope of application for hydropower plants (same as the proposal in Vol.5)
   - Article 62 Conditions of Penstock and cancel of Articles 63 to 65
   - Revised arrangement of articles in Part 6 related to inspection on electrical equipments

3) New QCVN on Hydropower Civil Works under MOC
   - Framework of the new technical regulation on hydropower civil works
   - Definition of authority proposed in Article 1
   - Article 5 Classification of design class
   - Article 6 to 13: Section 1 "Requirement for project implementation" and Section 2 "Exemptions"
   - Articles in Part 2 Design including Article 22 Guarantee level of hydraulic works design

Vietnamese WG members provided the following comments regarding the new QCVN for hydropower civil works:

- The title of the new QCVN shall be "Technical Regulation on Hydropower Civil Works."

- "Authority" defined in Article 1 shall include MOC and MARD but shall not be defined clearly in a mandatory regulation (QCVN). (opinion of MOC)
- Article 6 "Assignment of chief engineer" is not necessary to be stipulated in the QCVN.
- Article 8 "Order of remedy for conformance to Technical Regulations" is not necessary to be stipulated in the QCVN.
- Article 10 "Exemption" shall be included in Article 3 "Scope of Application"
- Stipulation of the guarantee level for irrigation purpose shall be reconsidered and discussed with relevant ministries.

(5) Discussions in the 5th Working Group Meetings (Hydropower-1&2)

The following are confirmed in the meeting;

1) Revised QCVN Vol.5
   - Article 2 Scope of application for hydropower plants
     Vietnamese WG member recommended to check the former MOI's Decision No.37/2006 /QD-BCN "Decision on the promulgation of Regulation stipulating the connection to national power system" dated 16 October 2006 and MOIT's Circular No.32/2010/ TT-BCT issued in July 2010 for revising the MOI's Decision No.37.
   - Class of hydropower projects in Article 74 Definitions
     It is agreed to change the classification from that stipulated in TCXDVN285:2002 (Ministry of Construction No.26/2002/QD-BXD, 28 August 2002) to the updated one that stipulated in QCVN-03/2009 of MOC.
   - Article 100: Frequency of periodic inspections
     The Vietnamese WG members requested to clarify the reason or background of the minimum frequency of 6 years proposed by JICA Team for dry inspection for waterways. Also, the Vietnamese WG members recommended JICA Team to study the current EVN regulation for determining the frequency of inspections for civil works.
   - Article 100: Paragraph 7 (proposed new paragraph for emergency Inspection)
     Additional stipulation proposed by JICA Team was agreed.
2) Revised QCVN Vol. (former Vol.6)
   - Article 60: Water filling and dewatering
     Additional stipulation proposed by JICA Team was agreed.
   - Article 62: Condition of General provision for penstocks
     Additional stipulation proposed by JICA Team was agreed.
   - Article 76: Principle of exploitation of water resources
     The Vietnamese WG members requested JICA Team to add "flood control" as one of the other economic sectors stipulated in Article 76.
3) New QCVN on Hydropower Civil Works under MOC

   The following are discussed and confirmed by MOC:

- It is necessary to involve the stipulations of survey issues in QCVN including investigation of dam foundation, environment, etc.
- Stipulations shall be provided for each type of structures (various types of dams, waterways, etc.).
- Issues related to construction progress such as general requirement for tests during construction works are stipulated in the new QCVN.

(6) Discussions in the 6th Working Group Meetings (Hydropower-1&2)

The contents of the 2nd draft of Technical Regulations were discussed and the following were confirmed in the meeting;

1) Revised QCVN Vol.5 and Vol.4

- Article 2 Scope of application for hydropower plants

  It was agreed to delete "with rated output installed capacity equal to or greater than 30MW".

  Accordingly, the provision shall be "Electrical equipment of hydro power plants located in Vietnam and connected to the National Grids."
- Scope for hydromechanical equipments in Vol.5 and Vol.4

  It was confirmed that the scope of application for hydromechanical equipments is limited to those related to safety of hydropower plants.
- Vol.5 Part 3 Chapter 1 and Chapter 2

  Contents of Chapter 1 and Chapter 2 were accepted for the final draft.
- Vol.5 Part 3 Chapter 3 Article 78 Grounding resistance measurement

  JICA Team proposed to add provisions related to grounding resistance as follows:

  "Grounding resistance value of power plant should be less than 0.5 ohm for safety reason.

  <Referred to Article 51, Part 2 of this technical regulation>"
- Vol.5 Part 3 Chapter 3 Article 79 Insulation resistance measurement

  It is agreed to move the specific provisions to Guideline.
- Vol.5 Part 3 Chapter 3 Article 82 Dielectric loss angle absorption current and polarity index

  It is agreed to delete Article 82 because Tan(δ) is not mandatory required in the test.

2) New QCVN on Hydropower Civil Works under MOC

- Article 1 Scope of Application

  It was agreed to provide the flowing provision:

  "This technical regulation shall be applied to hydropower plants which have installed capacity equal or greater than 30MW. However, this regulation could be applied for hydropower plants which have installed capacity less than 30 MW depending on the investor's judgment."

- Chapter 2 Particular Provisions for Project Implementation
  MOC requested to delete articles in Chapter 2 as the provisions are the management issues to be determined by circulars.
- Part 3 Chapter 6 Dams (design method for dams)
  JICA Team explained the design method of dams proposed in Chapter 6:
  MOC suggested to conclude the design method to be applied in the new QCVN after receiving the comments from participants of 1st Workshop.

(7) Discussions in the 7th Working Group Meetings (Hydropower-1)

The issues discussed in the 6th WG Meeting were discussed again and confirmed in the 7th WG Meeting. Major conclusions of the meeting were as follows;

- Vol.5 Article 2 Scope of Application Item 2. (2)
  It was agreed that the scope of application for the Technical Regulation under MOC will be discussed with MOC separately.
- Vol.4 General: Monitoring plan
  It was agreed to provide an additional provision in Vol.4 regarding the requirements for monitoring plan.
- Inspection and reassessment
  It was agreed to add some provisions in Vol.4 taking into account Article 14 and 17 of Decree No.72-2007.
- Vol.5 Chapter5 Section 1 Article 100 Frequency of periodic inspections
  MOIT requested to review this article referring to Circular No.34/2010/TT-BCT.

(8) Discussions in the 8th Working Group Meetings (Hydropower-1)

The issues discussed in the 7th WG Meeting were discussed again and confirmed in the 8th WG Meeting together with the comment received in the 1st Workshop. Major additional conclusions in the meeting were as follows;

- Vol.5 Part 3 Chapter 3 Article 79 Insulation resistance measurement
  It was agreed to maintain the present provision without moving to Guideline.
- Vol.5 Part 3 Chapter 3 Article 82 Dielectric loss angle absorption current and polarity index
  It was agreed to remain Tan(δ) and to move other provisions to the Guidelines.
- Minimum requirements for instrumentation
  It was agreed that detailed items of inspection should be exemplified in the Guidelines.
- Inspection and reassessment
  It was agreed that the provisions in Vol.5 should be reviewed and revised taking into consideration the following 4 different inspection items; these were “Routine inspection”, ”Periodic inspection”, “Main inspection (Reassessment)” and ”Special inspection” stipulated in Decree No.72-2007.

(9) Discussions in the 7th Working Group Meetings (Hydropower-2)

Purpose of the 7th WG Meeting (Hydropower-2) was to confirm the response to the comments from experts provided in the minutes of 2nd Workshop of MOC held on April 28, 2011 at MOC for revision of the 2nd draft of Technical Regulation on Hydropower Civil Works. The major conclusions of the meeting were as follows:

- Structure, form and literary style

  JICA Team agreed to follow the form to be provided by MOC.

  Also in the MOC's opinion, the matter of writing style shall be discussed later after preparing Final Draft.

- Matter of translation into Vietnamese

  JICA Team requested MOC's assist as the official output of JICA Project was English version and Vietnamese version prepared by JICA Team was for reference only, and confirmed that Vietnamese side was responsible for the finalization of Vietnamese version, although JICA Team would make efforts to improve the quality of translation into Vietnamese.

  MOC confirmed that they would discuss with MOIT how to handle the translation matter.

- Scope and object of application

  MOC does not concern about stability of power system but concern about safety.

  In the above regard, it is agreed to determine the scope of application as follows:

  1) Hydropower plants with total installed capacity equal to or more than 30MW

  2) Hydropower plants with one or more reservoirs regardless of their installed capacity

  It was also confirmed that hydropower projects including those of multipurpose projects should follow the provisions in QCVN of MARD (QCVN-2011/BNN) for dams, reservoirs and the structures related to water regulation procedures.

- Relationship with the Draft QCVN of MARD

  MOC requested to eliminate the duplications of provisions between the new Technical Regulation on Hydropower Civil Works and QCVN of MARD.

  MOC also requested to keep the provisions of RCC dam, OBE, MCE, etc. as they are related to American Standard which shall be kept in the final draft of Technical Regulation on Hydropower Civil Works as an option of design method in an appropriate arrangement.

- Opinion of using American Stipulation in the content of this Regulation

  MOC requested to provide American Standard as an option in the final draft of Technical Regulation on Hydropower Civil Works in an appropriate arrangement.

(10) Discussions in the 9th Working Group Meetings (Hydropower-1)

Purpose of the 9th WG Meeting (Hydropower-1) was to confirm the contents of revisions made by JICA Team in Preliminary Final Draft of QCVN Vol.5 and Vol.4. The major conclusions of the meeting were as follows:

- Use of the existing QCVN Vols.1 to 4 issued in 2006 (practice on electrical equipment)
  MOIT considers that the new regulation shall be applied to the existing power plant in principal, but it is possible to use the old regulation as the voluntary standards as long as it conforms to the provisions of the new regulation. .
- Article 2: Scope of Application (Vol.5 and Vol.4)
  In the Preliminary Final Draft, JICA Team proposed new idea for scope of application as follows:
  "This regulation applies to civil works and electrical equipment of all hydro power plants located in Vietnam and connected to the National Power Transmission Network (equal or more than 110kV)."
  EVN insisted that "National Power Transmission Network" should mean the network of transmission lines equal or over 200KV and the major lines of 110kV controlled by NPT (National Power Transmission Company), so the proposed definition was different from the practice in Vietnam.
  Also, a problem may be for the small hydropower plants with reservoirs in terms of safety of reservoir.
  It is confirmed that the scope of application for hydropower is pending and will be concluded based on further study.
- Vol.5 Article 74: Definitions
  It was agreed to delete the definition of "class" as there is no provision in Vol.5 as well as Vol.4 relating to "class".
- Vol.5 Article 100-a1 to 100-a2 in Section 2 "Periodic Inspection for Flood Control"
  It was agreed to stipulate the provisions relating to visual inspections of dams and inspections of spillway structures and spillway gates in Section 2 according to the requirement in Decree No.72/2007 as suggested by MOIT.
- Vol.5 Article 100-a3 to 100-a5 in Section 3 "Periodic Inspection for Dam Safety"
  It was agreed to stipulate the provisions relating to inspections of dams in Section 3 according to the requirement in Decree No.72/2007 as suggested by MOIT.
- Vol.5 Article 101 to Article 104 in Section 4-2 "Dams" in Section 4 "Periodic Inspection for Overall Power Plant Facilities"
  It is agreed to exclude the inspection of dams and spillway from the "Periodic Inspection for Overall Power Plant Facilities".
- Vol.5 Article 100-a7 "Frequency of inspection" in Section 4 "Periodic Inspection for Overall Power Plant Facilities"
  JICA Team explained that there was no clear reason for the 3 years (maximum) as the

frequency of periodic inspection for overall power plant facilities, and 4 yeas also could be applied if Vietnamese side agrees.

It was confirmed that frequency of periodic inspection was not directly related to the frequency of overhauls and that the technical regulations Vol.5 did not cover the provisions related to repair or overhaul.

In this connection, EVN agreed to apply 3 years for the maximum frequency of periodic inspection for overall power plant facilities as the frequency of repair and overhaul should be decided by the Owner of each power plant.

- General for Vol.5

  EVN insisted that the required inspection items, such as performance test for generator and turbine before and after overhaul shall be stipulated in Vol.5.

  JICA Team confirmed that the mandatory inspection items were stipulated in Vol.5 and specific issues such as test method would be explained in the Guideline.

- Vol.6 Article 78: Water discharge and storage regime

  It is agreed to modify the Paragraph 4 as follows:

  "In flood season, the operation of reservoirs shall be prioritized for ensuring dam safety, and the flood control and water filling shall be in compliance with the functions of the projects."

(11) Discussions in the 10th Working Group Meetings (Hydropower-1)

JICA Team and the Vietnamese WG members confirmed answers to the comments received in the 2nd Workshops held in June 2011 at HCMC, Nha Trang and Hanoi. The major conclusions of the meeting were as follows:

- Protection of downstream of dam (Vol.4)

  It was agreed to add a new article in Vol.4 according to Article 22 of Decree No.72/2007/ND-CP.

- Definition of terms "excessive", "severe" and "serious" (Vol.5)

  Vietnamese side insisted that a definition of "excessive", "severe" and "serious" should be clarified, otherwise an inspector and an owner would dispute interpretation of these words.

  JICA Team proposed that provisions should be so revised as to define the extent of deterioration by "exceed estimated, allowable or designed value" as it was impractical or impossible to express the extent of deteriorations quantitatively.

- Owner's right to file a complaint (Vol.5 Article 99)

  It was confirmed that owners have a right to file a complaint against the decision of the Authority on field inspection.

  Accordingly, it was agreed that the provision in Vol.5 Article 99 "the Owner may not file a complaint against the decision of the Authority on field inspection." should be deleted

- Vol.5 and Vol.4 Article 2 Scope of Application

  The following new proposal of JICA Team in the Preliminary Final Report was discussed in the meeting:

  "This regulation applies to civil works and electrical equipment of all hydro power plants located in Vietnam and connected to the National Power Transmission Network (equal or more than 110kV)."

  It was agreed in the meeting that the new proposal of JICA Team above was tentatively accepted for Final Report to be submitted to JICA on July 25, 2011 subject to further consideration and revision on the proposal.

  Vietnamese side will further study this matter for finalization of Vietnamese version for promulgation based on the statistics data of actual situation of hydropower plants.

4.2 Site Visit in the 1st Stage

Hydropower Group of JICA Team conducted the site visits to the existing and constructing hydropower plants in order to investigate the actual sitution in application of the existing Techncial Regulations and conditions of operation and maintenance at the hydropower plants. The surveys were made through interviews and site inspections. The results of the site visits are summarized as follows (details are shown in Appridix-5 of Progress Report No.1):

(1) Son La Hydropower Project (June 24-25, 2010)

Son La Hydropower Plant is the largest hydropower plant in Vietnam located on Da River with the total installed capacity of 2,400MW. The first unit was planned to be commissioned in December, 2010.

The Pre-Operation Board (POB) is mainly responsible for supervising installation of electrical equipment and the Project Management Board (PMB) is mainly responsible for supervising civil works, and administration of the hydropower plant was planned to be transferred from PMB and POB to the Son La Hydropower Company at a time when the commissioning test for the first unit was started.

A technical standard with higher technical level is adopted if the contractor proposes another technical standard which is different from ones in the technical specifications under the contract. For example, if Chinese a technical standard which require higher technical level than IEC is proposed by the contractor, Chinese ones will be adopted.

Equipment tests are performed in order of a type test, factory test and site test. However, it is sometimes argued with a contractor which items of tests and inspections should be applied in each test stage as the clear provisions of site test are not available in the existing QCVN Vol.5. In some case, a contractor insists that the site test is not necessary for a test item saying that the factory test was already conducted for such a test item even though a TCVN requests a site inspection. For example, QCVN requests the test of circuit transformers but IEC does not have

such a provision, and, therefore, the contractor once refused to do the test of circuit transformer although the contractor finally accepted to do the test.

The existing QCVN Vol.6 does not stipulate provisions regarding the 500 kV GIS and the SF6 gas used for the GIS, and has few provisions regarding a circuit breaker. Furthermore, it does not stipulate the requirements on test equipment, so it is difficult to select a type of test equipment.

ASTM and Chinese technical standards are used for hydromechanical equipment. These standards were accepted and adopted after comparing with other technical standards such as TCVN-8299, etc. TCVN-8299 was prepared based on Russian technical standards but is not used by contractors. Technical specifications of the contract provide that penstock shall be designed according to ASTM.

MOC, MARD and MOIT (EVN) control river flood, irrigation and power generation, respectively in the Son La Reservoir. However, there is no inter-ministerial agreement regarding a reservoir operation rule and allocation of reservoir storage capacity. The operation plan of Son La Reservoir for this year was recently approved by a prime minister's order. Water use for irrigation has priority over the power generation in a dry season. The central dispatching center decides a reservoir operation rule for power generation.

The existing QCVN Vol.6 does not have detailed provisions about measurement of sedimentation in a reservoir.

The Son La Project Office does not provide employees with particular education about the electric power technical standards.

(2) Hoa Binh Hydropower Plant (June 26, 2010)

1. Dissemination of electric power technical regulations

   The latest edition of existing QCVN Vol.5 and Vol.6 were distributed to the power company in April 2010 and the staff is studying them. Operation and maintenance of a hydropower plant shall be conducted according to manufacturer's operation manuals. QCVN Vol.5 and Vol.6 are general regulations and detailed items are referred to manufacturer's manuals, so they are the most important documents.

   The Hoa Binh Hydropower Company has about 700 employees. There are more than 100 engineers, and among them, there are four civil engineers. There are 400 people of maintenance staff, 120 people of operation staff, and 120 people of measurement and monitoring staff. As for education of technical regulations, engineers shall take an examination once a year. Technical staff shall attend a safety training class once a year but they are not educated about technical regulations.

2. Maintenance of hydropower plant

The completion inspection of Hoa Binh HPP was conducted by the Government, the Ministry of Energy, the Russian consulting company and the Russian contractor according to Russian technical standards.

Civil structures of the hydropower plant such as an embankment and a reservoir are inspected at regular intervals of every three months according to the Russian contractor's standards. A test operation of crest spillway gates is conducted once a year. Waterway, turbines and generators are inspected once a year in the dry season, from November to May in a dry condition by closing intake gates and outlet gates.

Periodical inspections are conducted in the cycle of four years in the order of a usual inspection (in 1st year), repair (in 2nd year), a usual inspection (in 3rd year) and an overhaul (in 4th year).

Trouble which occurred in the hydropower plant is informed to EVN first and a report is to be transferred in the order of EVN, MOIT and MARD.

A reservoir operation rule is communicated in the order of MARD, MOIT and EVN. The order of priority for discharging water is flood control, power generation, irrigation and navigation, and priority is given to irrigation in the dry season.

According to an inter-reservoir operation rule, the flood season is from 15 June to 15 September, and flood control capacity of the Hoa Binh reservoir is to be reduced from 5 billion m^3 to 3 billion m^3 after completion of the Son La dam.

3. Design of hydropower plant

There are six crest spillway gates and twelve bottom outlet gates and these have discharge capacity of 35,400 m3/s. The discharge capacity was decided according to the Russian technical standard.

(3) Tri An Hydropower Plant (June 30, 2010)

1. Application of QCVN Vol.5 and Vol.6

The latest edition of the existing QCVN Vol.5 and Vol.6 were distributed to the power company in May 2010 and the staff is currently studying them. Training of Technical Regulations is done in accordance with the EVN's request. Engineers are responsible for educating the staff of each department. There are some articles beyond the staff's comprehension due to mistranslations in the latest edition, so the power company will inform EVN about them.

Currently the following standards are used for the operation and maintenance of the power plant:

- 199 NL/KHTK (17Apr. 1997) for operation of power generating and transmission facilities
- 48 NL/KHTK (14 Mar. 1987) " Volume and Standards for Test, Acceptance and Hand Over of Electrical Equipment"

There are no stipulations of issues regarding new technology in the above standards. On the other hand, there is a stipulation that accept supplier's standards when such stipulation is not available in the above old standards. In the case that there is a difference between the manufacturer's manual and Vol.5, it is difficult to judge which documents shall be applied. (For example, frequency of the periodic inspection is not clear in Article 127 of Vol.5 while once in 4 years are required in the old standards.).

2. Operation, maintenance and inspection of the hydropower plant

Periodical inspections are conducted in the cycle of four years in the order of a usual inspection (in 1st year), repair (in 2nd year), a usual inspection (in 3rd year) and an overhaul (in 4th year) according to the EVN's standard 447/QD-EVN-HDQT enacted on December 07, 2004. A completion inspection might have been conducted according to the governmental regulation.

Almost all electrical equipment were supplied by Russia at the beginning (more than 95%) and recently some parts of the equipment were replaced with products of European manufactures such as ABB and Siemens because of better maintenance performance and termination of product supply in Russia.

The Tri An and Da Nhim reservoir operation regulation (QTDT-1-93 of Jan.1993 and QTXL-TA-94 of Jul. 1994) decides a reservoir operation rule for flood control. Design flood is 18,700m^3/s which was decided by Russian Standards.

The power plant has an obligation to discharge 60 m^3/s of water to the downstream area even in the dry season based on the Government decision at the design stage

(4) Can Dong Hydropower Plan (June 30, 2010)

Can Dong hydropower plant was commissioned in November 2003 with the installed capacity of 76.6MW (38.8MW x 2 units) as the first hydropower plant under BOT scheme (25 years) invested by Song Da Construction Company. The interview to Can Dong HPP was held regarding the practical use of electric power technical standards and regulations for operation and maintenance of the power plant.

1. Application of QCVN Vol.5 and Vol.6

The latest edition of the existing QCVN Vol.5 and Vol.6 were not distributed to the power company yet. (Not obtained by the Can Dong Power Company)

TCVN-4117-1985 was applied for the design and construction of civil works of the project. Electrical equipment was installed applying manufacturer's manual. Also IEC standards are used for the electrical facilities.

The Can Dong Hydropower Company has 130 employees including 40 electrical engineers and 1 civil engineer. The power company is providing the staff with technical training voluntarily.

2. Operation, maintenance and inspection of the hydropower plant

Company's internal operation manual, which involves EVN's standards, is applied for plant operation of Can Don power plant. Electrical equipment is maintained according to the Russian manufacture's manual as electrical facilities including turbine and generator were supplied by Russian supplier except for control system from USA.

The Can Don reservoir is a multi-purpose reservoir including water supply for irrigation ($4m^3/s$), so that the power plant will have an obligation to release $4m^3/s$ after the irrigation project is completed. A reservoir operation rule is prepared annually in the meeting among the Thac Mo, Can Dong and Srok Phu Mieng hydropower companies and relevant organizations.

Regarding the power plant operation, the power company sends information of reservoir water level and available energy production capacity to EVN and EVN gives an order to the power company about power generation.

Periodical inspections are conducted in the cycle of four years in order of a usual inspection (1^{st} year), repair (2^{nd} year), a usual inspection (3^{rd} year) and an overhaul (4^{th} year) according to the company's rules prepared based on the EVN's standards.

(5) Thac Mo Hydropower Plant (July 01, 2010)

Thac Mo hydropower plant was commissioned in 1995 with the installed capacity of 150 MW. The interview to Thac Mo HPP was held regarding the practical use of electric power technical standards and regulations for operation and maintenance of the power plant.

1. Application of QCVN Vol.5 and Vol.6

   The latest edition of the existing QCVN Vol.5 and Vol.6 were distributed to the power company in March 2010 and the staff is studying them. The power company examines the staff on the knowledge of the standard and safety issues.

   There is a discrepancy between numerical values of the regulation and the equipment, and there are some wrong descriptions. The latest edition made the contents too concise to find detailed regulations. So, the lack of articles is being filled with an old edition of the technical regulations, EVN's regulations and manufacture's manuals. In the old standards issued by the former Ministry of Energy (48 NL/KHTK dated 14 Mar. 1987) involves the stipulation that accept manufacturer's manual when there is no stipulation in it. However, there is no such stipulation in the existing QCVN Vol.5 and Vol.6 which stipulate only general requirements, so that it is difficult to understand which standards shall be applied.

   In addition, some problems attributed to the mistranslation of English into Vietnamese are detected in Vol.5 and Vol.6. Such problems are reported to EVN from time to time. On the other hand, Company's manual will be revised in accordance with the stipulations in Vol.5 and Vol.6.

   As Thac Mo HPP was constructed in 1990's without applying current new technology, so that there are some testing items which cannot be performed at Thac Mo such as vibration measurement. International standards such as IEC are used for electrical equipment such as the circuit breaker and distributer which were supplied from ABB and Siemens.

Regarding the civil works which was designed by Ukraine except for auxiliary dams and miscellaneous structures, there is no problem concerning the stipulation in Vol.5 and Vol.6 so far.

2. Operation, maintenance and inspection of the hydropower plant

   A completion inspection was conducted by the state committee, a Ukrainian consulting company, PECC2 and a contractor. Periodical inspections are conducted in the cycle of four years in order of a usual inspection (1st year), repair (2nd year), a usual inspection (3rd year) and an overhaul (4th year) according to the standard issued by former Ministry of Energy (199 NL/KHTK dated 17 Apr.2010).

   Almost all electrical equipment is made in Ukraine based on the Russian and Ukrainian standard at the beginning and recently a part of the equipment was replaced with products of European manufactures based on IEC. There was a problem related to design of break system of generator.

   The power plant is operated in accordance with the regulation of national network system. As the Thac Mo HPP is categorized as the 2nd class HPP, EVN or MOIT determine the operation.

   Thac Mo Reservoir has roles not only in hydropower generation but also in flood control. The flood preventive plan is prepared in coordination with Can Don HPP and Srok Phu Mieng HPP. There is no obligation of minimum discharge for downstream at the present, although it may be requested in the future.

(6) Ham Thuan and Da Mi Hydropower Plant (July 02, 2010)

Ham Thuan and Da Mi hydropower plants were commissioned in 2001 with the installed capacity of 300MW and 175MW respectively and currently owned by Da Nhim-Ham Thuan-Da Mi Hydropower Company. The interview to Da Nhim-Ham Thuan-Da Mi Hydropower Company was held regarding the practical use of electric power technical standards and regulations for operation and maintenance of the power plant.

1. Application of QCVN Vol.5 and Vol.6

   The latest edition of the existing QCVN Vol.5 and Vol.6 were distributed to the power company in May 2010 and the staff is studying them.

   There are some wrong translations and obscure sentences in the latest edition. Provisions in the latest edition and those in international technical standards contradict each other. Also, there are some unclear descriptions in Vol.5 and Vol.6. For example, the minimum capacity to be covered by Viol.5 and Vol.6 is 30MW. However is it not clear if the criterion of 30MW is the unit capacity or the installed capacity of a power plant.

   Most of the major international standards are available at the Company and IEC, Japanese standards, etc. are applied depending on the facilities.

2. Operation, maintenance and inspection of the hydropower plant

Operation plan of reservoir is submitted to EVN and flood prevention plan is also submitted to EVN and MOIT through EVN.

Periodical inspections of electrical equipment are conducted based on the standard 48NL/KHTK (14 Mar. 1987) issued by former Ministry of Energy, EVN regulation (447/QD-EVN-HDQT of 7 Dec. 2004) and manufacturer's manual in the cycle of four years in the order of a usual inspection (1st year), repair (2nd year), a usual inspection (3rd year) and an overhaul (4th year) like other hydropower plants.

Periodical inspections of a headrace tunnel and penstock under the dry condition were conducted one year after the commissioning and are conducted every five years after the initial inspection.

There are some conflicts between the requirements of MOIT for power generation and MARD for irrigation causing difficulties in reservoir operation. The amount of irrigation water which shall be discharged from the reservoirs of the power company is not fixed especially.

(7) Dai Ninh Hydropower Plant (July 03, 2010)

Dai Ninh hydropower plant were commissioned in 2008 with the installed capacity of 300MW and owned by Dai Ninh Hydropower Company. The interview to Dai Ninh Hydropower Company was held regarding the practical use of electric power technical standards and regulations for operation and maintenance of the power plant.

1. Application of QCVN Vol.5 and Vol.6

   The latest edition of the existing QCVN Vol.5 and Vol.6 were ordered but not distributed to the power company yet, while an electronic file of them was downloaded from the EVN's homepage so that Vol.5 and Vol.6 are currently applied in Dai Ninh HPP.

   International standards such as IEC and ISO are mainly applied in Dai Ninh HPP and it could be said that such international standards conform to the requirements in Vol.5 and Vol.6. Many TCVNs are the copy of IEC officially translated by MOST.

   On the other hand, there are some unclear issues in Vol.5 and Vol.6, and there is no stipulation regarding the inspection on the shaft of turbine and generator for example.

   Also, there are incorrect usages of Vietnamese terms probably due to incorrect translation of English (in Articles 90 and 91 of Vol.5 for example).

2. Operation, maintenance and inspection of the hydropower plant

   The completion inspection was conducted by the governmental committee and the power company prepared all required documents and submitted them to the committee.

   Company's inspection manual is prepared for each facility based on the existing TCVN, regulation of EVN as well as international standards.

   Periodical inspections of electrical equipment are conducted based on the standard 48NL/KHTK (14 Mar. 1987) issued by former Ministry of Energy, EVN regulation (447/QD-EVN-HDQT of 7 Dec. 2004) and manufacturer's manual in the cycle of four years in the order of a usual inspection (1st year, repair (2nd year), a usual inspection (3rd year) and

an overhaul (4th year) like other hydropower plants. However, the intervals of inspection are shortened for some sensitive equipment based on the Company's own judgment. On the other hand, the periodical inspections of a headrace tunnel and penstock under the dry condition are conducted every five years.

Spillway gates and appurtenant equipment are inspected before the rainy season every year. Additional inspection (special inspection) is performed for spillway gate based on the judgment of the Company. The regulations issued in the power sector such as the government regulations related to reservoir operation and accident reporting are also used in the periodic inspection.

Monitoring of civil structures mainly for dams are conducted by the staff of Company as well as by PECC2 under the contract with them. The results of the monitoring are analyzed once a year for general items and twice a year for important items in principle. Major problems are reported to and consulted with EVN for judgment of countermeasures, while minor problem are handled on the responsibility of the Company.

Reservoir operation plan was prepared in 2007 before commissioning and approved by MOIT. Dam owners along the main stream of the Dong Nai River (Da Nhim, Dai Ninh, Dong Nai 2, Dong Nai 3, Dong Nai 4 and Tri An) hold a meeting once a year to settle an agreement about a flood discharge rule in the rainy season. Flood prevention plan prepared by the relevant agencies are checked by the government level flood preventive committee.

It is difficult to fix the discharge of water to the downstream area through a low level outlet at the design level ($0.7m^3/s$) due to variation of discharge depending on water level. Also, there is one problem detected during installation work on the turbine/generator shaft due to a mistake in design.

(8) Ya Li Hydropower Plant (October 20, 2010)

Ya Li hydropower plant was commissioned in 2000 with the installed capacity of 720MW. Ya Li Hydropower Company owns also Se San No.3 HPP (260MW) and Pleikrong (100MW) HPP commissioned in 2006 and 2009 respectively. The interview to Ya Li Hydropower Company was held regarding the practical use of electric power technical standards and regulations for operation and maintenance of the power plant.

1. Application of QCVN Vol.5 and Vol.6

   The existing QCVN Vol. 5 to Vol.7 promulgated by the Decision QD54/ 2008/QD-BCT dated December 30, 2008 were distributed to the power company in 2008 and have been used for 2 years. At the present moment, no major problems have been found.

   Hydropower facilities except turbines and generators are inspected according to provisions in Part 2, Vol. 5 of the electric power technical regulations. Provisions of the QCVN Vol.5 to Vol.7 are not so detailed, for example, only three provisions are described in Article 63 "Steel penstocks" of Vol.6, so items which are not provided in QCVN are referred to manufacturer's operation manuals. Completion inspections of turbines and generators were conducted according to manufacturer's manuals.

As for design regulations of hydropower civil works such as design flood, etc., those of the Yali Hydropower Plant were based on Russian technical regulations, and those of the Pleikrong and Se San No.3 Hydropower Plants were based on TCXDVN 285 : 2002. A part of design standards for gates and penstocks are based on QPE380 prepared by MARD in 1980 and the in-house manual No.1556-19-201which was arranged for the Yali Hydropower Plant according to manufacturer's manuals. Design standards of electromechanical equipment are based on GOST, Russian technical standards and TCVNs whish are complied in from IEC and Russian technical standards.

The completion inspection was conducted by the state committee, the EVN committee and the construction office committee according to Decree No.209 dated December 16, 2004 and EVN DecisionNo.343 dated August 05, 2008, and the reports were prepared by the consultant based on manufacturer's manuals and the documents were prepared by the operation company according to international technical standards.

2. Operation and Maintenance of hydropower plant

A reservoir operation rule was submitted to MOIT and approved when the Yali Hydropower Plant was commissioned. The rule was reviewed after the Se San No.3 and Pleikrong Hydropower Plants were completed and at the present time a coordinated operation rule of the said three reservoirs has been approved.

Spillway gates are inspected before the rainy season by opening and closing them while the reservoir water level is below the sill level of the spillway. The company gives the communities downstream of the Pleikurong dam the notice of discharge from the dam by documents and an alarm but not for the Yali and Se San No.3 dams because downstream reservoirs catch the discharge and there are no communities downstream the dams.

Periodical inspections are conducted in the cycle of four years in the order of a usual inspection (1^{st} year), repair (2^{nd} year), a usual inspection (3^{rd} year) and an overhaul (4^{th} year) according to the EVN DecisionNo.447, and their details are based on manufacturer's manuals and international standards such as IEC. Intake gates, headraces and penstocks are inspected by emptying the waterway in parallel with the overhaul. It takes only four hours to empty the waterways including 3.8km long headrace tunnel.

3. Dissemination of Technical Regulations

The company accepts employees from other hydropower plants for training of operation and maintenance. As for education of technical regulations, the company does not do anything except distributing the latest edition of technical regulations.

The company agrees on dividing technical regulations into fundamental requirements and guidelines. The company does not think it necessary to hold a special seminar for their promotion but thinks it desirable to hold a workshop regarding guidelines.

(9) A Vuong Hydropower Plant (October 21, 2010)

A Vuong hydropower plant was commissioned in 2008 with the installed capacity of 210MW. The interview to A Vuong Hydropower Company was held regarding the practical use of

electric power technical standards and regulations for operation and maintenance of the power plant.

1. Application of QCVN Vol.5 and Vol.6

   The latest edition of the existing QCVN Vol.5 and Vol.6 were distributed to the power company between the end of 2008 and the beginning of 2009. The company started reviewing the existing manuals based on the latest technical regulations. No major problems have been found on the regulations since it had been used for one year.

   Operation and maintenance of the hydropower plant are conducted mainly using manufacturer's manuals. The technical regulation Vol.5 lacks provisions of pressure equipment such as air compressors, pressurized oil tanks, pressurized pips, etc. and there are articles with insufficient provisions in Vol.5.

   The foreign technical standards such as IEC, Russian, German, Japanese standards, etc., are used in the hydropower plant. Technical regulations used for hydropower civil works are TCXDVN.

   The company is reviewing the existing technical regulations and no required revisions are found at present. The company agrees on dividing technical regulations into fundamental requirements and guidelines.

   The company intends to demand establishing a new section in MOIT and EVN to observe the use of the latest edition of electric power technical regulations at each power plant.

2. Inspection, operation and maintenance of hydropower plant

   The completion inspection was conducted by the state committee, EVN committee based on DecisionNo.343 enacted in 2008 and local committee consisting of the electric power company.

   An overhaul was conducted in 2009, one year after commissioning. Periodical inspections are conducted in the cycle of four years in the order of a usual inspection (1st year), repair (2nd year), a usual inspection (3rd year) and an overhaul (4th year) according to the EVN Decision. The headrace and penstock are inspected by emptying the waterway in parallel with the overhaul. It takes 12 to 15 hours to empty the waterways. Other inspections are conducted based on manufacturer's manuals considering operation hours and details of accidents.

   Periodic inspections are conducted according to in-house manuals prepared based on manufacturer's manuals.

   A reservoir operation rule was submitted to MOIT in 2008 and approved. At present, a coordinated operation rule of the A Vuong, Dak My No.4 and Song Tranh No.2 Reservoirs was prepared based on the Decision of the Government. For the gate operation, four staffs are permanently stationed at the A Voung Dam for operation of spillway gates. An alarm for discharge from a spillway is sounded at the powerhouse before opening spillway gates.

   The MONRE Decision No.112 promulgated in August 2008 regulates amount of river maintenance flow. However, the A Vuong Hydropower Plant was not subject of the

regulation as the hydropower plant had been completed when the decisions was promulgated. Afterward the MONRE judged that the discharge of river maintenance flow from a dam was not necessary as a result of a site investigation.

3. Design and construction of hydropower plant

   A Voung Dam is the first RCC dam in Vietnam. Hydropower civil structures were designed by PECC2, constructed by LICOGI and others, and inspected by NARIME, an affiliate of MOIT. Gates and penstocks were installed by LILAMA.

   Design flood is calculated based on TCXDVN 285:2002.

(10) Song Tranh No.2 Hydropower Plant (October 22, 2010)

Song Tranh No.2 hydropower plant was under construction as of October 2010 as a plant with 190MW in installed capacity. The interview to Project Management Board of Song Tranh 2 Hydropower Project was held regarding the practical use of electric power technical standards and regulations for design and construction.

1. Project Outline

   The main dam is an RCC gravity dam with six spillway gates, and the height and crest length of the dam are 95m and 640m respectively. The saddle dam is an earthfill dam with height of 58m. The reservoir has a surface area of 21 km^2 and capacity of 645 million m^3. A waterway has an inner diameter of 8.0 m and a length of 1.8 km. The distance between the dam and the intake, and the dam and the powerhouse is 4 km and 8 km, respectively. The effective head is 87m and maximum power discharge is 122.7 $m^3/s \times 2$ units.

   The DecreeNo.112 requests discharge of river maintenance flow from the dam so that the two lines of outlet works with inner diameter of 400 mm are installed in diversion channels at the bottom of the dam to discharge 4.1m^3/s of water.

   The hydropower facilities were designed by PECC1. A main civil contractor is LYCO4 and subcontractors are LICOGI-10 and 13, Vietnamese companies. Manufacturing of electro-mechanical equipment is contracted by ECIDI and Alstom Tianjin, Chinese companies, and its installation is by COMA, an affiliate of MOC. Manufacturing and installation of gates and penstocks are contracted by a Vietnamese company and supervisory works are by three electrical and mechanical centers affiliated with EVN.

2. Dissemination and application of electric power technical regulations

   The latest edition of the existing QCVN Vol.5 and Vol.6 were distributed to the power company and the staff is studying them. The all staff have to receive training according to Circular and they also receive training of construction supervision for two weeks, so the present training system are suitable for promotion of technical regulations. MOC prepared textbooks for training.

   MOIT should guide the related organizations such as EVN for promotion of the latest edition of technical regulations. It is desirable for the staff to participate in a workshop held by JICA

Project Team to give opinions. A seminar should be held before promulgation of the regulations for promotion.

No problems have been found in construction of the hydropower plant as the items not covered by QCVN are referred to manufacturer's manuals.

Vietnamese and foreign technical standards such as European, Russian, American, Chinese, Japanese, etc., are used for construction works. ACI and USACE technical standards are applied to the RCC dam. Technical standards are selected out of TCVN and foreign standards such as IEC standards. In adopting foreign technical standards to the project, it is necessary to prove that they have the technical requirements at the level equal or higher than Vietnamese technical regulations. In adopting Chinese technical standards, the Project Managing Board requests the contractor to prove that Chinese technical standard stipulates equal or higher requirements than the approved technical standards including the Vietnamese technical standards, IEC standards, etc.

Design documents were approved by a competent government agency, previously MOIT and now EVN, according to Decree No.12/2009, the revised edition of DecreeNo.16/2005, in a technical design stage and by PMB in a construction design stage.

The reservoir operation rules was submitted to MOIT and approved. Preparation of an operation manual on gates has just started.

(11) Van Chan Hydropower Plant (October 22, 2010)

Van Chan hydropower plant was under construction as of March 2011 as a plant with 57MW in installed capacity. The interview to Van Chan Hydropower Company was held regarding the practical use of electric power technical standards and regulations for design and .construction.

1. Project Outline

   There are 46 employees and 28 engineers in the project office. The management board consists of stakeholders.

   MOIT conducted a master plan study of medium to small scale hydropower and this project was selected among the master plan study. A pre-feasibility study was conducted in 2004 and reviewed in 2007. PECC1 conducted the feasibility study and provided river discharge data for 50 years. The Vietnamese technical regulations require river discharge data for at least 20 years for the study and require that a feasibility study report should be submitted to MOIT for approval.

   A contract package is divided into civil works, hydromechanical equipment and electromechanical equipment. MECO, a subsidiary company of MARD, is the contractor to manufacture and install hydromechanical equipment. Steel materials were imported from P.R. of China and Korea. A subsidiary company of Petro Vietnam contracted for the civil works.

2. Application of design, construction and reservoir operation

   PECC1 prepared technical specifications according to Vietnamese and international technical standards of developed countries. Civil works, hydromechanical equipment and electromechanical equipment were designed by PECC1. Design of a hydropower plant is

judged by DOIT. Dam design is judged according to Decree No.72 and Circular No.34. IPP projects are classified into A, B and C by its investment amount. A project with its investment amount between 75 billion to 1.5 trillion VND is classified as B. This project is classified as B and approval documents are submitted to DOIT.

An EIA report of a large scale project should be submitted to the Prime Minister, and medium scale and small scale to MONRE and DONRE, respectively. In case of a micro scale hydropower project, an EIA should be submitted to MONRE if the project is located in a national park or a resort area though it is not necessary in a normal case. An EIA report of this project was submitted to DONRE

In Van Chan project, the elevation of spillway sill, minimum operation level and full supply level is EL. 217, EL. 227 and EL. 230, respectively, so river maintenance flow is discharged through a spillway gate. Amount of river maintenance flow is not stipulated in design criteria and instructed by MONRE.

Water right of a project with its output of 3 MW and over is approved by MONRE and less than 3 MW by DONRE, respectively.

Construction supervision and quality control are conducted by standards prepared by a consultant and contractor according to corresponding decrees.

A reservoir operation rule is prepared according to provisions of Decree No.112/2008/ NĐ-CP and submitted to MOIT for approval.

A completion inspection will be conducted by an inspection committee consisting of MOC members.

4.3 Workshops in the 1st Stage

In the 1st Stage, JICA Project Team held Workshops two times in March and June 2011 in the main cities in order to collect the opinions of all units in power sector for finalization of draft technical regulations as follows:

(1) 1st Workshop

1) March 11 (Fri), 2011 at Ho Chi Minh City with 37 participants in hydropower session
2) March 15 (Tue), 2011 at Hanoi with 15 participants in hydropower session

Agenda of General Session was as follows:

- Opening Remarks
- Introduction (background of the Project)
- Outline of the Project (scope and activity schedule)
- Policy and outline of new & revised technical regulations and guidelines for hydropower facilities
- Policy and outline of new & revised technical regulations and guidelines for thermal power facilities

- Policy and outline of new & revised technical regulations and guidelines for network facilities
- Closing Remarks

Agenda of Hydropower Session was as follows:

- Background of new Technical Regulation for Hydropower Civil Works under MOC
- Major changes in the existing QCVN Vol.5 (General, Civil works and hydromechanical works, Electrical works)
- Major changes in the existing QCVN Vol.6 (General, Civil works and hydromechanical works, Electrical works)
- Major points in the draft of new Technical Regulation for Hydropower Civil Works (Part-1 General)
- Major points in the draft of new Technical Regulation for Hydropower Civil Works (Part-2 Design of Civil Works)
- Major points in the draft of new Technical Regulation for Hydropower Civil Works (Part-3 Design of Hydromechanical Equipment)
- Major points in the draft of new Technical Regulation for Hydropower Civil Works (Part-4 Construction)
- Major points in the draft of new Technical Regulation for Hydropower Civil Works (Part-5 Completion Inspection)

The presentation and discussion in the Hydropower Session of 1st Workshop are summarized as follows:

- JICA Team presented general policies, the purpose of compiling revised version of the existing Technical Regulations of Vol.5 and Vol.6 under MOIT and the new Technical Regulation on Hydropower Civil Works under MOC.
- JICA Team explained major changes made on the existing Technical Regulations of Vol.5 and Vol.6 which include rearrangement of provisions by shifting numerical criteria and detailed voluntary requirements to the Guideline to be developed in the 2nd Stage of the Project.
- Also, JICA Team explained the main points of new Technical Regulation on Hydropower Civil Works including background, basic policies, framework and major stipulations such as classification, design method, completion inspection, etc.
- In and after the 1st Workshop, around 180 comments were collected from various agencies regarding the issues related to hydropower facilities as shown in Appendix-6 of Project Progress Report No.1.

(2) 2nd Workshop

1) June 22 (Wed), 2011 at Ho Chi Minh City with 25 participants in hydropower session
2) June 24 (Fri), 2011 at Nha Trang with 6 participants in hydropower session

3) June 28 (Tue), 2011 at Hanoi with 16 participants in hydropower session

Agenda of General Session:

- Opening Remarks
- Introduction (background and purpose of the Project / purpose of the 2nd Workshop)
- Overall activities and schedule of the Project
- Outline of the Baseline Survey
- Closing Remarks

Agenda of Hydropower Session:

- Introduction of the new Technical Regulation for Hydropower Civil Works
- Discussion on the contents of new Technical Regulation for Hydropower Civil Works
- Introduction of the revised QCVN Vol.5 and Vol.6 (hydropower issues)
- Information of revised QCVN Vol.5 and Vol.6
- Discussion on the contents of revised QCVN Vol.5 and Vol.6 (hydropower issues)

The presentation and discussion in the Hydropower Session of 2nd Workshop are summarized as follows:

- JICA Team explained major changes made on the existing Technical Regulations Vol.5 and Vol.6 which include rearrangement of provisions by shifting numerical criteria and detailed voluntary requirements to the Guideline to be developed in the 2nd Stage of the Project.
- Also, JICA Team explained the main points of new Technical Regulation on Hydropower Civil Works including background, basic policies, framework and major stipulations such as classification, design method, completion inspection, etc.
- In the 2nd Workshop, around 60 comments were collected from various agencies regarding the issues related to hydropower facilities as shown in Appendix-6 of Project Progress Report No.1.

4.4 Development of Draft Technical Regulations

4.4.1 Major Revisions in Vol.5

(1) Scope of Application for Hydropower Plants

There were many discussions about the scope of application and, finally, the original scope of application for hydropower plants was changed and a new application was proposed in Final Draft of Vol.5 as follows:

Original Vol.5:

1) *Civil works of all hydro power plants located in Vietnam and connected to the Vietnamese Grids, excluding hydro civil works with the special dams defined by the Government Decree No. 143/2003/ND-CP*
2) *Electrical equipment of hydro power plants located in Vietnam and connected to the Vietnamese Grids, with rated output equal to or greater than 30MW.*

Final Draft of Revised Vol.5:

"The articles regarding hydro power plants are stipulated in Part 3.They apply to civil works and electrical equipment of all hydro power plants located in Vietnam and connected to the National Power Grid."

(2) Proposed Revisions related to Civil Works

It was required to review the requirements in the relevant existing documents including Decree No.72/2007/ND-CP "Management of Dam Safety" and Circular No:34/2010/TT-BCT "Circular regulating the management of dam safety for hydropower structures".

As the results of review on the relevant existing documents including Decree No.72/2007/ND-CP and Circular No:34/2010/TT-BCT, the periodic inspections for civil works are categorized into three types of periodical inspections as follows:

- Periodic inspection for flood control (for dams and spillways)
- Periodic inspection for dam safety (for dams)
- Periodic inspection for overall power plant facilities (for civil structures except dams and spillways).

Final Draft of Vol.5 were modified in accordance with the above categorization, and the related revisions are made in arrangement of Articles.

In addition to the above, there were many opinions that the ambiguous terms such as "excessive", "serious", "severe" should be clarified in a quantitative manner. JICA Team explained that the condition of the civil works varies from site to site so that common quantitative criteria cannot be applied as mandatory regulations. However, JICA Team revised the description of provisions with ambiguous terms to provide clear definitions as much as possible.

(3) Proposed Revisions related to Hydromechanical Equipment and Waterways

The frequency of dry inspections for waterways is not stipulated specifically in Article 100 while it stipulates generally the frequency of periodic inspections. Power generation shall be suspended during the dry inspection for waterways. In order to save the operational costs and to reduce the suspension of the electric power supply, the frequency of inspections with suspension of power generation should be extended as much as possible in a practical manner provided that the technical requirements can be satisfied, as too much expansion of the inspection frequency causes an increase in accident risk. In addition, periodic inspection is performed at most of the

Vietnamese power plants in accordance with the interval stipulated in Decree No.447/QD -EVN-HDQD. Therefore, the frequency of inspections for waterway under dry condition should be proposed separately from ordinary periodic inspections taking into account the factors mentioned above and past inspection records.

Accordingly, the frequency of inspection for waterway under dry condition was proposed in the Final Draft of Vol.5 as follows:

"Regarding the periodic inspection for waterway under dry condition, the interval between the successive two inspections after the third inspection can be extended to a period more than three years up to six years in case that the rating of the last inspection result defined as in Table 99-1 is " A" or" B"."

(4) Proposed Revisions related to Electrical Facilities

1) The current contents of "Part 3 Hydro power plants" in Vol.5 are basically acceptable for each inspection of the hydropower plant.
2) In-progress inspection and completion inspection in Vol.5 were rearranged classifying the tests into "dry test" and "wet test" respectively.
3) The inspection items in Chapters 3, 4 and 5 of Vol.5 were separated into the mandatory parts to be stipulated in Technical Regulation and the voluntary parts to be stipulated in the Guideline. Some articles which involve detailed provisions were moved to the Guidelines.

4.4.2 Major Revisions in Vol.4 (former Vol.6)

(1) Scope of Application for Hydropower Plants

There were many discussions about the scope of application and, finally, the original scope of application for hydropower plants was changed and a new application was proposed in Final Draft of Vol.4 as follows:

Original Vol.6:

1) Civil works and appurtenant equipment of all hydro power plants located in Vietnam and connected to the Vietnamese Grids, excluding hydro power plants with the special dams defined by the Government Decree No. 143/2003/ND-CP;
2) Electrical equipment of hydro power plants located in Vietnam and connected to the Vietnamese Grids, with rated output equal to or greater than 30MW.

Final Draft of Vol.4 (revised Vol.6):

"This regulation applies to civil works and electrical equipment of all hydro power plants located in Vietnam and connected to the National Power Grid."

(2) Proposed Revisions Related to Civil Works

It was required to review the requirements in the relevant existing documents including Decree No. 72/2007/ND-CP "Management of Dam Safety" and Circular No: 34/2010/TT-BCT "Circular regulating the management of dam safety for hydropower structures".

As the results of review on the relevant existing documents including Decree No.72/2007/ND-CP and Circular No:34/2010/TT-BCT, the provisions mainly in Part 4 of Vol.6 related to monitoring of dams, operation of dams and reservoirs, emergency programs, etc. were updated as required for the mandatory technical regulations.

(3) Proposed Revisions Related to Hydromechanical Equipment

For example, a stipulation in Article 6, *"If water becomes acidified during operation for some reason (pH less than or equal to 4.0), proper countermeasures, such as application of special coatings, shall be taken for corrosion protection of steel penstocks."* is too detailed as a provision in the mandatory technical regulations. Although the monitoring of water deterioration (acidification) would be necessary to be stipulated in Vol.4, the stipulation of the threshold level (pH 4.0) shall be moved to the Guidelines.

There are articles stipulating the detailed requirement not necessary to be mandatory concerning some type of penstock. Therefore, the provision of these articles (Articles 63, 64 and 65) shall be moved to Guideline for Vol.4.

(3) Proposed Revisions Related to Electrical Facilities

1) The current contents of "Chapter 4 Hydraulic Turbines of Part 4 Civil Works, Water Sources, and Management of Hydraulic Turbines and Powerhouses" in the existing Vol.6 are basically acceptable for operation and maintenance of the hydropower plant.
2) Each item stipulated in Chapter 4 of Part 4 of the existing Vol.6 was modified in Vol.4 by adding clarification of the purpose for the operation and maintenance of the hydropower plant.

4.4.3 Major Issues in New Technical Regulation on Hydropower Civil Works (MOC)

(1) Status of Draft Technical Regulation on Hydropower Civil Works under MOC

The 1st draft and 2nd draft of Technical Regulation on Hydropower Civil Works were prepared based on the framework and arrangement proposed in the Review Report and referring to the provisions in the existing or drafted technical standards and regulations in Vietnam including TCXDVN-285/2002 and draft QCVN-2011/BNN, which is under process of promulgation by MARD, as agreed between JICA Team and MOC or as instructed by MOC. The 2nd draft was submitted to Vietnamese side in March 2011.

MOC hold an internal workshop on April 28, 2011 after JICA Team submitted the 2nd draft of Technical Regulations inviting the experts of hydropower civil works. Then, JICA Team

prepared the Preliminary Final Draft based on the comments received from MOC after their workshop on April 28 as well as the conclusion of Working Group Meeting held on May 19, 2011 at MOC. After submitting the Preliminary Final Draft, MOC reviewed it and JICA Team received the comments from MOC in Vietnamese on June 10, 2011 and those comments included the fundamental issues. In the 2nd Workshop held on June 22, 24 and 28, 2011 at HCMC, Nha Trang and Hanoi respectively, the discussion about the Technical Regulation on Hydropower Civil Works was made based of the Preliminary Final Draft.

After receiving the comments from MOC and in the 2nd Workshop, JICA Team discussed with MOC and confirmed that the following fundamental issues are still pending.

1) Status of American Standards in the new Technical Regulation (include American Standards as an option or not)
2) Scope of provisions for design (include dam or not)
3) Scope of provisions for completion inspection (include dam or not)

As there is major pending issues, MOC and JICA Team agreed to take the following process for finalization of the draft Technical Regulations on Hydropower Civil Works:

1) MOC will hold an internal workshop and conclude the above issues and inform of the conclusions to JICA Team within June 2011.
2) JICA Team will revise the Preliminary Final Draft and submit the revised Preliminary Final Draft within August 2011.
3) MOC will hold internal workshops once or twice in September 2011 for reviewing the revised Preliminary Final Draft submitted by JICA Team and inform of the result of workshop to JICA Team within September 2011.
4) After receiving the result of MOC workshop in September 2011, JICA Team will prepare the Final Draft and submit it to JICA and MOIT/ MOC within October 2011.

(2) Scope of Application for Hydropower Plants

After discussions, the scope of application was tentatively proposed in Preliminary Final Draft of Technical Regulation on Hydropower Civil Works as follows:

1. This technical regulation stipulates basic requirements for hydropower projects with reservoir and hydropower projects installed capacity equal or greater than 30MW in the periods of planning, investigation, design and construction of civil works and hydromechanical works for hydropower projects.;
2. The scopes of application of this technical regulation include new construction, modification, upgrading or extension of hydropower civil works and hydromechanical works regardless of sources of investment.

3. The application shall also comply with mandatory stipulations in the Laws, international treaty and other agreements, in which Vietnamese Government signed or involved regarding the construction objects.
4. It is allowed to apply this technical regulation for hydropower civil works with installed capacity less than 30 MW depending on the investor's judgment.

5. Project Activities of Thermal Power Group

5.1 Working Group Meetings in the 1st Stage

5.1.1 Member of Working Group (Thermal Power Group)

There is one Working Group (WG3) for Thermal Power. The Working Group members were assigned as listed below:

1) Mr. Nguyen Van Long (Science and Technology Dept. of MOIT)
2) Mr. Tran Hong Tien (Power Generation Dept., EVN)
3) Mr. Vu Ta Thong (Technical and Operational Dept., EVN)
4) Mr. Nguyen Xuan Khiem (Science, Technology and Environment Dept., EVN)
5) Mr. Trinh Van Yen (ETC)
6) Mr. Tuan Anh (ETC)
7) To be named (MOST)

5.1.2 Schedule of Working Group Meetings

During implementation of the 1st Stage, the Working Group Meetings (Thermal Power) were held 8 times as listed below:

Table 5.1.2-1 Schedule of WG Meetings in the 1st Stage (Thermal Power Group)

1st WG Meetings (3 Groups joint meeting)	March 16, 2010
2nd WG Meetings (3 Groups joint meeting)	June 22, 2010
3rd WG Meetings (Thermal Power group)	July 23, 2010
4th WG Meetings (Thermal Power group)	October 18, 2010
5th WG Meetings (Thermal Power group)	October 28, 2010
6th WG Meetings (Thermal Power group)	February 23, 2011
7th WG Meetings (Thermal Power group)	March 16, 2011
8th WG Meetings (Thermal Power group)	June 30, 2011

5.1.3 Main Point of Discussions in Working Group Meetings

(1) The JICA Team experts conducted technology transfer through activities in the four working groups established in the Project, discussions between members of the JICA Team team experts and Vietnamese counterpart organizations, review of electric power technical regulations by Vietnamese counterpart organizations, etc. Members of Vietnamese counterpart organizations shall present the outcome of the Project to JMC and JCC meetings and Workshops under the guidance and cooperation of the JICA team experts as activities of OJT (On the Job Training), so that they can understand the contents of the technical regulations and guidelines through these activities.

(2) The main contentions are as follows.

1) Should the technical regulations be applied to all thermal power facilities?
   - At this moment, the technical regulations shall be applied to the thermal power facility which is connected with National Grid in exceed 110kV.

2) Should the technical regulations be applied to all generation companies, such as EVN group Joint Stock Company, Vinacomin Group Company, Petro-Vietnam Group Company, Independent Power Producer, Foreign Investor (BOT) or Surplus Sales Company?
   - At this moment, this matter is not clear and shall be considered by MOIT as one of the energetic policy.

3) When the technical regulation should enter into force as a mandatory regulation?
   - QCVN-5&6 are promulgated as circular and already in effect. It is inappropriate view to say "though the existence of the new regulations is known, however, the actual operation is conducted according to the old norms". MOIT shall declare that nowadays the old norms became one of the voluntary standards. JICA Thermal Power Team experts recommends the design technical regulation being premised to apply to new plant.

4) The technical regulation shall prescribe a summary or a concept in detail for the guidelines as detailed regulations.
   - The technical regulation is the "technical minimum target and requirement to be achieved". The safety regulation or administration manual which is established by Owner is the actual and practical manual and procedure to be used for daily activity. The guideline is the reference which shows point, criteria and a sample.

5) The QCVN-5&6 and design technical regulations shall cover the design, inspection, operation and maintenance of control equipments.
   - The technical requirement of alarm and protection equipment for specific facility is stipulated in the aspect of safety and security, however, overall control system is not normalized because it does not fit as mandatory regulation.

5.2 Site Visits in the 1st Stage

During the 1st stage, in order to confirm the application status of QCVN-5&6 at power plant sites, to confirm the consciousness for mandatory regulation and voluntary standard, and to confirm status of design, construction, inspection and operation of generation facility, JICA Thermal Power Team experts visited thermal power plants in the north and south areas for hearing. As the result of visit interview, following matters which shall be considered in the establishment process of technical regulations and guidelines have been confirmed.

(1) The old power plant which passed exceed 50 years is kept now been maintaining and operating through difficult history, and moderate technical level has been maintained. On the other hand, the advanced GTCC power plant has been operating; it seems that there are fewer problems on the groundwork to familiarize the established new technical regulations widely.

(2) JICA Thermal Power Team experts could confirm that the administration manuals have been prepared and utilized in the daily activity even in the old and new power stations, although we could not confirm its details. On the other hand, it seems that it is necessary a little more time to take root firmly the new concept which the necessary inspection, operation, improvement and renewal shall be decided and conducted by themselves under their responsibility, because still remaining that it would be sufficient as long as conform to the national regulations or group norms of EVN.

(3) Thermal Power Plants themselves are the main which is two generations ago, and high performance and scale-up will be gradually progress in the future. Currently, there is no accumulation of know-how related to the design, construction, inspection and operation of state of the art GTCC and super critical plant; it is an issue in the future.

(4) Vietnam is intending to create the competitive power generation market, the competitive power wholesale market, the competitive power retail market, to create power pool in which the power price is decided in the market mechanism. It is essential to provide technical regulation for the formation of a stable and reliable generation market, in order to reach the goal without precedent. However, the foreign capital from overseas for power generation business has been stagnant so far. This has caused by the reason that the electric selling price and fuel price are kept low, it depends on the economical development and energetic policy in the future.

(5) In order to be compatible with future development of country under the Doi Moi policy, Vietnam became a member of WTO accede. This has become necessary “performance requirement type technical regulation” as a global standard. At this moment, each stakeholder could not have abandoned the sense of old “specification type technical regulation”. It is not clear at this time whether the “independent safety measures” or “state commitment” is promoted as national policy.

(6) At this moment, it is difficult to conduct in-house production and is expected privatization and expansion utilizing foreign investment and introduction of foreign technology. However, it is necessary some time to understanding, introduction and application of international standards. It is capable to forward to next level that can be carried out in-house production or EPC by local contractor in order to accumulate experiences to order whole power plant to foreign EPC contractor.

(7) In order to respond to rising power demand, the expansion of thermal power plants is essential. It is also pressing issue to educate and ensure human resources for development, construction, operation, inspection and maintenance of power plant.

5.3 Workshops in the 1st Stage

(1) In the 1st Stage work, JICA Project Team invited the authorities, generation units, inspection companies, independent consultants and academic experts, and held seminars in Ho Chi Minh City on 11/Mar/2011and in Ha Noi City on 15/Mar/2011 in order to collect opinions from stakeholders, share them and feedback items about the purpose, points, application and establishment of revised and newly developed technical regulations. JICA Thermal Power Team sxperts replied opinions as organized in "Comment Table for draft Technical Regulation (Thermal Power)" against the comments which are collected in seminal and after seminal, and reflected them to the final draft technical regulation, if it is necessary.

(2) In the 1st Stage work, JICA Project Team invited the authorities, generation units, inspection companies, independent consultants and academic experts, and held seminars in Ho Chi Minh City on 22/Jun2011, Nha Trang City on 24/Jun/2011 and in Ha Noi City on 28/Jun/2011 in order to collect opinions from stakeholders, share them and feedback items about the purpose, points, application and establishment of revised and newly developed technical regulations.

5.4 Development of Draft Technical Regulations

(1) JICA Thermal Power Team experts discussed with Vietnam counterparts and listened opinions and desires from Vietnam side throughout WG, JMC, JCC, WS, Site Interview, etc. during four missions, and established Work Report (Draft & Final), Review Report (Draft & Final), Technical Regulations (Draft & Final), which is expected to suit new age.

(2) These technical regulations shall be carried over well into the development of guideline that will be done in the 2nd stage work, so that the "mandatory regulation as requirement" is consistent with the "guideline as the means for achieving the requirement" as a pyramid.

(3) The final draft technical regulations are not quite perfect performance requirement type regulation and it still contains the specification type contents, because of the current from previous project and reflection of needs from Vietnam side. They shall be necessary to be refined in the process of revision in the future.

(4) Other issues to keep in mind when formulating the guidelines are the same as Section 5.1 to 5.3. Further matters to be considered in the process of formulating the guidelines are as follows

1) Expression of guideline which is easy to understand the relation with technical regulation.
2) Introduction and relation of useful voluntary standard
3) Introduction and instruction how to use guideline

6. Project Activities of Network Group

6.1 Working Group Meetings in the 1st Stage

6.1.1 Member of Working Group (Network Group)

Main members are nine engineers from related organizations and some of them attended WG if necessary.

1) Mr. Dang Hai Dung (Science and Technology Dept. of MOIT)
2) Mr. Cu Huy Quang (Science and Technology Dept. of MOIT)
3) Ms. Do Lan Binh (Power Network Dept., EVN)
4) Mr. Nguyen Xuan Khiem (Science, Technology and Environment Dept., EVN)
5) Mr. Nguyen Quang Viet (Science, Technology and Environment Dept., EVN)
6) Mr. Tran Xuan Tuan(ETC)
7) Mr. Nguyen Hoang Linh(ETC)
8) Mr. Cao Chan (Individual expert)
9) Mr. Tran Van Ap (Individual expert)

6.1.2 Schedule of Working Group Meetings

Network Working Group meeting held nine times during the first stage as shown in the table below. WG members and JICA discussed the project formation each other and determined the policy to develop the Technical Regulation.

Table 6.1.2-1 Schedule of WG Meetings in the 1st Stage (Network Group)

1st WG Meetings (Network)	March 16, 2010
2nd WG Meetings (Network)	June 23, 2010
3rd WG Meetings (Network)	July 9, 2010
4th WG Meetings (Network)	July 21, 2010
5th WG Meetings (Network)	October 28, 2010
6th WG Meetings (Network)	February 24, 2011
7th WG Meetings (Network)	March 4,' 2011
8th WG Meetings (Network)	May 9, 2011
9th WG Meetings (Network)	May 13,' 2011
10th WG Meetings (Network)	June 30,' 2011

6.1.3 Main Point of Discussions in Working Group Meetings

(1) Old and New Comparison Table

In progress document of regulation JICA classifies the revised history in different colors to identify the type of revisions. MOIT requested JICA and ETC to make "Old & new comparison table" for easy understanding to know what articles revised. Both sides agreed with this proposal but understood and JICA made these tables.

These tables have huge volume but they are very useful to recognize the changing parts at a glance. Entire table attached in the appendix.

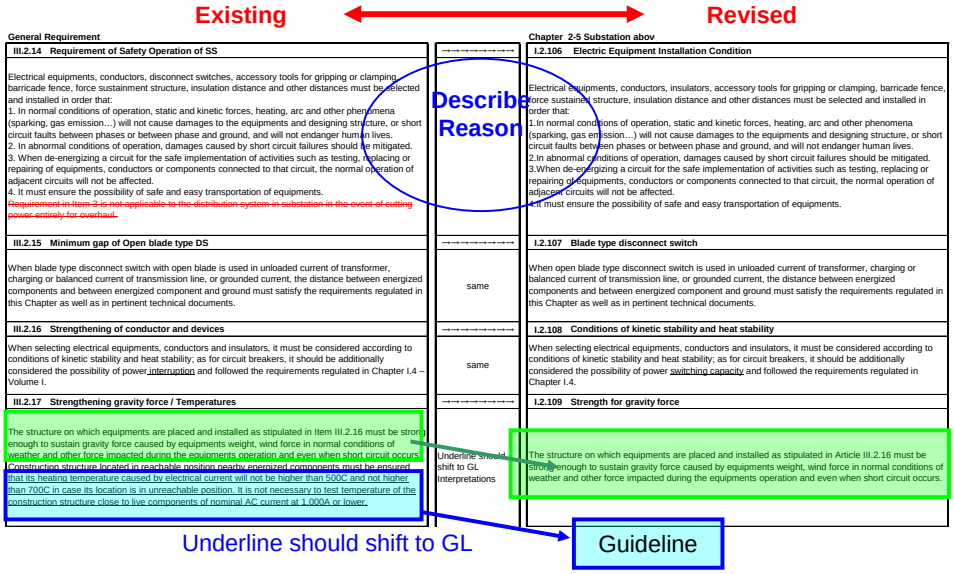


Figure 6.1.3-1 Sample of Old and New Table

(2) Safety Corridor (Horizontal Distance from outer Edge Conductor)

Vietnamese Technical Regulation stipulates the safety corridor of transmission line long enough compare with Japanese safety corridor. Since it is prohibited to build the construction structure (houses etc.) inside safety corridor especially 500kV transmission line, it has problems in operation and management of transmission line.

JICA Study Team explained the Japanese Technical Regulation as shown in the figure below, and showed the current safety situation in Japan. JICA and Vietnamese side agreed to discuss in detail values to include on Guideline during next stage.

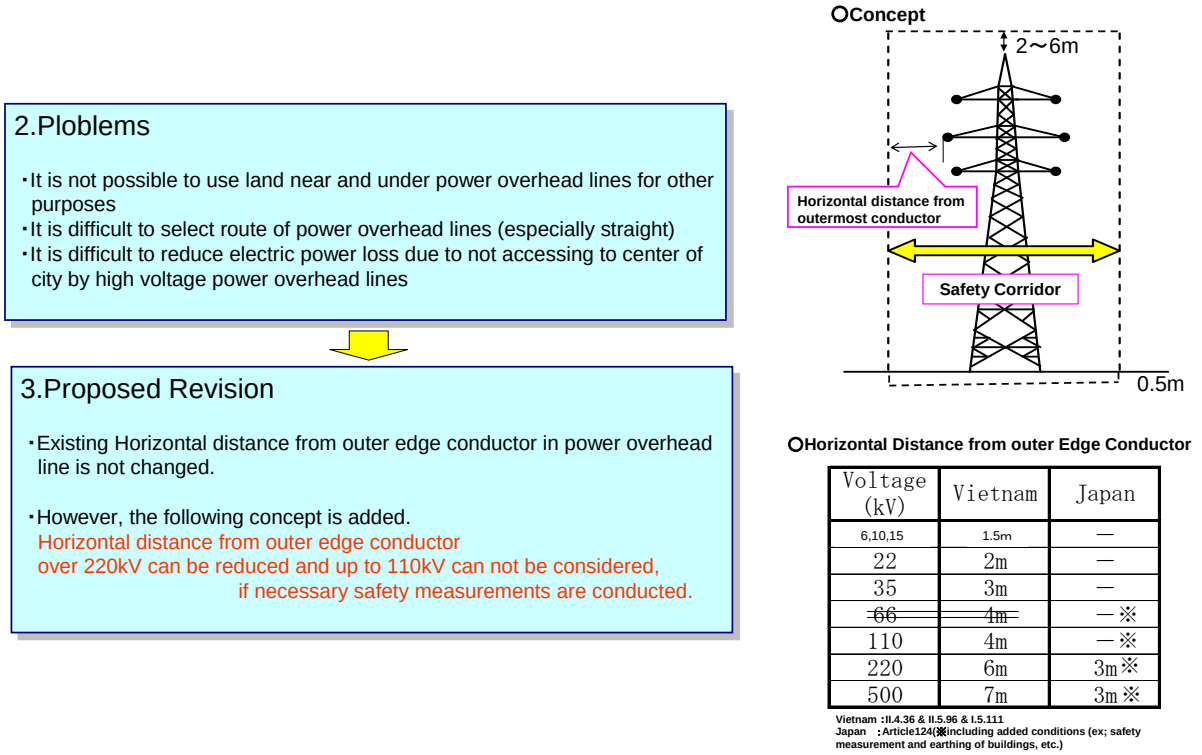


Figure 6.1.3-2 Outline of the safety Corridor

(3) Conduct the consultation for Ground Earthing Method

The purpose of earthing installation is to refrain from the electric potential during earthing electric failure and secure the safety of workers and public. One more important purpose is protection for electric devises from overvoltage. IEEE Std.80 is the most notorious methods as international standards for designing of earthing system. In this standard the touch voltage and step voltage are referred according to passing current in human body.

In Vietnamese Technical Regulation, the articles about earthing system are in accordance with IEEE above, but there are still some articles conflicting with IEEE, therefore it is very difficult to understand for electrical designers.

In this revision, JICA collected similar articles related with earthing contents and sorted out them to basic regulations and arranged them to new Technical Regulation. On the other hand, numerical judgment criteria will be arranged to new Guideline.

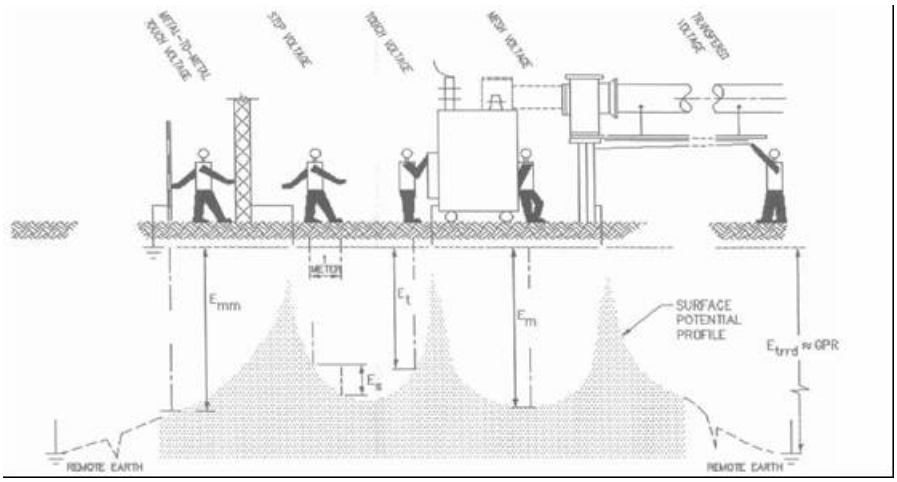


Figure 6.1.3-3 Concept of earth design in various cases

(4) Problems of Power Overhead Lines with High-voltage

Though electric shocks and radio disturbances are caused controversial problems near 500kV transmission line, it does not make the drastic solution on these.

JICA Study Team indicated basic three problems (near high-voltage transmission line) as listed below and suggested general measurements conducted in Japan.

JICA and Vietnamese side will discuss the appropriate regulations to include on Guideline next stage.

1. Electrostatic Induction (normal condition)
2. Electromagnetic Induction (during earth fault)
3. Radio or TV Interference (effective by transmission line)

4.Measures against problems

Problems	Measures
1.Electrostatic Induction a. Electrical shock from electrified Human body to earthing object or from electrified metal object to human body b. Noise against communication line	**(Common)** ・Height of conductors gets higher ・Negative phase arrangement in2 circuit power line ・Construction of shielding with earthing **(Only a)** ・Earthing of metal object **(Only b)** ・Using of communication line or optical fiber cable
2.Electromagnetic Induction a. Electrical shock to worker of communication line b. Noise against communication line	**(Common)** ・Using of high-speed circuit breaker ・Height of conductors gets higher ・Using of communication cable or optical fiber cable ・Transposition the phase of power overhead line ・Construction of shielding with earthing
3. Radio and TV Interference a. Noise against Radio wave by corona b. Shield and Reflection of TV wave	**(Common)** ・Removing of power overhead line ・Changing position of receiving antenna ・Receiving measures such as communication cable **(Only a)** ・Cross section area of conductor gets bigger **(Only b)** ・Using of satellite broadcast or digital broadcast

Figure 6.1.3-4 Measures against the problems

(Reference) Electrostatic induction

Height of conductor and electrical field intensity at 1m from ground

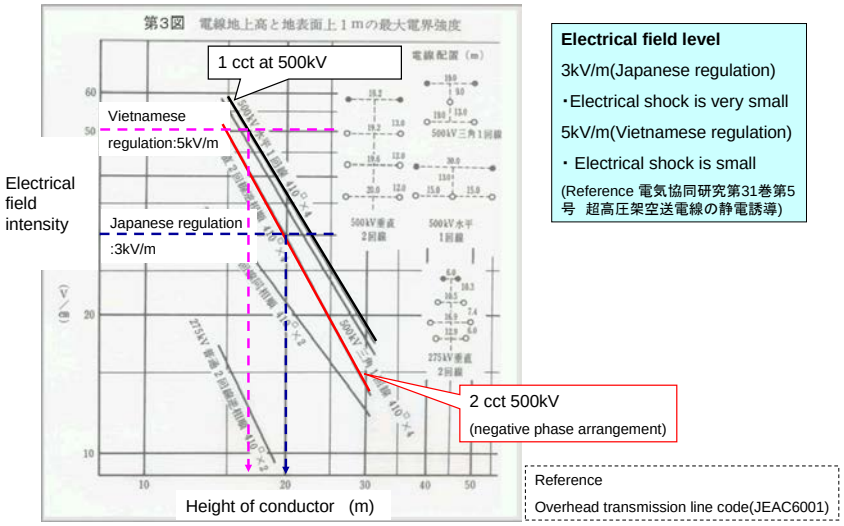


Figure 6.1.3-5 Height of conductor and electrical field intensity

(5) Minimum Air Clearance between equipments

"Minimum air clearance (p-p, p-g)" is very important provision for engineering designers to study arrangement of equipments. It must be stipulated in Technical Regulation. Vietnamese side requires JICA to conduct consultations for the management of these dielectric strength indexes. The main problems are minimum gap of the bus bars in the cubicle indicated in Vol.3.2.53, as actual cases in the site consist of both air gap and solid insulations.

JICA Team indicated basic concept and appropriate index of the insulation distance in Japan and IEC, and suggested the proper measurements of the compound insulation methods. As there are no differences the value of air clearance between both countries, both side agreed NOT to change the criteria values. Also JICA replied there is no needs of special measurements for air clearance against the different temperature.

JICA and Vietnamese side will discuss the appropriate regulations to include on Guideline next stage.

Nominal voltage of system (kV)	Maximum working voltage of equipment (kV)	Minimum clearance between phase-phase and phase-ground (N) (**) [phase-phase/ phase-ground] (mm)	
		Indoor	Outdoor
6	7.2	90 [120/90]	120 [120/90]
10 [11]	12 [11.5]	120 [190/150]	150 [190/150]
15	17.5	160	
22	24 [23]	220 [350/250]	
35 [33]	38.5 [34.5]	320 [480/350]	
66	72.5 [69]	630 [850/650]	
110	123 [115]	1100 [1400/1080]	
220	245 [230]	2100 [3600/2300 ← not minimum gap]	

Figure 6.1.3-6 Minimum Clearance in Each Voltage

"Withstand voltage test" is the only test that can stipulate the insulation performance of equipments. The most case of the insulation methods in the substation is compound insulation methods mentioned above, it is not possible for their inspections to apply the only air insulation distance, JICA Study Team suggested to introduce Basic Impulse insulation Level (BIL) such as lightning surge withstand voltage tests. On the contrary, existing test methods insulation distance can be applied to the layout of the power facilities in the substation.

Nominal voltage of system (kV)	Maximum working voltage of equipment (kV)	Withstanding voltage at nominal short-term industrial frequency (kV)	Withstanding voltage to lightning surge of 1.2/50 μ s (*) (peak values) (kV)
6	7.2 [6.9]	20 [22]	60 [60]
10 [11]	12 [11.5]	28 [28]	75 [90]
15 [No Regulation]	17.5 [No Regulation]	38 [No Regulation]	95 [No Regulation]
22	24 [23]	50 [50]	125 [150]
35 [33]	38.5 [34.5]	75 [70]	180 [200]
66	72.5 [69]	140 [140]	325 [360]
110	123 [115]	230 [230]	550 [550]
220	245 [230]	460 [No Regulation]	1050 [900]

Nominal voltage of system (kV)	Maximum working voltage of equipment (kV)	Withstanding voltage at nominal industrial frequency in shortest duration (kV)	Withstanding voltage to lightning surge of 1.2/50 μ s (kV)	Withstanding voltage to nominal phase-ground on-off pulse of 250/2500 μ s (kV)	Withstanding voltage to nominal phase-phase on-off pulse of 250/2500 μ s (kV)
500	550	710 [No regulation]	1800 [1800]	1175 [1050]	2210 [1550]

Figure 6.1.3-7 Withstanding Voltage in Each Nominal Voltage

(6) Insulation management of substation equipments

In regard to the comments about BIL(Basic impulse Insulation Level), it is effective or not to adopt Japanese data instead of IEC data. JICA explained carefully from the technical view point. For the concrete measurement against lightning surge, JICA suggested to manage insulation coordination utilizing lightning arrester and Vietnamese side agreed with these comments.

Regarding withstanding voltage test, the conclusion of the discussion is to describe the concept that "mandatory to conduct withstanding voltage test" in technical regulation. The detail value of withstand voltage are studied and described in Guideline.

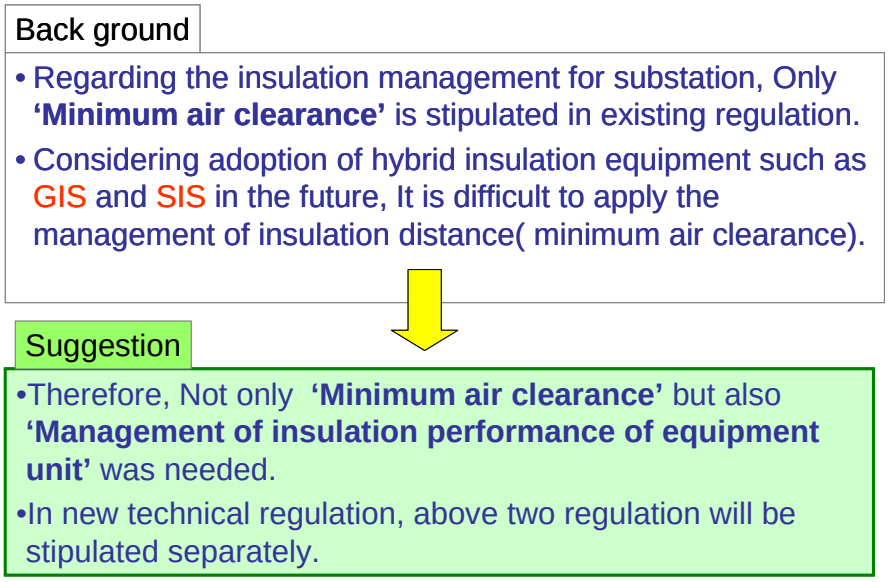


Figure 6.1.3-8 The policy concerning insulation management

The opinion which withstand voltage and test duration in the regulation Vol.5 are not matched actual situation in Vietnam. And JICA explained the detail technical concept about it. According to the comment in 8th WG on 13th, May 2011, Vietnamese members requested JICA to collect the opinion from HCMC and Nha Trang during 2nd WS.

JICA discussed it with participates and found that Vietnamese engineers inspects withstand voltage test only voltage up to 35kV by method IEC decided.

So, JICA and Vietnamese side agreed with these revisions to sift Appendix I to Guideline and will continue to discuss for withstand voltage and its test duration. JICA also recommended that it is very effective to refer the data of factory inspection instead of site test, when there are not specific testing values in IEC.

- 'Minimum air clearance' is needed in designing equipment layout.
  →It must be stipulated in technical regulation.
- "Withstand voltage test (LIWV, SIWV)" is the only method that can stipulate the insulation performance of equipment with the degrees of freedom for design. (BIL)
  →It must be stipulated in technical regulation.
  (It can apply to various insulation equipment [hybrid insulation]).
- In new technical regulation, above two regulation will be stipulated separately.

Figure 6.1.3-9 Summary of insulation management

(7) Link description between Technical Regulation and Guideline

After simplify the Technical Regulation, some of the articles deleted and shift to guideline. But it is important to keep the "link description" to show where they shifted. In doing so, site engineers can easily follows the regulations. JICA study team will prepare these tables.

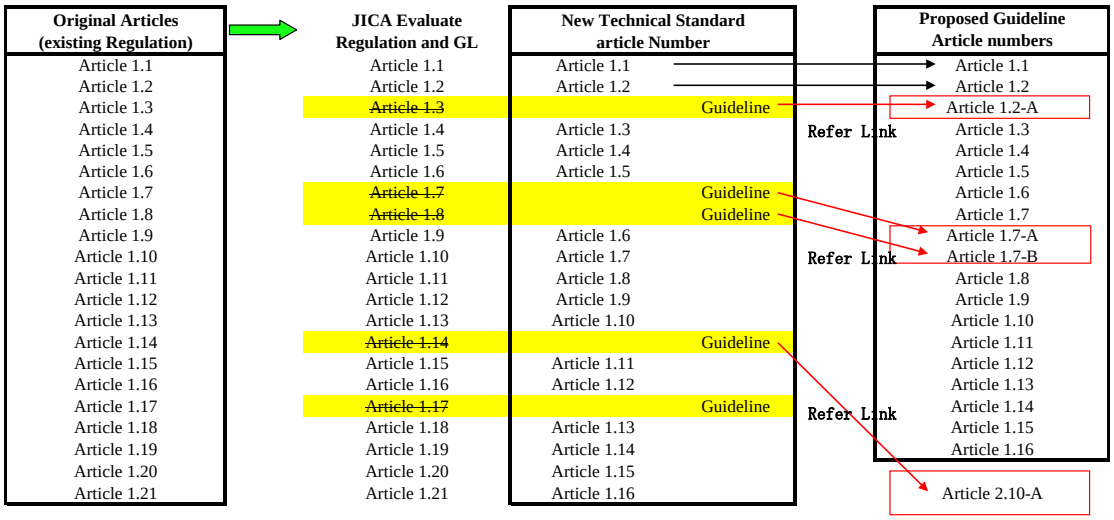


Figure 6.1.3-10 Link description between Technical Regulation and Guideline

6.2 Site Visits in the 1st Stage

Network Group of JICA Team conducted the site visits in order to investigate the actual sitution in application of the existing Techncial Regulations and conditions of operation and maintenance at the

network facilities as follows, and here is the analysis from the result of the interview from related organization.

(1) Substation and Transmission related Son La Hydropower Project, June 24, 2010

Construction equipments in substation are designed and constructed according to "Specifications in IEC or Manufacture". Because there are not all the descriptions in existing Technical Regulation. Concerning new equipments for 500kV, most of them are not included in existing Technical Regulation in Vietnam and their specifications are complied with foreign criteria at present individually.

There are no standard in existing Technical Regulation in Vietnam for 500kV GIS which will be adopted newly in Vietnam and installed in the Son La hydropower plant in this September.

The protection relay is designed according to specification of IEC and manufactures manual instead of Technical Regulation. Because it is not completed and there are mismatching with actual conditions (ex; temperature and specification) and the descriptions of transformer in 500kV is not enough.

(2) Substation and Transmission related Hoa Binh Hydropower Project, June 26, 2010

PTC1 is in charge of an operation of Hoa Binh substation. Designing according to Technical Regulation are utilized by Power Engineering Consulting Company (PECC1).

Although the Hoa Binh substation has already been operating for 16 years after starting operating and a replacing of some equipment has been conducted by same specifications. But in the near future the replacement will be needed with new technology and Technical Regulation need to revise.

The design for receiving transmission line from the Son La hydropower plant which is under construction is conducted by PECC1. Management structure for electric equipments in Vietnam does not have a similar system with the licensed chief engineering system in Japan.

PECC1 is operating the business under the Electricity Law. However, the current design standard does not have specific clauses for power grid connection. Therefore, ETC is requesting PECC1 to find a appropriate solution for receiving the transmission line from Son La hydropower plant.

Concerning the commissioning test, ETC is in charge. PTC1 is in charge of the regular periodic inspection according to EVN supervision (There are formats for inspection items). In addition, an inspection cycle does not have problems because of proper management with taking into consideration safety side according to specifications & manuals of manufacture.

All information such as system accidents are managed by Central Dispatching Center or CDC. When system accident occurs, operation room in Hoa Binh substation complies with CDC commands. Most of the causes of system accidents are lightning and overload.

(3) National Load Dispatch Center (NLDC), June 26, 2010

NLDC (A0) is one of organizations under EVN and its main task is to monitor and control 500kV transmission line. Concerning the transmission line up to 220kV, Regional Load Dispatch Centers (RLDC)) such as A1 (Ha Noi), A2 (Ho Chi Minh) and A3 (Da Nang) monitor and control them in each area such as the northern part, the southern part and the central part. In addition, concerning distribution line, Power Co. Hanoi manages Hanoi area, North Power Co. manages surrounding area of Hanoi, and Ho Chi Minh power Co. manages Ho Chi Minh area, South Power Co. manages surrounding area of Ho Chi Minh and Central Power Co. manages central area, etc.

The monitoring and controlling of power system in NLDC, RLDC utilizes SCADA system (ABB) installed recent years and NLDC operates frequency in 50±0.2Hz properly. Concerning actual power system control, Dispatch Center dispatches it to each substation by phone.

The neutral earthing methods in transmission line of over 100kV are direct earthing method mostly and one in transmission line up to 100kV has resistance earthing method. Although there might be troubles to communication line by fault current at earth fault, etc. in the direct earthing method, NLDC does not recognize this problem.

(4) Southern Region Load Dispatch Center (SRLDC), June 29, 2010

SRLDC (A2) monitors and controls mainly power system of 220kV and 110kV in southern part in Vietnam. SRLDC installed SCADA system (ABB) for monitoring and controlling of power system and other RLDCs such as A1 (Hanoi) and A3 (Da nang) use the same system. Across Vietnam, there are no big differences in equipments related to power system and operation. However, there is one difference in voltage utilized in both parts and it is 15kV used in the southern part. Now they are changing from 15kV to 22kV to unify the voltage level.

There is one 220kV indoor substation utilizing GIS in the southern part. There are 220kV and 110kV cable power system in HCMC and other than them are overhead power system. In addition, cable is XLPE and Oil Filled cable is not utilized at present. There is no submarine cable. All islands have isolated power system generated by DG. A boundary of property of Distribution Company is secondary side of switch gear of secondary side cubicle in 110kV/15kV substation. Information of 15kV bus bar and switch gear can be checked in dispatch center in Distribution Company.

(5) Power Transmission Company 4 (PCT 4), June 30, 2010

Equipments covered by PTC4 are 220kV and 110kV transmission line and PTC4 operates and maintains substation. Design of equipments is conducted by PECC2 or foreign consultants. And

construction of equipments is conducted by Construction Management Board and PTC4 takes over them after completing. In PTC4, all the cable is XLPE and no more Oil Filled cable in the area at present. And testing of cables is conducted according to manufacturer's specification. However, no standards for design of cables are problem.

Department which considers and develops standards creates company's manuals for periodical inspection based on conducting policy "Manual for operation & maintenance of 220 kV/110 kV overhead line" by EVN and conducts periodical test. Concerning standards, they said that latest version (2006) was better than that of previous version (1984). In addition, they submitted report mentioned impossible parts in standards to EVN. They requested us to include standards of GIS and XLPE cable.

The specialized units in addition to processing abnormal condition in the operation also is responsible for planning inspection and maintenance of station equipment according to technical requirements of the manufacturer and the provisions of the EVN.
This substation is only 220 kV indoor substation using GIS in Vietnam. In Hanoi, there is indoor substation for secondary SS. GIS is produced by TMT&T [Toshiba & Mitsubishi Electric Transmission and distribution]. Primary side transformer is TMT&T product and secondary side is Daihen product. Cable is XLPE1,600 mm^2

(6) Ho Chi Minh City Power Corporation (HCM Power Co.), July 1, 2010

Voltages of distribution line are (0.4-6-10-15-22-35-110) kV and wiring of distribution line is 3 phase 4 lines. This method of distribution line is same in all areas in Vietnam. Neutral & direct earthing method is utilized in all areas in Vietnam. Earthing is conducted in all pole transformers and each 250m earthing is conducted in facilities other than pole transformer.
In Ho Chi Minh city grid distribution voltage (15-22-110) kV is neutral earthing and no voltage grid (6-10-35) kV. In the north of Vietnam, the grid distribution voltage (6-10-22-35) kV is isolated neutral and no voltage grid 15kV voltage; grid 22kV neutral earthing. It is therefore the difference in standard note referring to the grounding problem.

In existing Technical Regulation, specific values of earthing resistance are not clear and calculating values is not practical, because they are described by calculating formula. Therefore, HCMC Power CO. submitted the request report for review. JICA team requested them to provide its data to us. Earthing is operated at present by 10Ω in neutral point in transformer and 4Ω in other facilities.

For design of distribution line, HCMC Power Co. provides only standards referring to Vol.1~4 to consulting company and construction company. Therefore, design volume is important and it is impossible without Vol.1~4.

Re-closer systems were introduced to all branch distribution lines and each feeder has 1~2 re-closer. This facility can separate the branch distribution line by coordinating with feeder CB

during electric failures of distribution line. Maintenance manual is created by HCMC Power Co. with reference to Vol.5~7, however detailed contents such as specific values is created by HCMC Power Co. with reference to manufacture's specification.

For revise of Vol.1~7, HCMC Power Co. requested us to include description of new technologies (ex; GIS and underground cable)

(7) Power Engineering Consulting 1 (PECC1),October 14, 2010

The interview survey to PECC1 regarding disseminating situation of existing technical regulation and current situation in the actual design work according to JICA questioner. JICA researched the calculating methods for earthing resistance and earth fault current. Additionally, PECC1 expressed safety corridor based on the indication from MOIT need to be reconsidered for secure safety for residents near transmission line.

6.3 Workshops in the 1st Stage

JICA Team held two Workshops in the 4th and 5th mission in main cities below.

(1) 1st Workshop

1) March 11 (Fri), 2011 at Ho Chi Minh City, total 32 participants
2) March 15 (Tue), 2011 at Hanoi, total 20 participants

Agenda of Network Session

- Background of revision on Technical Regulations Vol.1 to Vol.7 under MOIT
- Proposed major revisions on the existing QCVN Vol.1 to Vol.4
- Proposed major revisions on the existing QCVN Vol.5
- Proposed major revisions on the existing QCVN Vol.6
- Proposed major revisions on the existing QCVN Vol.7

Main Discussion

- Mr. Dung (MOIT) presented the purpose and requirements of the revised regulation, as well as development standards consistent with the new regulations promulgated by the National Assembly. He simultaneously highlighted the goal for this conference that was to collect the opinions of all units, based on which JICA will receive a complete editing to prepare the final draft, then proceed to completed the first phase of the project in July 2011
- JICA presented general policies, the purpose of compiling a new regulation. He also provided normative comparisons Vietnamese with Japanese and some international standards. And JICA also presented general policies, the purpose of compiling revised regulation (Vol.5). The regulation does not change much because in 2007 the same group of Japanese JICA Vietnam has changed, but the comments to the regulations will also be considered if appropriate editing.

- Comment from Vietnamese side: Insulating oil is used extensively in electrical equipment. So that it is better to add a new item in the revised regulation in order to show out a new oil standards and operating oil. For example: Table 27-6 (page 5-13)
- Comment from Vietnamese side: Technical Regulation referring to testing transformer oil, given value of gas content in oil is incoherent and needed to be changed, for example, increase the value.
- Comment from Vietnamese side: Testing voltage for underground cable, referring to Annex, Table 1-1 (page 5-97), given value is incoherent and needed to be changed to gain conforming to standards.
- Comment from Vietnamese side: Table referring the distance insulator air data is classified into 2 items, kV and air gap in mm. If it is needed to rewrite in the clear way and classify into only 1 item, kV or air gap in mm.
- JICA presented Part 3 including table III.2.1 (III.2.53) referring the minimum distance to ensure safety for indoor and outdoor equipment.
- Mr. Dung (MOIT) thanks for representatives of units and welcome for all contributing idea for new regulation.

(2) 2nd Workshop

1) June 22 (Wed), 2011 at Ho Chi Minh City
2) June 24 (Fri), 2011 at Nha Trang
3) June 28 (Tue), 2011 at Hanoi

Agenda of Network Session

- Restructure of Vol.5 Inspection according to Vietnamese request in 9th WG in May.
- Explanation of revision parts according to Vietnamese comments from Vol.1-7
- Open discussion on items especially from Vietnamese sides
- Insulation management
  (Insulation performance of equipment and minimum insulation clearance)
- Basic concept of protection relay

Main Discussion

- At the result of the discussion, both side agreed that transmission line greater than or equal to 220kV shall install fault locater and reflects it in Technical Regulation. Additional revision is to describe as a special case that installation of fault locater in the important transmission line less than or equal to 110kV are desirable, and it is reflected in Guideline.
- JICA explained the measurements and purpose to introduce both Air clearance and withstand voltage to secure the insulation level. And Vietnamese side understood them. JICA received the question about the management of minimum air clearance in cubicle, JICA explained that If these equipment satisfied withstand voltage test such as lightning surge, there are no need to keep air clearance criteria.

- Regarding withstand voltage test, it is mandatory to do in the technical regulation. The result of discussion is Vietnamese side prefer existing Vol. 5 appendix 1 but this appendix will be shifted to the guideline. (Vietnamese side understood that following all the test to IEC standard are very difficult)
- Regarding the request to introduce the measurement of the current of No-load transformer, JICA did not suggested to adopt it because of the difficulties of the test. But after the strong request by Vietnamese side, JICA accepted them and will discuss the test methods in Guideline development stage.

6.4 Development of Draft Technical Regulations

(1) Restructure and combine the definitions in Part.1 "Definitions"

There are the chapters describing the definitions of each facilities in each existing volume, To combine these volumes and to be simplify the structure, JICA created specific part describe the definitions in new regulation.

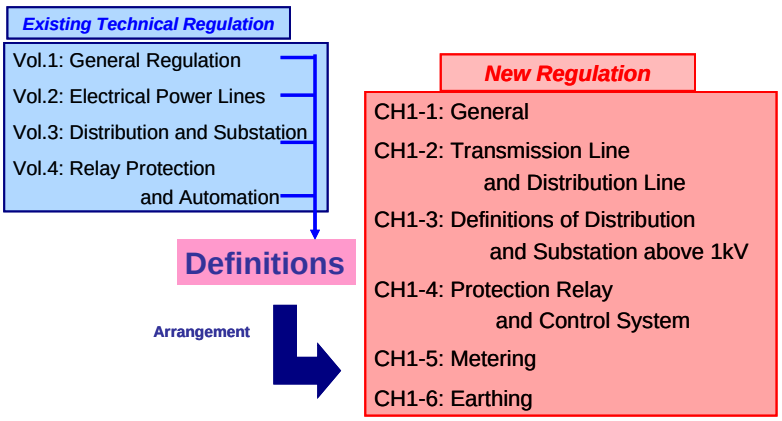


Figure 6.4-1 Revision of Definitions in Part1

(2) Restructure and combine the general requirements in Part.2"General Requirements"

General requirement is the overall functions these facilities need to have minimum its capabilities or performances. It is vital for all the facilities to maintain these qualities and JICA recommend focusing basic requirement in each facility to aim the good quality of power supply.

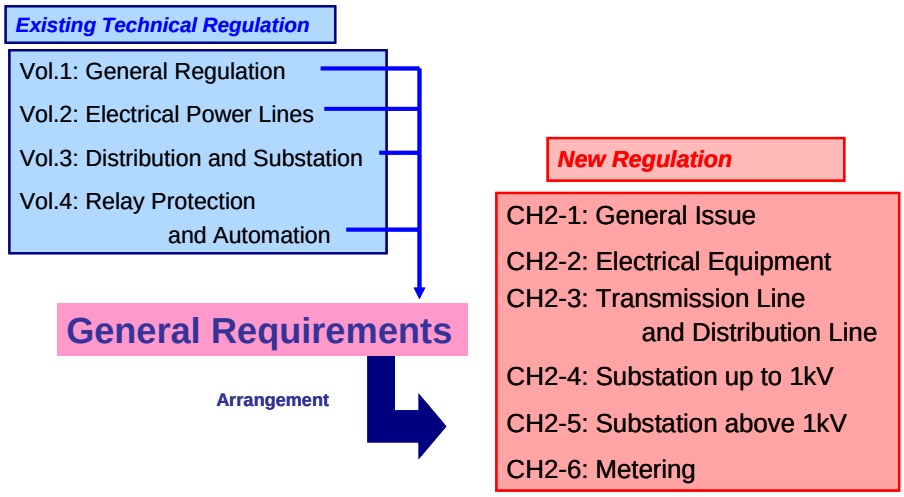


Figure 6.4-2 Revision of General Requirement in Part 2

(3) Restructure and arrange the chapters in Part.3"Transmission and Distribution Line"

Existing Technical Regulation Volume 2 line up the chapters in consequence with the voltage level, that makes these contents large quantity and many articles with the duplications in deferent voltages. JICA recommended combining some of them and simplifying them.

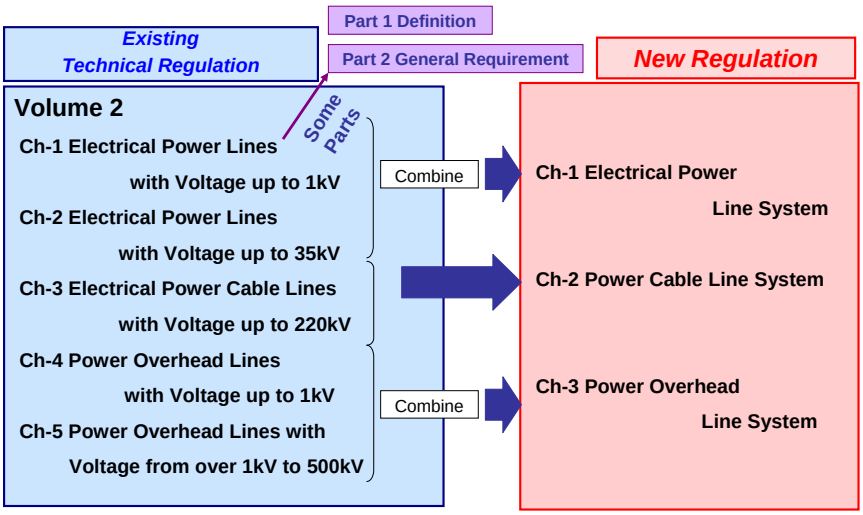


Figure 6.4-3 Revision of Transmission and distributions Line in Part 3

(4) Restructure and arrange the chapters in Part.4"Distribution equipment and Substations"

Volume 1 "Distribution Equipment and Substation" should be focused on "Design" of the electric facilities. But there are many articles related with the electrical installation, JICA suggested to arrange the structures and some sub chapters regarding installations should be sifted to Volume 7 "Installation".

There are many articles in chapter 2 mentioned about "Fire Prevention Measurement", "Ventilation System" and "Minimum Clearance", these are very detailed contents and numerical values are shifted to Guideline.

Additionally many articles related battery system in chapter 3 are described to much detail design such as ventilation specification and the condition of the compartment atmospheres should be shifted to Guideline. and articles mentioned its cleaning and operation/maintenance should be shifted to Vol.6"Operation Regulation".

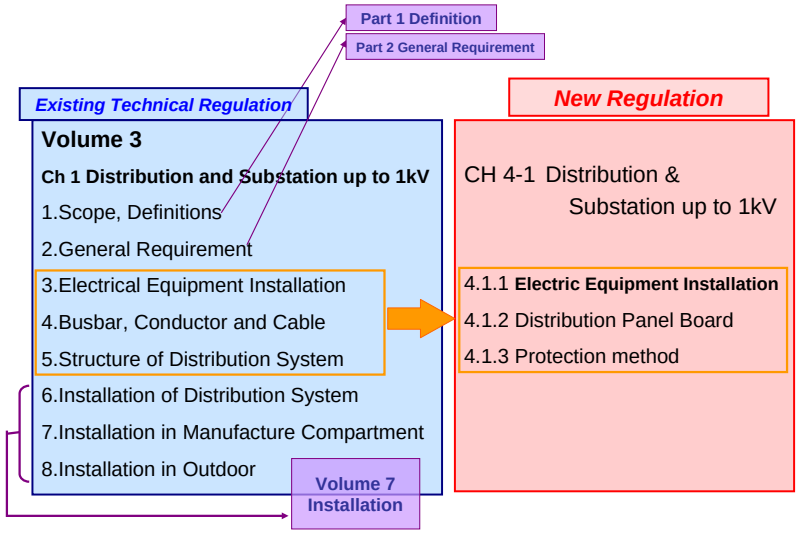


Figure 6.4-4 Revision of distributions equipment and substation in Part4_Chapter 1

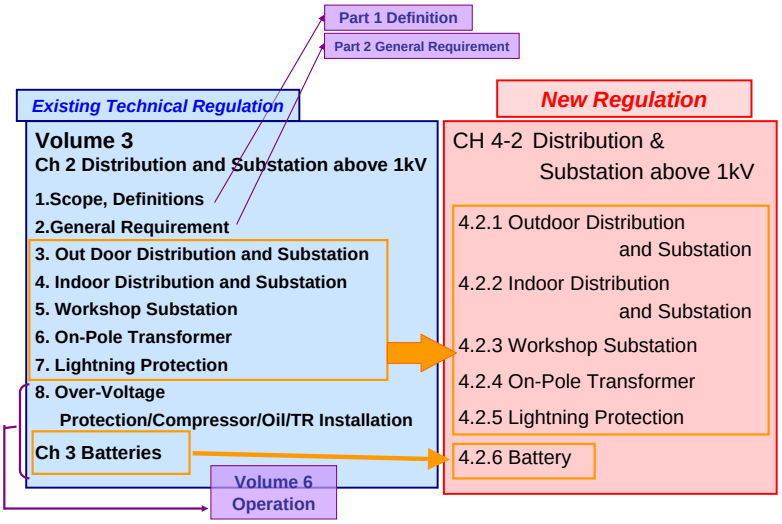


Figure 6.4-5 Revision of distributions equipment and substation in Part4_Chapter 2

(5) Restructure and arrange the chapters in Part.5"Protection Relay and Control System"

The existing Technical Regulation includes from basic articles such as component of protection relay to detail such as motion value, therefore each article contains too much substance and some of them do not have proper consistencies. JICA separated detailed items from basic concepts in these revises.

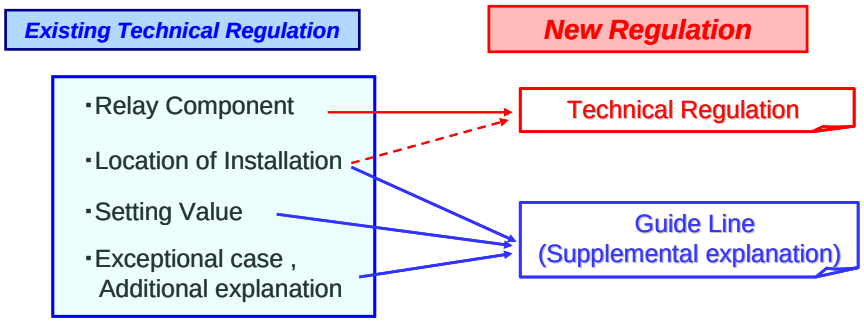


Figure 6.4-6 Revision of Protection Relay and Control System in Part 5

(6) Restructure and arrange the chapters in Part.6 "Earthing"

IEEE Std.80 is the most notorious methods as international standard for designing of earthing system. In the result of review of the existing Technical Regulation, in Vietnamese Technical Regulation, the articles about earthing system are in accordance with IEEE above, but there are still some articles conflicting with IEEE, therefore it is very difficult to understand for electrical designers.

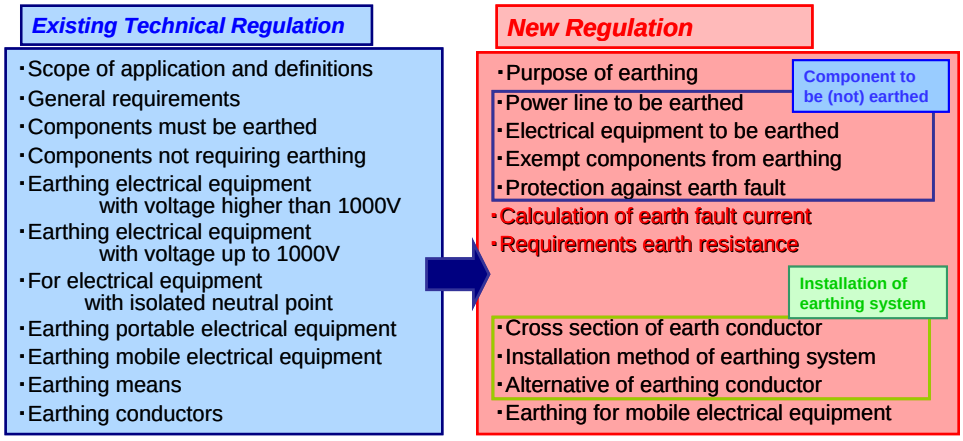


Figure 6.4-7 Revision of Earthing System in Part 6

(7) Check Consistency and the revision of Vol.5

JICA insisted that Numerical Criteria are not appropriate in Technical Regulation and shift to Guideline. But JICA and Vietnamese WG members realized there are many detail items especially in Vol.5.

Basic three concepts of Vol.5 are as follows, this Vol.5 is revised by former JICA Study in 2007. And in this project it should be revised again if there are additional problems in it.

- The items of regulation are the minimum requirement of the test in each equipment and facilities own can add necessity inspection, if needed.
- The owner of the facilities shall conduct the entire test stipulated in Vol.5

- Technical Regulation stipulates only the outline of the test and detail substances are set in companies manual.

Here are some comments from Vietnamese engineers in working group. The main comments are as follows.

- There are some testing items which are not indispensable concerning its situation and content.
- There are not listed all testing items that are done in Vietnamese power company

At the result of these facts, JICA proposed the draft of the revision concerning Japanese current situation that purpose and contents of the test. Both Japanese and Vietnamese side discussed these problems and developed the most appropriate test items for Vietnam system.

JICA also separated detail contents such as judgment criteria and testing values from basic concepts to make them clear as the regulation. The interpretations and spatial cases in this articles sifted to Guideline.

CH	Category	Contents
Ch-1	General Provision	Scope / Definition / Purpose
Ch-2	Organization	Organization / Documentation
Ch-3	Acceptance Inspection	Product damage check during delivery
Ch-4	In-Progress Inspection	Acceptance inspection in each equipment
Ch-5	Commissioning Test	Total Inspection before commissioning 1)General, 2)OH transmission, 3)Underground cable, 4)Substation
Ch-6	Periodic Inspection	Confirm to maintain normal function 1)General, 2)OH transmission, 3)Underground cable, 4)Substation

Former JICA Study developed in 2007 and already well organized

Need some revisions to secure power facilities complying with Technical Standard

Numerical Judgment Criteria should be shifted to GL

===> *Consistency Hydro and Thermal Part*

Figure 6.4-8 Major Change in Vol.5

(8) Check Consistency and the revision of in Vol.6

In part 6 and part 7 related power networks, as there are duplication articles with other volumes, JICA deleted and shifted these articles to proper volumes such as grounding earthing operation. Additionally the detailed contents such as the specific values like allowable voltage rise and construction work area. The contents of battery maintenance added to Chapter 6.

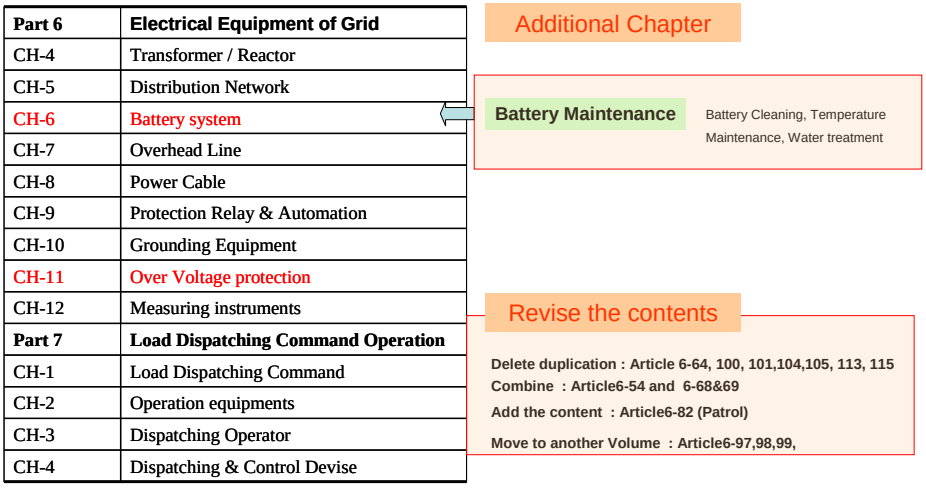


Figure 6.4-9 Major Change in Vol.6

(9) Check Consistency and the revision of in Vol.7

Some of the articles in existing Volume 3"Distribution Equipment and substation" includes the articles related the installation of compartment, battery and other devises in substation. These articles are described about fire prevention measurement then JICA suggested shifting them to Volume 7 in section 8"Fire prevention measurement". Another articles related with site patrol and quality management training added to Chapter 1.

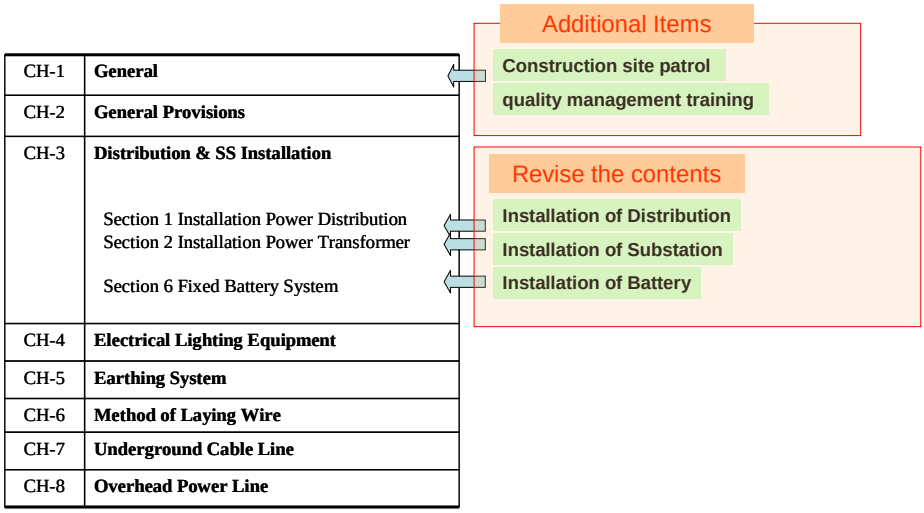


Figure 6.4-10 Major Change in Vol.7

7. JMC and JCC Meetings

7.1 Joint Management Committee (JMC) in the 1st Stage

JMC Meetings were held four (4) times during the 1st Stage of the Project. Main points of discussions in the 1st to 4th JMC Meeting are summarized as follows:

7.1.1 Discussions in the 1st JMC Meeting (March 15, 2010)

In the 1st JMC Meeting, the following issues were discussed and concluded among the participants:

1) Draft Work Report
2) Confirmation of PDM and PO
3) Assignment of WG Members

(1) Draft Work Report

After explanation of Draft Work Report by the JICA Project Team, the JICA Project Team and Vietnamese authorities concerned exchanged opinions on the Project as follows:

1) Framework of the Project Organization
   It was agreed that JMC1 and JMC2 should be substantially unified in their actual activities and that WG1 (hydropower under MOIT) and WG2 (hydropower under MOC) be substantially unified but as the separate JMCs and WGs nominally as agreed in R/D.
2) Schedule of Fieldwork Missions
   Vietnamese authorities concerned requested that JICA Project Team should consider the schedule of preparation of the final draft of Technical Regulations taking into consideration that 3 months period was required for public hearing before approval of the final draft by JCC.
3) Structure of Technical Standards
   Vietnamese authorities concerned requested that the JICA Project Team should divide Vols. 1 to 4 of the existing Technical Regulations of MOIT into mandatory standards and voluntary guidelines, and renew them because some provisions of them are out of date to apply them to the current facilities. Vietnamese authorities also requested that Vols. 5 to 7 could be further divided into mandatory standards and voluntary guidelines with only limited modifications.
   MOC suggested that the Technical Regulation for construction of hydropower facilities should be developed in one volume mainly for safety requirements, and that the guidelines should be prepared separately for design, construction and completion inspection.
4) Schedule of Review Stage
   The JICA Project Team proposed and agreed that the Second Fieldwork, which was originally scheduled from the middle of May 2010 was postponed by one month to allocate the sufficient time for the Review Stage.

5) Capacity Building and Public Relations

Vietnamese authorities concerned proposed that public relations should include dissemination to electric power companies and DOIT (Department of Industry and Trade). The JICA Project Team replied that dissemination to electric power companies could be conducted in some additional workshops in the Second Stage.

6) Definition of Large-scale thermal power plant

Vietnamese authorities concerned requested the JICA Project Team to prepare classification criteria for scale of thermal power plant by unit output. The JICA Project Team replied that he would prepare a classification criterion in due consulting with the Vietnamese side.

7) Baseline investigations

Vietnamese authorities concerned stated that questionnaires for the baseline investigations should be distributed to electric power companies after approval by the relevant authorities (MOIT, MOC, EVN).

8) Local Consultants

Vietnamese authorities concerned suggested that the local consultants shall be selected in due consideration of the experience in the technical regulations.

9) Counterpart Training in Japan

The schedule of the counterpart training in Japan was confirmed among the parties as follows; 1st Group in November 2010, 2nd and 3rd Groups in April 2011.

10) Procurement of Material

Vietnamese authorities concerned proposed that a vehicle should be procured for the Project considering dissemination and capacity building of standards to the related Vietnamese organizations and supporting the project activities.

11) Required Undertaking from Vietnamese Side

Vietnamese authorities concerned agreed to provide undertakings as requested in the draft Work Report including office space for the Project Team for the long-term expert and the missions of short-term experts.

12) Final Work Report

The JICA Project Team stated that the Work Report would be finalized incorporating the agreed issues and opinions of the participants in the meeting.

(2) Confirmation of PDM and PO

The JICA Project Team and Vietnamese authorities concerned agreed on PDM and PO as agreed in Record of Discussion (R/D) dated November 26, 2009 subject to updating the activity schedule in PO.

(3) Assignment of WG Members

The JICA Project Team requested that a staff of all concerning organizations for the Project should be assigned to a member of WGs. Vietnamese authorities concerned replied that they would submit a member list of WGs soon.

7.1.2 Discussions in the 2nd JMC Meeting (July 27, 2010)

In the 2nd JMC Meeting, the following issues were discussed and concluded among the participants:

1) Acceptance of Work Report
2) Contents of draft Review Report
3) Other Issues

(1) Acceptance of Work Report

It was confirmed that the Vietnamese counterpart accepted the contents of the final Work Report.

(2) Contents of draft Review Report

1) General Issues

Scope of the Project was confirmed as explained by JICA Project Team based on the proposal in the final Work Report.

MOC insisted that MARD shall be indicated in the framework of the Project. Also MOIT insisted that MOC and MARD shall cooperate each other.

Regarding the relationship between MARD and MOC, it was recommended, as an idea of MOC, that the Technical Regulation and Guideline on Hydropower Civil Works should be promulgated under the joint-name of MOC and MARD. MARD expressed his support to this idea. This matter shall be discussed further for final conclusion.

Regarding the status of Guidelines, JICA Project Team presented the three ideas; Option-1/ Guidelines to be prepared as one of TCVN, Option-2/ Guidelines to be prepared as the Special TCVN and Option-3/ Guidelines to be prepared as TCCS (industrial level standards). Among the three options, majority of the parties concerned supported Option-2 in general. This matter shall be discussed further for final conclusion.

Regarding the contents of the Guidelines, it was agreed in general to prepare the Guidelines with stipulations of only voluntary provisions as all mandatory requirements are stipulated in the corresponding Technical Regulations.

Regarding the structure of Guidelines, JICA Project Team proposed to arrange articles in Guidelines corresponding to each article of Technical Regulations (article by article), and the proposed structure of Guidelines was agreed among the parties concerned in principle.

2) Hydropower Issues

The Vietnamese authorities concerned agreed to the basic issues in the Draft Review Report as explained by JICA Project Team in general:

3) Thermal Power Issues

The Vietnamese authorities concerned agreed to the contents of Draft Review Report as explained by JICA Project Team.

Some of the Vietnamese authorities concerned suggested that the Guidelines should be prepared as mandatory standards. The JICA Project Team replied that Project Team and Vietnamese authorities concerned would discuss this matter together because it was common subject of this project.

4) Network Issues

The basic policy for the revision of Technical Regulations related to the network issues are as follows:

- Vietnamese counterparts accepted the suggestion of JICA Project Team's basic concept for revising the Technical Regulations Vols.1 to 7
- Vietnamese counterparts requested especially the following items to add detail explanations and to revise the values with consideration of the international methods. JICA Project Team agreed its priority and importance and would consult with Vietnamese side about these items carefully in the next step.
  - Prevention measurements against lightning
  - Appropriate judgment criteria of earthing ground, including the effect to the communication line.
  - Appropriate judgment criteria of minimum clearance with conductors and other objects.
- Vietnamese counterparts proposed that the existing Technical Regulations Vols.1 to 4 should be simplified and combined into one volume. JICA Project Team agreed their proposal and would analyze the appropriate structure and table of contents in the next step.

(3) Other Issues

1) Baseline Survey

The baseline survey on accidents of electric power facilities was planned to be conducted by ETC in August and September 2010 under the scope of the contract between JICA Project Team and ETC. However the parties concerned agreed that MOIT and EVN would cooperate with ETC for conducting the baseline survey. JICA Project Team explained that schedule of baseline survey could be adjusted in accordance with the actual situation of the survey

2) Counterpart Training

The parties concerned agreed the schedule of the counterpart training in Japan as proposed in the final Work Report.

3) Survey on the actual needs of technical regulations and guidelines

JICA Project Team explained about the survey on the actual needs of technical regulations and guidelines for electric power facilities to be performed by the local consultants during the period from June 2010 to January 2011 under the scope of the contract. The parties concerned agreed to conduct the survey as proposed by JICA Project Team.

7.1.3 Discussions in the 3rd JMC Meeting (March 04, 2011)

In the 3rd JMC Meeting, the following issues were discussed and concluded among the participants:

1) Major Activities in 1st Stage (Overall Schedule)
2) Confirmation of contents of the 2nd draft of revised and new Technical Regulations
3) Confirmation of activities in the remaining period of the 1st Stage
4) Arrangement for the 1st Workshop
5) Baseline Survey
6) Final Draft of Technical Regulations
7) 5th Mission of JICA Project Team
8) Comments from JICA

(1) Major Activities in 1st Stage (Overall Schedule)

The JICA Project Team reported the major project activities performed so far since March 2010 and the reported issues were confirmed by the Vietnamese authorities concerned.

(2) Confirmation of contents of the 2nd draft of revised and new Technical Regulations

The JICA Project Team reported the main points of the 2nd draft of Technical Regulations as follows:

1) General Issues
   The scope of the Project and status of the Project outputs (Draft of Technical Regulations and Draft of Guidelines) were reconfirmed.
2) Hydropower Issues
   Major issues proposed in the 2nd draft of Technical Regulations such as scope of application were explained by JICA Team.
3) Thermal Power Issues
   Major issues such as classification of plants, scope of cover of Technical Regulations, etc. were explained by JICA Team.
4) Network Issues
   It was confirmed that JICA Team would prepare Old-New comparison table to show the complicated process of revisions.

(3) Confirmation of activities in the remaining period of the 1st Stage

The JICA Project Team reported the major points of activities in the remaining period of the 1st Stage of the Project as follows:

1) Preparation of Old-New Comparison Table
   The JICA Project Team agreed to prepare Old-New Comparison Tables not only for network but also for hydropower and thermal power.

2) Background of Revisions

The JICA Project Team agreed to provide with reasons for revisions in Old-New Comparison Tables.

3) Scope of Application for Hydropower Plants

The participants of meeting agreed to discuss this matter in the next Working Group Meeting.

4) Renumbering of Volumes of the existing Technical Regulations

The participants agreed to discuss about renumbering of volumes for the existing Technical Regulations in the next Working Group Meeting.

(4) Other Issues

1) Arrangement for the 1st Workshop

The parties concerned confirmed to assign chairpersons for each of hydropower, thermal power and network sessions from MOIT, MOC (hydropower only) and EVN.

2) Baseline Survey

The ETC (the local consultant assigned for Baseline Survey) reported the results of Baseline Survey. MOIT and EVN stated that the reported survey has provided with sufficient research outputs and the report involved satisfactory contents.

On the other hand, the JICA Project Team proposed that answers of questionnaires should be collected as much as possible from the remaining power plants and power network companies to which the questionnaires had been delivered in cooperation with EVN.

EVN agreed to the proposal of JICA Project Team.

3) Final Draft of Technical Regulations

The JICA Protect Team reconfirmed that the official output of the Project was English version and that the Vietnamese side should take responsibilities for translation of the output into Vietnamese for their promulgation. The Vietnamese side participants confirmed that they fully understood this matter.

4) 5th Mission of JICA Project Team

The Vietnamese side agreed that the 1st JCC meeting would be held by the initiative of Vietnamese side.

5) Comments from JICA

Mr. Kenji Takada of JICA gave an address of thanks for the cooperation of Vietnamese authorities in the implementation of the Project and requested further cooperation in the accumulated Project activities including preparation of Old-New Comparison Tables for the existing and new Technical Regulations, etc.

The Vietnamese authorities stated that they understood the situation of the Project and that they would consider arrangement of personnel for preparation of the draft Technical Regulations, especially for the network group for its big work volume.

7.1.4 Discussions in the 4th JMC Meeting (July 05, 2011)

In the 4th JMC Meeting, the following issues were discussed and concluded among the participants:

1) Report of Current status of the Project
2) Preparation of Final Draft of Technical Regulations (English version) by JICA Project Team
3) Finalization of Draft Technical Regulations (Vietnamese version) by Vietnamese authorities
4) Promulgation of Technical Regulations (VN version) by Vietnamese authorities
5) Development of Guideline (2nd Stage)

(1) Report of Current status of the Project

According to the agenda, JICA Project Team reported current status of the Project.

(2) Preparation of Final Draft of Technical Regulations (English version) by JICA Project Team

The parties concerned agreed to the following:

1) Arrangement of new volume numbers
2) Arrangement of Article No. for the revised Volumes
3) Preparation and submission of Final Draft (English version)
   JICA Project Team will prepare the English version of Final Draft based on the comments received up to the 2nd Workshop on June 22, 24 and 28, 2011 and the conclusion of the WG Meeting on June 30, 2011 and submit them to JICA by July 25, 2011.
   Final Draft of Technical Regulation for Hydropower Civil Works under MOC will be submitted by JICA Team in October 2011 after necessary procedure of MOC.
4) Preparation of Final Draft (Vietnamese version) by JICA Project Team
   JICA Project Team will update the Vietnamese version of Final Draft based on the English version as the documents for reference, and submit them to Vietnamese authorities in August 2011 except for Technical Regulation for Hydropower Civil Works.

(3) Finalization of Draft Technical Regulations (Vietnamese version) by Vietnamese authorities

JICA Project Team requested the Vietnamese authorities to finalize Draft Technical Regulations as follows:

1) Actions against further comments
   Vietnamese WG members shall compile the additional comments before transferring them to JICA Project Team and conclude the necessary revisions on Final Draft submitted by JICA Project Team.
2) Finalization of draft Technical Regulations by Vietnamese authorities
   Vietnamese WG members shall finalize the draft of Technical Regulations within six months after JICA Project Team submitted the English version of final draft.

JICA Project Team proposed that they would support Vietnamese authorities for the technical matters by participating discussions and giving advices.

On the other hand, the Vietnamese side confirmed their responsibility to finalize the Vietnamese version for promulgation.

(4) Promulgation of Technical Regulations (VN version) by Vietnamese authorities

JICA Project Team requested the Vietnamese authorities to promulgate Technical Regulations as follows:

1) Promulgation procedure of Technical Regulations under MOIT will be commenced by MOIT after finalization of them by the Vietnamese authorities within six months after JICA Project Team submitted the English version of Final Draft.
2) Promulgation procedure of Technical Regulations under MOC will be commenced by MOC after finalization by the Vietnamese side within three months after JICA Project Team submitted the English version of Final Draft.
3) MOIT and MOC shall make utmost effort to achieve the promulgation of Technical Regulations within the Project period, by February, 2013.

MOC stated that it would be difficult to finalize Technical Regulations within three months, however, MOC intended to finalize and promulgate it by the end of March 2012 and by the end of June 2012 respectively.

MOIT proposed that Technical Regulations and Guidelines would be promulgated simultaneously as the both documents were closely related each other and it would be necessary to revise Technical Regulations during preparation of Guidelines.

JICA Project Team proposed and MOIT agreed to discuss the proposed promulgation schedule in the next JMC Meeting because the proposed promulgation schedule of Technical Regulations would affect the Project Purpose in the PDM.

On the other hand, MOC stated that they would promulgate Technical Regulations under MOC by the end of June 2012 without waiting for the promulgation of Guideline.

(5) Development of Guideline (2nd Stage)

JICA Project Team proposed a tentative schedule of the 2nd Stage as follows:

1) Outline of activities

   JICA Project Team proposed and the Vietnamese authorities agreed that the Workshop would be held twice in the 2nd Stage and that the number of Field Works in Vietnam would be increased.

2) Project Term

   JICA Project Team confirmed the opinion of Vietnamese authority concerning the possibility of extension of Project term for some months until March 2013 or a few months later for securing the time for successful completion of Guidelines, although the PDM stipulated the termination in January, 2013.

The Vietnamese authorities stated no objection against the extension of the Project term for some months by giving an authority of the final decision to the JICA side.

7.2 Joint Coordination Committee (JCC) in the 1st Stage

The 1st Joint Coordination Committee Meeting was held on July 05, 2011 as the combined meeting with the 4th JMC Meeting. Schedule for promulgation of Technical Regulations were discussed in the meeting. The contents of discussion are described in Item (4) of 7.1.4 above in this report.

8. Other Activities in the 1st Stage

8.1 Employment of Local Consulting Companies in the 1st Stage

The JICA Project Team employed local sub-consultant companies which had a lot of experiences and information regarding the scope of works of the local consultants.

The local sub-consultant companies were employed in the form of a long term consultant contract because the scope of works of local consultants includes many different fields and are conducted irregularly during the Project period. The candidates for a local sub-consultant company should be well acquainted with technical standards and regulations of electric power facilities including civil work structures and have headquartered in Hanoi considering the base for implementation of the works. There were few companies or organizations which satisfy the said conditions, so the companies were selected through biddings among the nominated companies. As, the Project includes the works in the fields which are controlled by the two different government agencies, MOIT and MOC, the works were commissioned to two separate local consulting companies or institutes which can cover the specific fields of works related to MOIT and MOC respectively as follows:

1) Electrical Testing Center (ETC) for the scope regulated by MOIT
2) Center for Water Researc and Engineering Application (CRA) for the scope regulated by MOC

8.2 Baseline Survey in the 1st Stage

8.2.1 General

The Project initially set overall goal and project purpose in its PDM as follows respectively:

1) Improve reliability and safety of power supply by means of decreasing electric power disorders caused by failures in design, construction, operation and maintenance through disseminating technical regulations to electric power industry in Vietnam (overall goal)
2) Electric power technical regulations will be enacted and operated effectively and efficiently through disseminating the technical regulations and guidelines to electric power industry in Vietnam (project purpose)

The baseline surveys were conducted for the following items in order to set baselines as a base of evaluation on the achievement of said overall goal and purpose of the Project:

1) The number of accidents and power outages for setting baseline of the item 1) above (overall goal)
2) Dissemination levels of technical standards and regulations and degree of satisfaction regarding guidelines to the technical staff of electric power companies for setting baseline of the item 2) above (project purpose).

Surveys were conducted by the local sub-consultant companies for the following items.

1) Detailed items of a baseline survey regarding the number of accidents and power outages;

a) Average number of occurrence and time period of electric power outages, and interrupted amount of electric energy per electric power user for each electric power distribution company;
b) The number of accidents and interrupted amount of electric energy at substations;
c) The number of accidents at transmission lines;
d) The number of accidents and interrupted amount of electric energy at hydropower and thermal power plants; and
e) The actual situation regarding the reporting of accidents.

2) Detailed items of a baseline survey regarding degree of understanding of electric power technical regulations.

a) The actual situation regarding the use of electric power technical standards and regulations in electric power companies;
b) The actual situation regarding the preparation of administration manuals and operation manuals based on electric power technical standards and regulations; and
c) The actual situation regarding the institutional framework for compliance of electric power technical regulations.

In the 3rd JMC Meeting on March 4, 2011, the ETC (the local consultant assigned for Baseline Survey) reported the results of Baseline Survey. MOIT and EVN stated that the reported survey has provided with sufficient research outputs and the report involved satisfactory contents.

ETC prepared the final report after receiving the additional answers submitted by some power plants and network companies and ETC reported the result in the 2nd Workshop held on June 22, 24 and 28 in Ho Chi Minh City, Nha Trang and Hanoi respectively.

8.2.2 Baseline Survey on Hydropower Facilities

(1) General Information

Baseline survey for the accidents at hydropower facilities was conducted through the questionnaire. The questionnaire was delivered to the 17 hydropower plants (13 hydropower companies) and the answers were collected only from 10 hydropower plants (7 hydropower companies)..

According to the answers from the 10 hydropower plants, 116 accident cases were reported in total.

(2) Accident Type

In the questionnaire, the accidents are categorized into the following 6 types:

1) Type-1: Fire accident
"Fire accident" is a fire on power plant facilities which caused damages to surrounding facilities outside the power plant and property of third parties.
2) Type-2: Accident on power plant by which public facilities were forced to be out of use or faced to serious or dangerous situation and/or which affected social activities such as public traffic
3) Type-3: Accident by which the main equipment * of power plant were damaged.
4) Type-4: Forced power supply outage
Forced power supply outage is such situation that the power supply is stopped or restricted urgently due to accident of power plant equipments or human error.
5) Type-5: Accident or trouble on equipment or structures which required significant repair and/or countermeasures regardless of its effect to power supply
6) Type-6: Accident or trouble on civil work structures or reservoir

Among the 116 cases, 106 cases (91%) were reported as Type-4 while the other 9 cases (8%) and 1 case (1%) were Type-5 and Type-6 respectively.

(3) Cause of Accident

In the questionnaire, the accidents are categorized by cause into the following 5 cases:

1) Cause-1: Equipment
2) Cause-2: Maintenance trouble
3) Cause-3: Natural Disaster
4) Cuase-4: Human error
5) Cuase-5: Others

Among the 116 cases, 93 cases (79%) were reported as Cuase-1 and 11 cases (9%) were reported as Cause-4 while the other 3 cases (3%), 4 cases (3%) and 6 cases (5%) were Cause-2, Cause-3 and Cause-5 respectively.

(4) Summary of Accident at Hydropower Plants

Through summarizing and analyzing the investigation results, the following could be recommended as countermeasures against the accidents at hydropower plants:

1) To improve testing and checking procedures for equipment to ensure safety and reliability of plant equipment
2) To train and improve the competency of workers, investigators and maintenance personnel in order to prevent accidents and issues caused by human errors.

8.2.3 Baseline Survey on Thermal Power Facilities

(1) What can be inferred from the survey results.

- We sent questionnaire to 11 power stations, however, we could received answer from only 7 power stations.The cause why no answer is estimated as followe:
- Originally, such data have not been collected in the power station.
- They could not understand the purpose of this survey.
- There is no system to oblige to submit such data to the States and to know the health of power facilities and reflect them for electric utility policy.
- The restriction to put out the bad informations what the power station does not want put out.

(2) What can be inferred from the content of survey results of general.

- As the general trend, the new power plants have high utilization factor and old power plants has low utilization factor. However, the Ba Ria power station and Phu My4 (2009) which is not old one has low utilization factor. It may have any specific reason.
- When assuming the maintenance and accident stop in a year, utilization factor is estimated as; $(365\text{-}60)_{days}$ x 24h/8,760h x 100% = 83.6%. Pha Lai, Phu My1, Phu My2.1, Phu My2.1MR and Phu My 4 (except 2009) are keeping reasonable level.
- On the other hand, Thu Duc, Can Tho, Hiep Phoc, O Mon, Na Duong are infered that the low utilization factor due to troubles because of oldness.

(3) What can be inferred from the content of survey results of static number of accident or trouble.

- The number of accident of Pha Lai, Ba Ria, Thu Duc accounted 73.5% of the total number. It seems to be due to the strict application of “accident or trouble” severer than other power plants.
- The equipment and maintenance accounted the almost cause of accidents or troubles. This may require detailed analysis, because they have several reasons.

8.2.4 Baseline survey in Network facilities

After conducting baseline survey, JICA Team understood there are no formal data related to the electric failures in Vietnam and many power companies managed these data by themselves. Then the data below are the collected data by ETC from Transmission Power Companies and Load Dispatch Center.

According to the data of “Transmission line accidents”, 78% of the accidents caused by lightning, a kind of natural factor, but the second main cause of 8% are by object contact. Contact with wire due to the lack of maintenance and inspection tour. JICA Team concluded the necessity of the enhancement of operation manual especially for safety corridor, the design of transmission line, and supervision and management of transmission lines.

Table 8.2.4-1 Summary of Transmission Line Accidents

Transmission Line accident 500kv+220kV (3Years 2007-2009)

Cause	times	brackout time[m]	
Lightning	322	8,304	
Damaged insulator (without lightning)	16	25	
Touch with object /tree	33	301	
Breaking of wire (without lightning)	6	3,067	
Others	36	4,509	length[km]
Total	413	16,206	13,158

According the data of “Transformer accidents” below, most common cause for “protecting relay” is the malfunction of the relay. These results gave the evidence for the lack of operation knowledge of protecting relay. Second major cause of “fire” is big disaster for power companies and it is possible to reduce it by enhancing the regulations for operation and design.

Table 8.2.4-2 Summary of Transformer Accidents

Transformers accident 500kv+220kV (3Years 2007-2009)

Cause	times	brackout time[m]	
Protection Relay	29	3,577	
Fire	7	83,957	
Damaged insulator	1	420	
Others	26	3,314	No. of TR[Unit]
Total	63	91,268	127

Part 3 Project Activities in the 2nd Stage

9. Project Activities of Hydropower Group

9.1 Working Group Meetings in the 2nd Stage

9.1.1 Member of Working Group (Hydropower Group)

There are two Working Groups for Hydropower; WG1 (hydropower under MOIT) and WG2 (hydropower under MOC). The member of WG1 and WG2 are as listed below:

- Member of WG1 (hydropower under MOIT):

1) Mr. Tran Viet Hoa (Science and Technology Dept., MOIT)
2) Mr. Duong Khac Hien (Hydropower Department, General Energy Directorate, MOIT)
3) Dr. Tran Huu Ha (Deputy Director General, Dept. of Science, Technology & Environment, MOC)
4) Mr. Dinh Vu Thanh (Science, Technology & Environment Dept., MARD)
5) Mr. Khong Trung Duan (Science, Technology & Environment Dept., MARD)
6) Mr. Nguyen Tuan Anh ((Science, Technology & Environment Dept., MARD)
7) Mr. Le Huu Hoang (Technical-Operational Dept., EVN)
8) Mr. Tran Hong Tien (Technical-Operational Dept., EVN)
9) Mr. Le Kim Ngoc (Science, Technology & Environment Dept., EVN)

- Member of WG2 (hydropower under MOC):

1) Dr. Tran Huu Ha (Deputy Director General, Dept. of Science, Technology & Environment, MOC)
2) Mr. Hoang Quang Nhu (Dept. of Science, Technology and Environment, MOC)
3) Mr. Nguyen Cong Thinh (Dept. of Science, Technology and Environment, MOC)
4) Mr. Dinh Chinh Loi (Dept. of Science, Technology and Environment, MOC)
5) Mr. Doan Trong Tuan (Vietnam Institute of Architecture, Urban and Rural Planning, MOC)
6) Mr. Tran Viet Hoa (Science and Technology Dept., MOIT)
7) Mr. Duong Khac Hien (Hydropower Department, General Energy Directorate, MOIT)
8) Mr. Dinh Vu Thanh (Science, Technology & Environment Dept., MARD)
9) Mr. Khong Trung Duan (Science, Technology & Environment Dept., MARD)
10) Mr. Nguyen Tuan Anh ((Science, Technology & Environment Dept., MARD)
11) Mr. Le Huu Hoang (Technical-Operational Dept., EVN)
12) Mr. Tran Hong Tien (Technical-Operational Dept., EVN)
13) Mr. Le Kim Ngoc (Science, Technology & Environment Dept., EVN)

9.1.2 Schedule of Working Group Meetings

During implementation of the 2st Stage, the Working Group Meetings (Hydropower) were held as listed below:

Table 9.1.2-1 Schedule of WG Meetings in the 2nd Stage (Hydropower Group)

11th WG Meetings (Hydropower group-1)	November 15, 2011
8th WG Meetings (Hydropower group-2)	November 15, 2011
12th WG Meetings (Hydropower group-1)	November 18, 2011
13th WG Meetings (Hydropower group-1)	November 21, 2011
14th WG Meetings (Hydropower group-1)	May 8, 2012
15th WG Meetings (Hydropower group-1)	May 10, 2012
9th WG Meetings (Hydropower group-2)	May 15, 2012
16th WG Meetings (Hydropower group-1)	July 16, 2012
17th WG Meetings (Hydropower group-1)	July 17, 2012
18th WG Meetings (Hydropower group-1)	October 23, 2012
19th WG Meetings (Hydropower group-1)	January 08, 2013
20th WG Meetings (Hydropower group-1)	January 10, 2013
10th WG Meetings (Hydropower group-2)	January 15, 2013
21st WG Meetings (Hydropower group-1)	April 18, 2013

9.1.3 Main Point of Discussions in Working Group Meetings

Main points of discussions in the Working Group Meetings are summarized as follows and the details are shown in Appendix-4 of Project Progress Report No.2 and Appendix-4 of this Report:

(1) Discussions in the 11th Working Group Meetings (Hydropower-1) on Nov. 15, 2011

JICA Hydropower Team and the Vietnamese WG members confirmed the work schedule and principle of the Guideline. The Vietnamese side proposed that MOIT and MOC should unify the contents of the Technical Regulations. The JICA Project Team answered that working members of the both ministries should coordinate their opinions.

The contents of draft Guideline Vol.4 was also discussed in the meeting based on the tentative examples of the Guideline (civil work part) prepared by JICA Project Team. The Vietnamese side requested the JICA Project Team to prepare the draft Guideline more minutely with photographs showing examples of measuring devices used in developed countries. The JICA Project Team answered that they would provide the draft with photographs as the occasion demands because the Guideline is not a textbook.

(2) Discussions in the 8th Working Group Meetings (Hydropower-2) on Nov. 15, 2011

JICA Hydropower Team and the Vietnamese counterparts confirmed the work schedule of finalization for the Technical Regulation and development of Guideline.

Regarding the Technical Regulation, MOC explained that the second draft Technical Regulation would be discussed in the MOC Workshop meeting to be held in December, 2011 with 25 to 30 experts and MOC would send a draft amendment to the JICA Project Team at the end of December, 2011. MOC also explained that MOC would hold a workshop at the end of February, 2012 and send a draft amendment to the JICA Project Team.

(3) Discussions in the 12th Working Group Meetings (Hydropower-1) on Nov. 18, 2011

The contents of the Guideline Vol.4 (electrical and electromechanical part) were discussed among parties based on the tentative example prepared by JICA Team. The proposed contents in the tentative example of Guideline were accepted by the Vietnamese side in general subject to revisions or supplementation of details.

(4) Discussions in the 13th Working Group Meetings (Hydropower-1) on Nov. 21, 2011

The contents of the Guideline Vol.5 (civil work part and electrical and electromechanical part) were discussed among parties based on the tentative example prepared by JICA Team. The proposed outline and contents in the tentative example of Guideline Vol.5 were accepted by the Vietnamese side in general subject to revisions or supplementation of details.

(5) Discussions in the 14th Working Group Meetings (Hydropower-1) on May 8, 2012

The 14th WG meeting was held to confirm the final solutions for the comments received from Vietnamese side (MOIT) regarding general and hydropower issues of draft Technical Regulation Vol.4 and Vol.5. Discussion was made based on the specific contents of the comments in the Technical Comment Table on Final draft of Technical Regulation (prepared on March 23, 2012). The proposed final solutions are discussed and agreed in general in the meeting.

(6) Discussions in the 15th Working Group Meetings (Hydropower-1) on May 10, 2012

The 15th WG meeting was held to confirm the countermeasures for JICA Team's comments regarding general and hydropower issues on draft Technical Regulation Vol.4 and Vol.5. Discussion was made based on the specific contents of the comments in the Technical Comment Table on Final draft of Technical Regulation (prepared on March 30, 2012). The proposed final solutions are discussed and agreed in general in the meeting.

Also, the procedure for reviewing the 1st draft and development of 2nd draft Guidelines Vol.4 and Vol.5 regarding the hydropower issues was discussed in the meeting. MOIT stated that the Guidelines are the important documents so that they shall be developed through sufficient discussions between JICA Team and Vietnamese side. Confirmation procedure on the draft Guidelines is agreed as follows.

1) Each article of the Guidelines will be prepared with efforts to contain following contents by way of submitting maximum information by JICA Team and Vietnamese counterparts as much as possible.
   - Explanation of the stipulations in the mandatory Technical Regulations,
   - Applicable methods (specific methods) and relevant technical or technological matters,
   - Stipulations of the internationally accepted standards, and
   - Relative figures, pictures and so forth.

2) The comments regarding the 1st draft of the Guidelines already submitted by JICA Team will be collected by MOIT (Mr. Hoa), and he will send them to JICA Team by the end of May 2012 in Vietnamese. JICA team will reflect the answer of the comment to the 2nd draft of the Guidelines as much as possible.

(7) Discussions in the 9th Working Group Meetings (Hydropower-2) on May 15, 2012

Basic ideas and procedure for formulation of the draft Guideline of Technical Regulation on Hydropower Civil Works were discussed and concluded in the meeting to apply the following in principle:

1) The format of the Guidelines shall conform to the Vietnamese format whichever as national regulations or as technical guidelines.
2) The contents which overlap with contents of the QCVN shall be deleted and guideline shall be prepared only for the articles which are difficult to understand.
3) Explanations of the stipulations in Technical Regulation are acceptable because they are comprehensible.
4) Specific measures to implement the requiremets of QCVN shall be added in the Guidelines.

MOC informed that the promulgation of the Technical Regulation on Hydropower Civil Works will delay because the procedure for promulgation of MARD's QCVN which is referred to by the draft Technical Regulation is still underway

(8) Discussions in the 16th Working Group Meetings (Hydropower-1) on July 16, 2012

JICA Hydropower Team and the Vietnamese counterparts confirmed contents of the 1st draft of the Guideline Vol.4 based on the Technical Comment Table on draft Guideline. The major conclusions of the meeting are as follows:

1) It is desired to refer not only to regulations corresponding to JIS but also to all relevant international standards. It is acceptable to show only numbers of relevant provisions.
2) The regulation on management of oil shall be shifted from the part of hydropower to that of general issues. In concrete, it shall be shifted to Chapter 15 of Part 6 in Vol.4. Vietnamese side will prepare a draft amendment and request the JICA Hydropower Team to confirm it after due consultation with Thermal Power Team.
3) Regarding Article 99 of Vol.4, detailed explanations of technical requirements which classify structures of penstock are contents of technical handbooks, and not of guidelines,

and as the guideline on electrical equipment, the provision of Article 99 has sufficient content.

(9) Discussions in the 17th Working Group Meetings (Hydropower-1) on July 17, 2012

JJICA Hydropower Team and the Vietnamese counterparts confirmed contents of the 1st draft of the Guidelines Vol.4 and Vol.5 based on the Technical Comment Table on draft Guideline. The major conclusions of the meeting are as follows:

1) Regarding Article 98 “Runner inspection” of Vol.4, Vietnamese side agreed to the JICA Hydropower Team’s proposal. However, legal provisions in Vietnam shall enumerate all examples, and words “etc.” and ”and so on” shall not be used because these expressions make the sentence unclear.
2) Regarding the title of Chapter 3 “In Progress Inspection” in Part 3 of Vol.5, Vietnamese side agreed to keep it as it is.
3) Regarding the title of Article 87-a6 “Main transformer” in Part 3 of Vol.5, Vietnamese side agreed to keep as it is, because the transformer is used not only as step-up transformer during power generation but also used as ”step-down transformer” during pumping operation at pumped storage power plants.
4) Regarding Article 86 “Auxiliary equipment operation test” in Part 3 of Vol.5, each party agreed to add provisions regarding an ancillary power system and telecommunication system to the Guideline as paragraphs (10) and (11), respectively..
5) Regarding the tests on power plant equipment, each party agreed to provide Article 98-a2 “Power plant equipment test” additionally in Part of Vol.5 for both of Technical Regulation and Guideline.
6) Regarding the provisions of Article 5 and Article 7 in Guideline Vol.5, it was agreed that the JICA Team would propose provisions taking into account the ideas proposed by Vietnamese side provided that the contents shall not be of deviating from the implication of technical regulations.

(10) Discussions in the 18th Working Group Meetings (Hydropower-1) on October 23, 2012

JICA Hydropower Team and the Vietnamese counterparts confirmed proceedings of the breakout sessions of Hydropower Group in the 3rd Workshop to be held on October 26 and 20, 2012 at Ho Chi Minh City and Hanoi respectively. The major conclusions of the meeting are as follows:

1) In the breakout session A-1 of WS, CRA explains the draft of new technical regulation and pre-draft of guideline for hydropower civil works.
2) In the breakout session A-2 and A-3, MOIT takes the chair at the session on the 2nd draft Guideline of Vol.4 Part 4 and Vol.5 Part 3 and the participants discuss them. The JICA Project Team supports the discussion.
3) The reception of comments from participants shall be closed on November 30, comments shall be consolidated by MOIT and sent to the JICA Project Team, and the both parties will discuss them at Working Group meetings to be held late in January 2013.

Also, the comments on the second draft guideline Vol.4 and Vol.5 were discussed. The major conclusions are as follows:

1) Regarding the time of 1st periodic inspection for dam safety stipulated in Article 100-a6 of the draft Technical Regulation Vol.5, the description that "the first periodic inspection for dam safety shall be carried out during one year period from one year after the date when the reservoir water level reaches the normal high water level" is liable to cause misunderstanding. Therefore, the clarification with illustration will be provided in the draft Guideline.

(11) Discussions in the 19th Working Group Meetings (Hydropower-1) on January 08, 2013

JICA Hydropower Team and the Vietnamese counterparts confirmed conclusions of comments on Guideline Vol.4 discussed in the working group meeting and the 3rd Workshop. The major conclusions of the meeting are as follows:

1) Regarding Articles 5 and 7 in draft Guideline Vol.4, it shall be avoided in general to quote provisions of the existing laws or regulations in the mandatory regulation, but it is acceptable to quote them in Guideline.
2) Regarding Article 50 in draft Guideline Vol.4, it is not necessary to add thresholds to Tables 50-1 to 50-3 since there are no clear thresholds of monitoring data as dams are constructed on various conditions. Also, Tables 50-1 and 50-2 show examples in Japan and that Table 50-3 shows an example of the minimum requirements on monitoring items and not a mandatory regulation.

(12) Discussions in the 20th Working Group Meetings (Hydropower-1) on January 10, 2013

The JICA Hydropower Team and the Vietnamese counterparts confirmed conclusions of comments on Technical Regulation and Guideline Vol.5 discussed in the Working Group meeting on 23 October 2012 and the 3rd Workshop on 26 and 30 October 2012 and the contents which have been revised by the JICA Hydropower Team on Guideline Vol.5. The major conclusions of the meeting are as follows:

1) Regarding Article 79 of draft Guideline Vol.5, the methodology using each of two formulas mentioned in "Comment" column will be described in the Guideline.
2) Regarding Article 92 of the draft Guideline Vol.5, it will be revised so as to provide clear explanation regarding particular case of load rejection test.
3) Regarding Article 123 of the draft Guideline Vol.5, it was agreed that Table 123-1 "Frequency of periodic inspections" shown in the draft Technical Regulation Vol.5 will be also shown in the draft Guideline Vol.5.
4) Regarding Article 108 of the draft Guideline Vol.5, revision of Paragraph 3 regarding sedimentation is acceptable for English versions. However, the Vietnamese version is difficult to understand due to incorrect translation. Therefore, Vietnamese versions shall be reviewed and corrected according to the English versions.

5) Regarding Article 100-a8 of the draft Guideline Vol.5, the Vietnamese counterpart explained that the uplift measurement devices are arranged independently from the drain holes in Vietnam. In this regard, the explanation that the measurement method of uplift by closing valve is adopted only when the drain holes are used for uplift measurement will be added.

(13) Discussions in the 10th Working Group Meetings (Hydropower-2) on January 15, 2013

JICA Hydropower Team and the Vietnamese counterparts discussed the comments on the Technical Regulation on Hydropower Civil Works which was prepared by JICA team, and confirmed the agenda of the workshop which will be held by MOC on January 17, 2013. The major conclusions of the meeting are as follows:

1) Regarding Articles 3.36 and 5.3 of the draft Technical Regulation on Hydropower Civil Works, the supplemental explanation is to be added to the Guideline based on the understanding of JICA Hydropower Team.
2) Regarding Article 4.2.1 of the draft Technical Regulation, MARD informed that the table of classification criteria by plant capacity had been deleted by MARD in the latest QCVN 04-05. So the stipulation in the draft Technical Regulation shall be confirmed referring the latest regulation in Vietnam
3) Regarding Article 7.1.3 of the draft Technical Regulation, the participants agreed that it was hard to conduct actual plant operation following the stipulation in the current draft of TR which had been prepared based on the QCVN 04-05 so that the comment of JICA Team is reasonable. MARD informed that they would start the procedure for revision of QCVN 04-05 in January or February 2013, and MARD recommended JICA Team to submit a comment on this matter to MOC for their consideration to propose the revision of Article 4.4 of QCVN 04-05 to MARD. In this regard, the content in the QCVN 04-05 and the Technical Regulation may be revised based on the opinion of JICA Team below:
   "The minimum volume of water to be discharged to the downstream shall be decided taking into account of each circumstances of the project based on an environmental impact assessment."
4) Regarding Article 7.3.4.2 of the draft Technical Regulation, the solution mentioned in "Conclusion (tentative)" column, which is to follow the existing Vietnamese standards, was agreed though the maximum vertical distance between galleries of 20m stipulated in paragraph a) seemed to be too short.
5) Regarding Article 7.3.4.3 of the draft Technical Regulation, the solution mentioned in "Conclusion (tentative)" column, which is to follow the existing Vietnamese standards, was agreed, though the "settlement joint" is not applied in general in Japan.
6) Regarding Article 7.3.4.4 of the draft Technical Regulation, Vietnamese side proposed and JICA Team agreed to study more about the application of settlement joint and thermal-settlement combination joint to finalize the stipulation of Article 7.3.4.4.
7) Regarding Article 7.12.5 of the draft Technical Regulation, the participants agreed to delete Article 7.12.5 as proposed by JICA Team. This is because the design of powerhouses has

various options depending on the site conditions and general layout of entire structures of hydropower plant, and it is recommended to avoid provision of mandatory requirements regarding the general layout of powerhouse.

8) Regarding Article 7.13.1 of the draft Technical Regulation, the participants agreed to delete Article 7.13.1 as proposed by JICA Team. This is because construction of a daily storage reservoir on the conduit channel or its sub-lateral channels is considered impractical.
9) Regarding Article 7.14.1 of the draft Technical Regulation, the participants agreed to delete the 2nd item of paragraph c) of Article 7.1.4.1, because this provision, which is to apply diversion tunnel to the sediment discharge and water emptying after finishing a task of constructional diversion works, cannot be always applied to all hydropower plants.

(14) Discussions in the 21st Working Group Meetings (Hydropower-1) on April 18, 2013

JICA Hydropower Team and the Vietnamese side member of WG1 hold a meeting concerning the two (2) major issues regarding hydropower, which are the confirmation of major revisions in the draft of Technical Regulation Vol.4 and Vol.5 from the original QCVN and the confirmation of the final draft of Guideline Vol.4 and Vol.5 prepared in accordance with the conclusions in WG1 Meeting on Jan. 8 and 10, 2013. However, efficient discussion could not be made in the meeting as the attendance of the Vietnamese side member of WG1 was only one person from EVN. The JICA Hydropower Under these circumstances, the JICA Team understood that he Vietnamese WG members accepted the latest drafts of Technical Regulation and Guidelines in principal

9.2 Site Visit

No site visit was conducted by Hydropower Group in the 2nd Stage.

9.3 Workshops

9.3.1 The 3rd Workshop

The 3rd Workshop was held on October 26 and 30, 2012 at Ho Chi Minh City and Hanoi respectively.

(1) Workshop on October 26, 2012 in Ho Chi Min City (Hydropower Session)

In the Breakout Session A-1, CRA explained revised MOC Technical Regulation and JICA Hydro Team explained outline of MOC Technical Regulation Guideline. Major comments stated by Vietnamese participants are as follows:

1) Contents on the current version conform to stipulations in the QCVN of MARD, but it is also necessary to conform to stipulations in the Decrees of MONRE or Government such as Decree No.112 (management, protection and general exploitation the resources and environment of hydraulic and irrigational reservoirs) and No.120 (River Basin Management).
2) This Technical Regulation is applied to the hydropower plants which have dams and their maximum output is over 30MW, and others are recommended to obey.

3) This Technical Regulation is applied to new construction or expansion of hydropower plants and not existing ones.
4) There are some contradictions regarding flood prevention measures between the Technical Regulations and current conditions at some existing dams. How about application of PMF?
5) The stipulation in Article 7.13 “Daily storage reservoir” has contradictions with current stipulation in Decree of MONRE. （The Decree stipulates that the discharge volume depends on the class of the power plant.
6) The requirements on downstream flood protection are acceptable in general although applications are ambiguous. They shall be clarified in the Guideline.
7) Some contents of draft QCVN such as classification and requirements of model test were eased comparing with the stipulation inTCXDVN285：2002, but the safety matters shall not be eased.
8) Stipulations in Decree No.72 shall be reflected to the contents regarding monitoring device system stipulated in article 7.16.1.
9) Article 6.2 stipulates that the data of natural conditions shall refer to QCVN 02: 2009/BXD. However, this stipulation is not suitable. Because the purpose of QCVN 02: 2009/BXD is to formulate the master plan in provincial area.

In the Breakout Session A-2, JICA Hydro Team explained outline of the 2nd draft of Guidelines for Technical Regulation Vol.4. Major comments stated by Vietnamese participants are as follows:

1) It is desirable that a list of taking over items of information including conditions of each device in a powerhouse in changing a shift should be prepared.
   JICA Team answered as follows:
   It is not necessary to record all conditions of each device in a powerhouse in a diary for shift workers. Only special mentions such as abnormalities in facilities shall be recorded.
2) The threshold shall be added regarding contents in Tables 50-1, 50-2 and 50-3.
   JICA Team answered as follows:
   Whether the phenomenon existed or not is the purpose of the measurement. If the abnormal result is found, the investigation for the cause is needed.

In the Breakout Session A-3, JICA Hydro Team explained outline of the 2nd draft of Guidelines for Technical Regulation Vol.5. Major comments stated by Vietnamese participants are as follows:

1) Regarding Article 98-a1, it shall be confirmed if values in Table 98-a1-1 are applied to vibration tests compulsorily or just for reference.
   JICA Team answered as follows:
   Values in Table 98-a1-1 are reference for vibration tests.
2) It is desirable that a list of visual inspection items for civil structures and electrical equipment should be described in Guidelines.

JICA Team answered as follows:
Visual inspection items are included in those for civil structures. Most of inspection items for electrical equipment are related to tests of equipment, and it will be considered if visual inspection items should be added to the existing items

3) Frequency of periodic inspection for electrical equipment is three years in Guideline, which shall be coordinated with that in EVN's regulation.
JICA Team answered as follows:
Frequency of periodic inspection for electrical equipment will be re-considered.

At the end of Breakout Session, MOIT announced that the participants were requested to send further comments to MOIT by email.

(2) Workshop on October 30, 2012 in Hanoi (Hydropower Session)

In the Breakout Session A-1, CRA explained revised draft Technical Regulation on Hydropower Civil Works under MOC scope and JICA Hydro Team explained the outline of Guideline for Technical Regulation.

CRA explained the outline of activities as follows:

1) MARD executed the updating of TCXDVN-285/2002 and newly developed QCVN-04-05/2012 which was promulgated by MARD in June 2012 under the requirement of Standard Law in 2007.
2) Draft QCVN for Hydropower civil works is being newly prepared under MOC referring to the QCVN 04-05/2012 on hydraulic works developed by MARD and other relevant regulations and standards applying new approach with a manner different from that of QCVN 04-05.

Major comments stated by Vietnamese participants are as follows:

1) According to the Standard Law 2007, difference between the standards (TCVN) and the regulation (QCVN), which stipulates mandatory requirements regarding safety, national security and environmental safety, has become clear. It is required to develop QCVNs which are easy to understand.
2) Some contents which are not applicable to mandatory regulations and are to be stipulated in technical standards (TCVN) shall be deleted or moved to the Guidelines. The contents in the mandatory regulations shall be only minimum requirements to keep the facility safe.
3) Hydropower work is a part of hydraulic work. Therefore, the contents of new QCVN on Hydropower Civil Works shall be only additional ones without reiterating the contents of QCVN 04-05/2012.
4) It is stipulated in the draft QCVN that 90 percent frequency flow of dry season shall be discharged to downstream of the river for environmental preservation (Article 7.1.3). But

some current hydropower plants have other obligations and cannot adopt such a regulation. The stipulation shall be amended.

5) The extent which is necessary to take measures against flood is not clear (Article 7.1.13). It shall be confirmed whether the extent is from dam to sea or to the point confluent to the main river.
   CRA answered as follows:
   It is difficult to answer to the question of downstream extent of flood prevention measures for the present. The extent shall be approved by a competent agency of state level or provincial level or a lower level depending on project scale.

In the Breakout Session A-2, JICA Hydro Team explained the outline of 2nd draft of Guidelines for Technical Regulation Vol.4.

There were not any questions and comments regarding vol. 4 of the Guidelines.

In the Breakout Session A-3, JICA Hydro Team explained the outline of 2nd draft of Guidelines for Technical Regulation Vol.5.

Major comments stated by Vietnamese participants are as follows:

1) It is desirable that detailed test methods, classification patterns and judgment criteria are added to articles of Guidelines.
   JICA Team answered as follows:
   Guidelines are not operation and maintenance manuals, and not so many items can be added to them. However, JICA Project Team will confirm comments and reply to them.
2) It is desirable that Technical Regulations should be suited to the present situation of electrical equipment in Vietnam because regulations in other developed countries cannot always be adapted to electrical equipment in Vietnam.
   JICA Team answered as follows:
   The JICA Project Team has researched staff's ideas in hydropower plants to adapt them to Technical Regulations and Guidelines by site investigations and baseline survey as much as possible.

9.3.2 Workshops held by MOC

In addition, MOC held their own workshops in the 2nd Stage to discuss the draft of Technical Regulation on Hydropower Civil Works under MOC's scope and its Guideline as follows:

(1) MOC's Workshop on August 18, 2011

The Workshop was held with the participants invited by MOC including representatives of MOC, PECC1, Institute for Concrete Technology, University of Civil Engineering, Water Resource University, Song Da Consulting Company, etc. and the following were discussed and concluded in the Workshop:

1) Agenda of the Workshop

- Study comments of experts on the content of the 2nd draft of QCVN
- Discuss and provide opinions on the content of the 2nd draft of QCVN
- Exchange opinions on application of American standards in design, construction of hydropower structures
- Provisions of international standards
- Discuss other matters relating to structure, format and linguistic of the Draft of QCVN

2) Conclusion of the Workshop

After studying contents of the draft QCVN (latest version) and comments from experts, it is concluded that this draft has not yet satisfied the requirements of a QCVN. It is required to be revised a lot so as to be entitled for its promulgation. It is recommended for JICA Team to revise the draft QCVN based on following suggestions:

a) Structure of the QCVN should be based on the QCVN xxxx:2011/BNN (QCVN which will be issued by MARD stipulating mainly design matters of hydraulic facilities).

b) Regarding the contents of articles in the new QCVN, for articles with duplicated content with ones of the QCVN xxxx:2011/BNN, it is recommended to refer it as follows: "to apply in accordance with QCVN xxxx:2011/BNN".

c) It is recommended to supplement new stipulations that the draft of QCVN xxxx:2011/ BNN has not mentioned (mechanical equipment, construction, regulating operation, etc.).

d) It is permissible to apply American standards in this QCVN, beside applying QCVN xxxx:2011/BNN.

e) Format of the QCVN shall comply with stipulations of TCVN 1-2:2008: Part 2: "Stipulations on showing and expressing content of a National Standard".

(2) MOC's Workshop on December 21, 2011

The Workshop was held with the participants invited by MOC including representatives of MOC, MOIT, MARD, EVN, PECC1, PECC3, University of Civil Engineering, etc. and the following were discussed and concluded in the Workshop:

- All experts attending the meeting as well as not attending the meeting but sending their comments to the workshop agreed that the 3rd draft of the technical regulation is now clearer in structure and more sufficient in contents.
- Nine (9) big parts of the contents contain major aspects in construction of hydropower works, and, together with QCVN 04-05:2011/BNNPTNT, all information can be accessed and available.

- Besides approved contents, the 3rd draft still has some parts not meet the demand and accuracy such as structures, translation works and compositions. Moreover, hydraulic aspects are surplus content of hydropower construction and it might lead to a misunderstanding in the core objective of this regulation.
- It is necessary to demonstrate the contents of this regulation so that readers can have a better idea about the establishment in construction science of technical requirements contained in the regulation.

(3) MOC's Workshop on May 11, 2012

The Workshop was held with the participants invited by MOC including representatives of MOC, EVN, PECC1, PECC3, University of Civil Engineering, Son Da Company, etc. and the following were discussed and concluded in the Workshop:

The experts who attended in the meeting and the experts who did not attend in the meeting but have sent their suggestions and comments have the common opinion as follow:

- MOC has received many opinions about the 4th draft Technical Regulation from the participants of previous workshops and the meetings of expert groups, therefore the 4th draft Technical Regulation had the clear structure, relatively complete content and basically met the requirements.
- The contents have covered the main contents of hydro construction hydro-electric power. The contents in combination with QCVN 04-05:2011/ MARD shall ensure the requirements.
- Besides the contents achieved, the 4th draft Technical Regulation remains some unsatisfactory contents, some parts of the draft Technical Regulation is not appropriate. The translation and used technical terms are not accurate.
- It is required to have the explanation of contents of Technical Regulation to help the readers to understand the scientific basis used to set up the technical requirements in the contents of Technical Regulation.

(4) MOC's Workshop on January 17, 2013

The Workshop was held with the participants invited by MOC including representatives of MOC, MOOIT, MARD, EVN, Institute of Building Material, University of Civil Engineering, Song Da Construction Consultant Company, Vinaconex Corporation, PECC1, Center for Water Resource Engineering Application, etc. Major issues discussed in the Workshop are as follows:

1) Discussion on the draft Technical Regulation on Hydropower Civil Works
   - There is inconsistency between some articles of draft Technical Regulation regarding the stipulation on concrete strength. In Vietnam, there are many stipulations relating to the quality of concrete and their classification code.
   - There is no stipulation for RCC material although there are stipulations for normal concrete. Therefore, stipulations regarding the concrete of RCC dam which are

constructed widely in Vietnam shall be added because some of them have caused various problems.

- In some projects in Vietnam, many problems occurred because the design was made not taking into consideration the effect of natural environment and plant durability sufficiently. The stipulations shall be composed of regarding the material for construction such as concrete and soil taking into consideration the maintenance phase.
- One of the purposes of this project is keeping safety during construction. Issues related to labor safety shall be added.

  MOC answered this comment that the labor safety standard is under preparation in Ministry of Labor. Addition of safety matters which is specifically related to construction of hydropower plant will be considered.
- The classification on hydropower plant is suitable for some projects, but it is not always appropriate for whole projects. It is recommended to follow the same manner of classification as QCVN 04-05/2012 of MARD.

2) Discussion on the draft Guideline on Hydropower Civil Works

- There are many TCVNs which stipulate specific procedure for design. But the stipulations are not provided specifically in the draft Guideline.
- The objective and structure of the proposed draft Guideline are suitable and referring to standards in other countries is preferable because it helps readers' understanding.
- Regarding the project classification, it is recommended to classify the projects by their type, and classification by reservoir capacity is not important, but it is proposed to apply the classification of hydropower project by environmental impact.
- The major concern in the company which we are worrying about is that the current design method based on Russian, Chinese and Vietnamese standards, and current equipment will be prohibited to use by promulgation of new Technical Regulations.
- It shall be noted during carrying out the projects that the objective of the technical standard is different between in Japan and in Vietnam. In Japan, the owners assure the safety and reliability of the plants, but in Vietnam, the investors play a critical role. The technical standards are required for investors to control engineering consultant, construction companies and so on to make the quality of plant high.

The JICA Team replied to the comments as follows:

- -The policy of composing the draft Technical Regulation and Guideline regarding hydromechanical equipment is to adopt various TCVNs as well as internationally accepted standards.
- -Specific procedures are to be determined by means of referring to the standard which is adopted project by project, and fundamental requirements to be satisfied in all projects are stipulated in the draft Technical Regulation and explained in the draft Guideline.

As there were still various different opinions among the participants, further discussions would be required for finalizing the draft of Technical Regulation and Guideline.

9.4 Finalization of Draft Technical Regulations

9.4.1 Major Revisions in Vol.4

(1) Scope of Application for Hydropower Plants

There were many discussions about the scope of application and, finally, the original scope of application for hydropower plants was changed in Final Draft Vol.4 and agreed in the 15th WG Meeting of Hydropower-1 on May 10, 2012 as follows:

Agreed scope of application for hydropower plant in the revised Vol.4:

"This regulation applies to civil works and electrical equipment of hydro power plants located in Vietnam and connected to the National Power Grid."

(2) Revisions Related to Civil Works

As the conclusion of the discussions in the 14th and 15th WG Meeting on May 8 and 10, 2012 respectively, the provisions in the current version of Vol.4 related to civil works were considered to be appropriate in general and substantial revisions were not required in Vol.4 except some minor provisions.

(3) Revisions related to Electrical Facilities

As the conclusion of the discussions in the 14th and 15th WG Meeting on May 8 and 10, 2012 respectively, the provisions in the current version of Vol.4 related to electrical facilities were considered to be appropriate in general and substantioal revisions were not required in Vol.4 except some minor provisions.

9.4.2 Major Revisions in Vol.5

(1) Scope of Application for Hydropower Plants

There were many discussions about the scope of application and, finally, the original scope of application for hydropower plants was changed in Final Draft Vol.5 and agreed in the 15th WG Meeting of Hydropower-1 on May 10, 2012 as follows:

Agreed scope of application for hydropower plant in the revised Vol.5:

"The articles regarding hydro power plants are stipulated in Part 3.They apply to civil works and electrical equipment of hydro power plants located in Vietnam and connected to the National Power Grid."

(2) Revisions related to Civil Works

As the conclusion of the discussions in the 14th and 15th WG Meeting on May 8 and 10, 2012 respectively, the provisions in the current version of Vol.5 related to civil works were considered to be appropriate in general and substantial revisions were not required in Vol.5 except some minor provisions.

(3) Revisions related to Electrical Facilities

As the conclusion of the discussions in the 14th and 15th WG Meeting on May 8 and 10, 2012 respectively, the provisions in the current version of Vol.5 related to electrical facilities were considered to be appropriate in general and substantial revisions were not required in Vol.5 except some minor provisions.

9.4.3 Major Issues in New Technical Regulation for Hydropower Civil Works (MOC)

(1) Status of Draft Technical Regulation for Hydropower Civil Works under MOC

In the end of the 1st Stage of the Project, after submitting the Preliminary Final Draft in May 2011, MOC reviewed it through the experts and JICA Team received the comments of experts from MOC on June 10, 2011 and those comments included the fundamental issues. Also, JICA Team received the comments from participants of Workshop held on June 22, 24 and 28, 2011 at Ho Chi Minh City, Nha Trang and Hanoi respectively. In this situation, MOC hold an internal Workshop on August 18, 2011 in order to study the comments of experts and provide opinions on content of the Preliminary Final Draft of QCVN.

In the 2nd Stage of the Project, JICA Team received the comment of participants in the MOC's internal workshop of August in the middle of September 2011 and prepared the 2nd version of Preliminary Final Draft by updating the previous draft based on the comments. The 2nd version of Preliminary Final Draft (October 2011 Version) was submitted to MOC on November 7, 2011. Further updating was made on the 2nd Preliminary Final Draft based on the discussions in the Working Group Meeting held on November 15, 2011 and the updated version (3rd version of Preliminary Final Draft) was submitted to MOC on December 1, 2011.

MOC organized an internal workshop on December 21, 2011 and discussed the contents of 3rd version of Preliminary Final Draft. JICA Team received the comments of participants on the 3rd version of Preliminary Final Draft in the middle of January 2012 and prepared the 4th version of Preliminary Final Draft by revising the draft based on the comments. JICA Team submitted the 4th version to MOC on March 21, 2012.

MOC further organized an internal workshop on May 11, 2012 to discuss the content of 4th version of Preliminary Final Draft and concluded that the 4th version had clear structure and relatively complete contents and basically met the requirements for Technical Regulation in Vietnam provided that there were some inappropriate contents including the translation and used technical terms.

However, it was reported by MOC on June 5, 2012 that a comment was issued by a leader of MOC stating that the current draft Technical Regulation (4th version of Preliminary Final Draft) still did not satisfy the requirements on Technical Regulation in Vietnam, so that further revisions were required.

(2) Procedure for finalizing the Draft Technical Regulation

As the result of discussion with MOC, the following procedure was taken for finalizing the draft Technical Regulation on Hydropower Civil Works:

- MOC will arrange internal meetings among the experts to discuss how to make required further revisions on the 4th version of Preliminary Draft.
- JICA Team and sub-consultant will make revisions based on the result of above discussion among the Vietnamese experts and to submit the 5th version of Preliminary Final Draft as soon as possible.
- MOC will arrange a workshop to discuss the 5th version of Preliminary Final Draft in order to finalize the draft.
- JICA Team and sub-consultant will prepare and submit the Final Draft to MOC for approval.

Under the above situation, further revision work was conducted together with MOC and JICA Team and substantially finalized in May 2013 reflecting the comments raised in the WG Meeting held on January 15, 2013 and MOC's Workshop held on January 17, 2013. Then, the Final Draft of Technical Regulation on Hydropower Civil Works was submitted to JMC by JICA Team and approved in the 8th JMC Meeting held on June 5, 2013. However, since there are some Vietnamese experts who request further review and revisions. Therefore, further revisions and refining will be conducted by Vietnamese side after the Project for promulgation.

9.5 Development of Draft Guidelines

9.5.1 Draft Guidelines Vol.4 and Vol.5 (MOIT)

The 1st draft of Guidelines Vol.4 and Vol.5 were submitted to MOIT in March 2012 as follows:

- 1st Draft Guideline Vol.4 (Hydropower Civil Work Portion)
- 1st Draft Guideline Vol.4 ((Hydropower Electro-mechanical Portion)
- 1st Draft Guideline Vol.5 (Hydropower Civil Work Portion)
- 1st Draft Guideline Vol.5 ((Hydropower Electro-mechanical Portion)

The 1st draft was revised based on the comments of MOIT provided with to JICA Project Team in June 2012 and the 2nd draft Guidelines were submitted to MOIT by on August 30, 2012. The comments on the 2nd draft Guidelines were delivered to JICA Team from MOIT in the beginning of December 2012 after the 3rd Workshop held in October 2012 Then, the comments were discussed in the WG meetings in January 2013 and the solutions were agreed and concluded in the meetings. The Final Draft for Approval of Guideline Vol.4 Part 1 to Part 4 and Vol.5 Part 3 were submitted to MOIT in March 2013 reflecting the conclusions of WG meeting s in January 2013 and the these draft was accepted by Vietnamese side in the WG Meeting and 7th JMC Meeting held in April 2013.

9.5.2 Draft Guideline for Hydropower Civil Works (MOC)

As the further revisions was required on the draft of Technical Regulation under on Hydropower Civil Works as mentioned in 9.4.3 (1) above, the process for developing the draft Guideline for the Technical Regulation was delayed and the 1st draft Guideline was prepared and submitted to MOC by JICA Team in January 2013 and discussed in the WG Meeting held on January 15, 2013 and MOC's Workshop held on January 17, 2013.

Then, the Final Draft of Guideline on Hydropower Civil Works was prepared by JICA Team and submitted to JMC at the beginning of June 2013 and approved in the 8th JMC Meeting held on June 5, 2013. However, there are some Vietnamese experts who request further review and revisions. Therefore, further revisions and refining will be conducted by Vietnamese side for promulgation after the Project.

10. Project Activities of Thermal Power Group

10.1 Working Group Meetings

10.1.1 Member of Working Group (Thermal Power Group)

There is one Working Group (WG3) for Thermal Power. The Working Group members were assigned as listed below:

1) Mr. Nguyen Van Long (Science, Technology and Energy Efficiency Dept. of MOIT)
2) Mr. Tran Hong Tien (Technical - Operational Dept., EVN)
3) Mr. Vu Ta Thong (Technical - Operational Dept., EVN)
4) Ms. Dao Tmi Hien (EVN)
5) Mr. Trinh Van Yen (ETC1)
6) Mr. Nguyen Xuan Truong (ETC1)
7) Mr. Nguyen Tuan Anh (ETC1)

10.1.2 Schedule of Working Group Meetings (Thermal Power Group)

During implementation of the 2nd Stage, the Working Group Meetings (Thermal Power) were held as listed below:

Table 10.1.2-1 Schedule of WG Meetings in the 2nd Stage (Thermal Power Group)

9th WG Meetings (Thermal Power group)	21/Nov/2011
10th WG Meetings (Thermal Power group)	22/Nov/2011
11th WG Meetings (Thermal Power group)	24/Nov/2011
12th WG Meetings (Thermal Power group)	08/May/2012
13th WG Meetings (Thermal Power group)	14/May/2012
14th WG Meetings (Thermal Power group)	17/May/2012
15th WG Meetings (Thermal Power group)	21/May/2012
16th WG Meetings (Thermal Power group)	23/Aug/2012
17th WG Meetings (Thermal Power group)	27/Aug/2012
18th WG Meetings (Thermal Power group)	04/Sep/2012
19th WG Meetings (Thermal Power group)	05/Sep/2012
20th WG Meetings (Thermal Power group)	23/Oct/2012
21th WG Meetings (Thermal Power group)	22/Jan/2013
22th WG Meetings (Thermal Power group)	28/Jan/2013
23th WG Meetings (Thermal Power group)	18/Apr/2013

10.1.3 Main Point of Discussions in Working Group Meetings (Thermal Power Group)

Main points of discussions in the Working Group Meetings are summarized as follows and the details are shown in "Appendix-4.2: Minutes of Working Group Meeting (Thermal Power Group)"

(1) Discussions in the 9th Working Group Meetings

JICA Thermal Power Team experts and the Vietnamese counterparts discussed following items regarding guidelines.

1) General and mechanical part
   - Configuration of guideline Vol.2
   - Introduction of sample guideline
   - Development schedule
   - Role of guideline and request for GL from WG members
   - Reference TCVNs, and others

2) Electrical part
   - Configuration of guideline Vol.2, 4 and 5
   - Introduction of sample guideline
   - Contents of guidelines
   - Role of guideline
   - Development schedule, and others

(2) Discussions in the 10th Working Group Meetings

JICA Thermal Power Team experts and the Vietnamese counterparts discussed following items regarding guidelines.

- Explanation of the sample guidelines (Boiler, GT, ST, Water-treatment and coal handling facility)
- Opinion for configuration of guideline by MOIT
- Overview of Guideline
- Work plan for development of guidelines, and others

(3) Discussions in the 11th Working Group Meetings

JICA Thermal Power Team experts and the Vietnamese counterparts discussed following items regarding guideline.

- Work plan for development of guidelines
- Position of guideline
- Scope and content of guideline
- Promulgation schedule, and others

(4) Discussions in the 12th Working Group Meetings

JICA Thermal Power Team experts and the Vietnamese counterparts discussed following items regarding technical regulation.

1) Design mechanical part
   - Review list for final draft of Technical Regulation by JICA
   - Comment list for final draft of Technical Regulation by Vietnamese side, and others
2) Inspection and operation of mechanical part
   - Scope of application of Technical Regulation
   - Comment list for final draft of Technical Regulation by Vietnamese side, and others

(5) Discussions in the 13th Working Group Meetings

JICA Thermal Power Team experts and the Vietnamese counterparts discussed following items regarding technical regulation.

1) Operation and inspection mechanical part
   - Comment list for final draft of Technical Regulation by Vietnamese side, and others
2) Design and operation electrical part
   - Definition of terms
   - Classification of voltage
   - Hydrogen concentration
   - Motor mode operation of a generator
   - Comment list for final draft of Technical Regulation by Vietnamese side, and others

(6) Discussions in the 14th Working Group Meetings

JICA Thermal Power Team experts and the Vietnamese counterparts discussed following items regarding technical regulation.

1) General part
   - Submission schedule of Guideline
2) Design electrical part
   - General theory of dielectric strength
   - Protection equipment for steam turbine, and others

(7) Discussions in the 15th Working Group Meetings

JICA Thermal Power Team experts and the Vietnamese counterparts discussed following items regarding technical regulation.

1) Design mechanical part
   - Treatment of Part.6 Environmental requirement
   - Balance of content between main facility and other facility
   - Classification by output of power plant

- Summarization about comments for technical regulation, and others

(8) Discussions in the 16th Working Group Meetings

JICA Thermal Power Team experts and the Vietnamese counterparts discussed following items regarding guideline. The content of discussion is organized in "Appendix-4.2: Minutes of Working Group Meeting (Thermal Power Group)".

- Current status of the development of guideline
- Current status of the comment table for guideline, and others

(9) Discussions in the 17th Working Group Meetings

JICA Thermal Power Team experts and the Vietnamese counterparts discussed following items regarding guideline. The content of discussion is organized in "Appendix-4.2: Minutes of Working Group Meeting (Thermal Power Group)".

- Results of discussing comments from EVN for guideline Vol.2
- Comments form MOIT for guideline Vol.2, and others

(10) Discussions in the 18th Working Group Meetings

JICA Thermal Power Team experts and the Vietnamese counterparts discussed following items regarding guideline. The content of discussion is organized in "Appendix-4.2: Minutes of Working Group Meeting (Thermal Power Group)".

- Issues which are obtained through discussion with parties and opinions against them
- Current status of the comments version 3 form MOIT for guideline
- Practices of supporting project, and others

(11) Discussions in the 19th Working Group Meetings

JICA Thermal Power Team experts and the Vietnamese counterparts discussed following items regarding guideline. The content of discussion is organized in "Appendix-4.2: Minutes of Working Group Meeting (Thermal Power Group)".

- Comments version 4 form MOIT for guideline Vol.5
- Comments form EVN for guideline Vol.2, and others

(12) Discussions in the 20th Working Group Meetings

JICA Thermal Power Team experts and the Vietnamese counterparts discussed following items regarding guideline. The content of discussion is organized in "Appendix-4.2: Minutes of Working Group Meeting (Thermal Power Group)".

- Comments version 5 from MOIT for guideline
- Practices of 3rd Work Shop, and others

(13) Discussions in the 21st Working Group Meetings

JICA Thermal Power Team experts and the Vietnamese counterparts discussed following items regarding guideline. The content of discussion is organized in "Appendix-4.2: Minutes of Working Group Meeting (Thermal Power Group)".

- Comments version 6&7 from MOIT for guideline, and others

(14) Discussions in the 22nd Working Group Meetings

JICA Thermal Power Team experts and the Vietnamese counterparts discussed following items regarding guideline. The content of discussion is organized in "Appendix-4.2: Minutes of Working Group Meeting (Thermal Power Group)".

- Comments version 6&7 from MOIT for guideline
- Submission of pre-final draft guideline
- Proposal for resolution on legislation of technical regulation, and others

(15) Discussions in the 23rd Working Group Meetings

JICA Thermal Power Team experts and the Vietnamese counterparts discussed following items regarding guideline. The content of discussion is organized in "Appendix-4.2: Minutes of Working Group Meeting (Thermal Power Group)".

- Contents of reporting to the 7th JMC meeting
- Confirmation of approval of final draft guideline, and others

10.2 Site Visits

(1) Site Visit of Hai Phong Power plant

JICA Thermal Power Team experts visited Hai Phong coal-fired power plant on 18/May/2012, conducted interview about existing Technical Regulation (QCVN-5&6) etc. and visited the turbine house and control room.

1) Current status on utilization of QCVN-5&6
   - QCVN 5&6 was promulgated in 2009 and they are utilized in this power plant. They are stored in library room and power plant staff can refer them every time.
   - O&M manual of this power plant were developed based on manufacture manuals and QCVN. Some manuals are under developing.
2) Problems in QCVN-5&6
   - Hai Phong power plant has no trouble about QCVN-5&6.
3) Interval of revision of O&M Manuals
   - O&M Manuals are not revised periodically and revised when power plant staff trouble about manuals and decrees and regulations related to power plant are amended.
4) Current status on utilization of international standard
   - Hai Phong power plant utilizes ASME and IEC. They request consulting company to check international standards and reflect on O&M Manuals.

(2) Interview with PV-Power

JICA Thermal Power Team experts visited head office of PV-Power and conducted an exchange of opinions about technical regulations and guidelines. The content of discussion is organized in "Appendix-6: Minutes of Meeting with Stakeholders".

1) The pyramid of law and regulation
   - JICA documents are intended to help the future activities on the design management. When we design, we refer to code (regulation) and standard. The purchase agreement is established based on the Vietnamese and foreign standards. If anything, we often use foreign standards. There is quite no difference between principle of JICA and actual activity that PV-Power is performing.
   - In operation, we are implementing by means of our administration manuals made based on the manufacturer's O&M Manual. Among them, the operation procedure is included. Accident report has been carried out in accordance with Old Norms. Maintenance procedure has been implemented according to the national regulation and international standards. Technical management procedure has been formulated according to the national regulation as well.
   - It will be necessary guidelines, when we establish the rules of entire management and maintenance. The guideline will be the guiding to achieve the requirement what technical regulation requires, now we are going to carry out the maintenance of Bunn Ann power station.

2) Agreement of this concept between MOIT and JICA
   - The development policy of technical regulation and guidelines for Vol.2, 4 and 5 must be agreed.

(3) Interview with Vinacomin-Power

JICA Thermal Power Team experts visited head office of Vinacomin-Power and conducted an exchange of opinions about technical regulations and guidelines. The content of discussion is organized in "Appendix-6: Minutes of Meeting with Stakeholders".

1) Positioning of technical regulation and guideline
   - Any sample "how to design the equipment" in Vol.2 guideline is required.
   - There is no GB (Chinese Standard) which is popular in Vietnam for making contract related to ST in the guideline.
   - ASME and equivalent standard are required in many cases. However, we don't know the meaning "equivalent".

2) Content of technical regulation
   - I feel that the content is overlapped between Vol.4&5 and Old Norm when tried to read the draft of technical regulation. Compared to Old Norm and Draft, there is no description about the frequency of periodic inspection of the running plant in Old Norm.
   - We want JICA to establish something easy to use containing details as much as possible.

(4) Interview with Vietnam Thermal Association

JICA Thermal Power Team experts visited office of VTA (Vietnam Thermal Association) and conducted an exchange of opinions about technical regulations and guidelines. The content of discussion is organized in “Appendix-6: Minutes of Meeting with Stakeholders”.

1) Positioning of technical regulation and guideline
   - Standard is voluntary. Regulations currently being created are mandatory, though some standard will be mandatory if it were associated with the regulation. Technical regulations have less volume compared with standards. Therefore, it is not necessary to put the standard into the regulation.
   - There are many standards in Vietnam, I evaluate that the reference standards have been introduced in a list of guidelines. However, it is not still enough.
   - In Vietnam, if we cannot understand the regulation, we carefully read the standard.
   - It is necessary to provide concrete matter in the regulation, since the designer performs design according to the regulation.

2) Management system
   - The regulation should include the management requirements for coal storage capacity or the number of spare equipment in addition to safety.
   - If only safety matter were stipulated in the regulation, it is impossible to be able to meet the regulation. Management is important. If only safe matter, it may be only standard.

(5) Interview with Institute of Energy

JICA Thermal Power Team experts visited office of IE (Institute of Energy) and conducted an exchange of opinions about technical regulations and guidelines. The content of discussion is organized in “Appendix-6: Minutes of Meeting with Stakeholders”.

1) The pyramid of law and regulation
   - The explanation regarding relation of law and regulation of JICA is the same as our idea and agree with JICA.
   - I think that the Norm is mandatory, but the regulation is voluntary in Vietnam. Is the technical regulation which JICA has created is the guideline rather than the Norm?

2) Detail matters
   - Many owners require something cheap rather than high performance. The performance must be prescribed in contract though the detailed requirement is not required.

3) Voluntary and mandatory
   - How does MOIT think the method how to use these documents? In the current situation of Vietnam, it would be confused if all things related to the power station were promulgated openly (those with more choices of Owner). It may be better to provide the things in the mandatory regulation.

(6) Interview with EVN

JICA Thermal Power Team experts conducted an exchange of opinions about technical regulations and guidelines with EVN. The content of discussion is organized in "Appendix-6: Minutes of Meeting with Stakeholders".

1) Comments on guideline Vol. 2
   - Electric field strength under the electric wire
   - Rated power of transformer in which protection should be installed
   - SCADA/EMS system, DCS
2) Comments on guideline Vol. 5
   - Only protection equipment and measurement devices are descried, but there is no description of inspection of the control device.

10.3 Workshops (2nd Stage)

(1) Workshop in HCMC

1) 3rd Workshop for southern district was held on 26/Oct/2012 in HCMC. 23 participants participated in the thermal power breakout session and discussed about the content of technical regulations and draft guidelines.
2) The content of discussion is arranged in "Appendix-5-2: Minutes of Workshop (Thermal Power Group)".

(2) Workshop in HANOI

1) 3rd Workshop for northern district was held on 30/Oct/2012 in HANOI. 30 participants participated in the thermal power breakout session and discussed about the content of technical regulations and draft guidelines.
2) The content of discussion is arranged in "Appendix-5-2: Minutes of Workshop (Thermal Power Group)".

(3) Collection of comments from parties

1) Comments for draft guidelines were collected from participants or their parties by MOIT by 30/Nov/2012.

10.4 Finalization of Draft Technical Regulations

(1) Review of final draft technical regulation

1) The final draft of Technical Regulations which had once submitted to MOIT in Aug/2011 was reviewed again in Mar/2012 and re-submitted in Aug/2012.
2) JICA Thermal Power Team experts and the Vietnamese counterparts discussed comments on final draft of Technical Regulation from Vietnamese side in WG meeting. JICA Thermal Power Team revised final draft of Technical Regulation based on Conclusion Table in Appendix-4.2 of Project Progress Report No.2.

3) The final draft of Technical Regulations has revised depending on the matters which are obtained in the process of development of the guidelines. And revised English version has been submitted on 26/Jun/2013.

4) JICA Thermal Power Team experts advised on technical regulation in WG or WS being involved in the guideline. However, JICA expert was not enough to unify different opinions between Vietnamese parties about the ideal situation of technical regulation, since there is big difference in the basic part without unify between stakeholders. Therefore, the finishing work of technical regulation into appropriate for Vietnam in the process of legislation is decided to be conducted by MOIT based on the draft after the transfer.

10.5 Development of Draft Guidelines

(1) Development of draft guideline for Vol.2 (Design of Thermal Power Facilities)

1) The draft guideline Vol.2 was developed dividing into 12 sub-volumes such as boiler, steam turbine, gas turbine, coal fuel handling facility, oil fuel handling facility, gas fuel handling facility, liquefied gas handling facility, coal ash handling facility, water treatment facility, environment facility, welding and electrical facility in line with the article numbers of technical regulation according to the original request from Vietnam side. Welding is provided as an independent sub-volume, though welding is not the facility itself, since it is very important to produce safety facility.

2) The guideline was composed of acronyms/abbreviations, comparison article list, attached table list, attached figure list, attached photo list, each item for guideline, reference international technical standard list, reference Japanese standard list, reference TCVN list and reference literature and material list.

3) The acronyms/abbreviations list shows the meaning of acronyms/abbreviations that are used in the text. The comparison article list shows the comparison of content between articles of technical regulation and guideline. The attached table list, attached figure list and attached photo list explain the title of table, figure and photo that are used in the text.

4) The list of reference international technical standard shows the representative international standard which may be essential or useful for corresponding facility. The list of reference Japanese standard shows the representative Japanese standard which may be essential or useful for corresponding facility. The list of reference TCVN shows the representative TCVN which may be essential or useful for corresponding facility. The source of reference and quotation is shown in each table, figure, photo and the list of reference literature and material.

5) The web address of reference table, figure and photo from web site is shown in the text so as can be seen directly by the electric version of guideline.

6) The design technical regulation is developed as the performance requirement type one and the guideline is developed as voluntary one which is same level as the international standards, regional standards, and industrial standards. The owner may select appropriate

method to the extent that it will comply with the mandatory technical regulation. It is necessary to understand that the guideline should be used at the discretion. It is a mistake to understand that guideline is the bylaws of the mandatory regulation.

7) The design guideline is not the design book which shows a detail and concrete design procedure. The each item for guideline shows the interpretation of technical regulation and guidance to achieve the requirement of technical regulation, typical calculating formula, typical criteria for design, sample figure or sample photo. The guideline has been developed as the reference book which shows technical matters that should be noted in the aspect of safety when the Owner is to establish an EPC Contract or a purchase specification.

8) The important, useful and latest information for planning of power plant or power facility has been collected from the firmly proven literature and standard. Therefore, the amount of guideline Vol.2 has exceeded more than planned one, since a lot of information has been provided as possible. Further information has to be looked for by Owner clue to the reference standard list.

9) The draft guideline of electrical facility Vol.2 was developed while focusing on the matters to prevent a fire, explosion, and electric shock due to a fault of design of electrical facilities, works and not design of major electrical facilities themselves of which a manufacturer can only design.

(2) Development of draft guideline for Vol.4 (Operation and Maintenance of Thermal Power Facilities)

1) The draft guideline Vol.4 was developed about operation and maintenance of mechanical and electrical equipment in thermal power plants in line with structure and contents of the existing mandatory regulation QCVN-QTD-6.

2) The list of reference Vietnamese standard shows the representative Vietnamese standard which may be essential or useful for corresponding facility. The list of reference Japanese standard shows the representative Japanese standard which may be essential or useful for corresponding facility. The list of reference International standard shows the representative International standard which may be essential or useful for corresponding facility.

3) The guideline is not the operation and maintenance manual which shows a detailed operation and maintenance procedure. The each item for guideline shows the interpretation of technical regulation and guidance to achieve the requirement of technical regulation, typical calculating formula, typical criteria, and sample figure or sample photo. The guideline has been developed as the reference book which shows technical matters that should be noted in the aspect of safety when the Owner is to establish operation and maintenance manual.

4) The guideline was developed mainly based on O&M manuals and house training texts for power plants while referring to international standards and Japanese standards.

(3) Development of draft guideline for Vol.5 (Inspection of Thermal Power Facilities)

1) The draft guideline Vol.5 was developed about inspection of mechanical and electrical equipment in thermal power plants in line with structure and contents of the existing mandatory regulation QCVN-QTD-5.
2) The list of reference Vietnamese standard shows the representative Vietnamese standard which may be essential or useful for corresponding facility. The list of reference Japanese standard shows the representative Japanese standard which may be essential or useful for corresponding facility. The list of reference International standard shows the representative International standard which may be essential or useful for corresponding facility.
3) The guideline is not the inspection manual which shows a detailed inspection procedure. The each item for guideline shows the interpretation of technical regulation and guidance to achieve the requirement of technical regulation, typical calculating formula, typical criteria, and sample figure or sample photo. The guideline has been developed as the reference book which shows technical matters that should be noted in the aspect of safety when the Owner is to establish inspection manual.
4) The guideline was developed mainly based on the “article 73-4 of regulation of Japanese Electricity Business Act, completion inspection” and “article 94-3 of regulation of Japanese Electricity Business Act, periodic inspection” which are promulgated by Ministry of Economy, Trade and Industry (METI) in Japan.

(4) Submission of guidelines

Guidelines in each version have been submitted in the schedule as listed below;

Table 10.5-1 Submission Schedule of Vietnamese Version of Guidelines

Guidelines		Submission Schedule			
Version		1st Draft	2nd Draft	Final for Approval	Final
Design (Vol.2)	Mech	Mar&Apr/2012	Aug/2012	Mar/2013	Jun/2013
	Elec	Apr/2012	Aug/2012	Mar/2013	Jun/2013
Operation (Vol.4)	Mech	Aug/2012	—	Mar/2013	Jun/2013
	Elec	Aug/2012	—	Mar/2013	Jun/2013
Inspection (Vol.5)	Mech	Apr/2012	Aug/2012	Mar/2013	Jun/2013
	Elec	Aug/2012	—	Mar/2013	Jun/2013

11. Project Activities of Network Group

11.1 Working Group Meetings

11.1.1 Member of Working Group (Network Group)

The main members are nine engineers from related organizations and some of them attended WG if necessary.

1) Mr. Nguyen Duy Hoa (Science and Technology Dept. of MOIT)
2) Mr. Le Viet Cuong (Science and Technology Dept. of MOIT)
3) Mr. Dang Hai Dung (Science, Technology and Energy Efficiency Dept., General Energy Directorate of MOIT)
4) Ms. Do Lan Binh (Technical & Operational Dept., EVN)
5) Mr. Nguyen Xuan Khiem (Science, Technology and Environment Dept., EVN)
6) Mr. Nguyen Quang Viet (Science, Technology and Environment Dept., EVN)
7) Mr. Tran Nam Trung (Technical & Operational Dept., EVN)
8) Mr. Cao Chan (Individual expert)

   ⇒ Mr. Cao Chan has become the Local Consultant from September, 2012.

9) Mr. Tran Van Ap (Individual expert)

11.1.2 Schedule of Working Group Meetings

Network Working Group meeting was held 24 times in the 2nd Stage as shown in the table below. WG members and JICA Team discussed the contents of draft technical guideline and revised the Technical Regulation

Table 11.1.2-1 Schedule of WG Meetings in the 2nd Stage (Network Group)

10th WG Meetings (Network)	November 9th, 2011
11th WG Meetings (Network)	November 11th, 2011
12th WG Meetings (Network)	November 15th, 2011
13th WG Meetings (Network)	November 16th, 2011
14th WG Meetings (Network)	November 18th, 2011
15th WG Meetings (Network)	November 21st, 2011
16th WG Meetings (Network)	November 23rd, 2011
17th WG Meetings (Network)	November 25th, 2011
18th WG Meetings (Network)	November 28th, 2011
19th WG Meetings (Network)	December 1st, 2011
20th WG Meetings (Network)	May 9th, 2012
21st WG Meetings (Network)	May 14th, 2012
22nd WG Meetings (Network)	May 17th, 2012

23rd WG Meetings (Network)	May, 18th, 2012
24th WG Meetings (Network)	July 9th, 2012
25th WG Meetings (Network)	July 11th, 2012
26th WG Meetings (Network)	July 13th, 2012
27th WG Meetings (Network)	July 16th, 2012
28th WG Meetings (Network)	August 1st, 2012
29th WG Meetings (Network)	August 3rd, 2012
30th WG Meetings (Network)	August 31st, 2012
31th WG Meetings (Network)	October 23rd, 2012
32th WG Meetings (Network)	January 17th, 2013
33th WG Meetings (Network)	April 18th, 2013

11.1.3 Main Point of Discussions in Working Group Meetings

Main points of the discussions in the Working Group Meetings are summarized as follows and the details are shown in Appendix-4-3

(1) Discussions in the 10th Working Group Meetings (Network) on Nov. 9, 2011

1) Kick Off Meeting
   - Both side confirmed the latest schedule of Guideline development include article numbers and agreed to read Vietnamese version before the meeting. JICA Team and ETC will improve the quality of the document both English and Vietnamese.
   - JICA Team explained that these drafts are just a list of JICA's idea and suggestion for Vietnam. JICA expects the Vietnamese WG members to provide comments on the table format (Excel file).
   - As there are more than 600 articles in Vol.3-4, it is difficult to complete it during JICA visit just for three weeks. Both side agreed to fill in the comments and its alternative sentence in the table until the end of December.
   - After collecting the comments, Vietnamese side checked all of their contents and made them uniform opinions from Vietnam side.
   - EVN sends their authorized documents to JICA. ETC supported them.
   - As there are a lot of language barriers in both communication. Both sides improved the quality of the articles.
   - Articles that we could not conclude during this trip, EVN held WG to complete them and submitted their opinion and the result of the discussion to JICA.
2) Current status of preparation of final draft Technical Regulations
3) Basic policy of activities in the 2nd Stage for development of Guidelines
4) Discussion on proposed framework of 2nd stage and detailed policy of Guideline
   - Four power experts visited VN six times. (For about 2 weeks each)

- For efficient work, 2 members visits in each visit and separately
- JICA submits 1st draft, 2nd draft, Pre-final draft and final draft in Eng and VN
- JICA holds work shop in Hanoi and HCMC

(2) Discussions in the 11th Working Group Meetings (Network) on Nov. 11, 2011

JICA Network Team and the Vietnamese counterparts discussed following items regarding guideline.

- Substation (Vol.3 Article 82-130, Article163-183)
- Power System Operation (Vol.4 Article 385-409)

(3) Discussions in the 12th Working Group Meetings (Network) on Nov. 15, 2011

JICA Network Team and the Vietnamese counterparts discussed following items regarding guideline.

- Substation(Vol.3 Article131-155)
- Vol 3, Article 117, 120, 125, 126, 128, 163

(4) Discussions in the 13th Working Group Meetings (Network) on Nov. 16, 2011

JICA Network Team and the Vietnamese counterparts discussed following items regarding guideline.

- Vol.3, Article 166, 168, 170, 174, 177, 180, 181
- Substation (Vol.3.Fire Prevention Article 163-183)

(5) Discussions in the 14th Working Group Meetings (Network) on Nov. 18, 2011

JICA Network Team and the Vietnamese counterparts discussed following items regarding guideline.

- Lighting (Vol.3 Article 184 - 212)
- Transmission(Vol.4 OH Line Article 303-322)

(6) Discussions in the 15th Working Group Meetings (Network) on Nov. 21, 2011

JICA Network Team and the Vietnamese counterparts discussed following items regarding guideline.

- Article 304 Vol 4: Implementation of repair and overhaul
- Article 305 Vol4: Implementation of design
- Article 306 Vol 4: Taking over of overhead line
- Article 307 Vol 4: Watching over of site
- Article 308 Vol 4: Safe protection for power network project
- Article 309 Vol 4: Agreement with the owner of the corridor
- Article 310 Vol 4: Cutting tree in corridor of the route
- Article 311 Vol 4: Maintenance of signals and signs

(7) Discussions in the 16th Working Group Meetings (Network) on Nov. 23, 2011

JICA Network Team and the Vietnamese counterparts discussed following items regarding guideline.

- Article 312Vol 4: Installation and maintenance of warning plate and barriers
- Article 313 Vol 4: Patrol overhead line
- Article 314 Vol 4: Clearing of insulator

(8) Discussions in the 17th Working Group Meetings (Network) on Nov. 25, 2011

JICA Network Team and the Vietnamese counterparts discussed following items regarding guideline.

- Article 338 Vol 4: General provisions
- Article 339 Vol 4: Responsibility to management and operation
- Article 340 Vol 4: Requirement for protection relay and automation facilities
- Article 341 Vol 4: Signing and numbering
- Article 342 Vol 4: Inspection of protection relay and automation facilities

(9) Discussions in the 18th Working Group Meetings (Network) on Nov. 28, 2011

JICA Network Team and the Vietnamese counterparts discussed following items regarding guideline.

- Article 343 Vol 4: Inspection of protection relay, automation facilities
- Article 344 Vol 4: Secondary winding of current transformer and voltage transformer
- Article 345 Vol 4: Requirement of protection relay, automation facilities
- Article 346 Vol 4: General provision of grounding equipment
- Article 352 Vol 4: Grounding resistance measurement
- Article 353 Vol 4: Earthing area has high corrosives
- Article 357 Vol 4: Compensation of capacitive
- Article 358 Vol 4: Arc supprestion coil

(10) Discussions in the 19th Working Group Meetings (Network) on Dec. 1, 2011

JICA Network Team and the Vietnamese counterparts discussed following items regarding guideline.

- Protective relay and Automation system (Vol.4 Article346-358)

(11) Discussions in the 20th Working Group Meetings (Network) on May. 9, 2012

1) Task allocation especially the comments related to the linguistic expression problem
There are almost 130 comments from Vietnamese side but most of the comments are related to the linguistic expression problems. JICA Team asked Vietnamese side that these linguistic comments should be solved by Vietnamese side.

- Technical Regulation Vol.1: Total 73 comments

2) Proposed solution by JICA Team for the main technical comments in Vol.1 Technical Regulation

- I.1.8 1) The definition of "insulated overhead line" should be changed to 1～35kV
- I.1.26 3) Revise technical terms and clarify meaning of the article
- I.2.73 Add the connection method of "Pressure"
- I.3.72 Add the connection method "Pressure"
- I.3.108 Clarify meaning of the contents
- I.3.119 Clarify meaning of the contents
- I.3.122 Change the interpretation meaning that "only the same pole"
- I.3.123 Clarify meaning of the contents
- I .4.26 Delete the numerical Number

(12) Discussions in the 21st Working Group Meetings (Network) on May. 14, 2012

1) Task allocation especially the comments related to the linguistic expression problem

There are almost 130 comments from Vietnamese side but the most of the comments are related to the linguistic expression problem. JICA Team asked Vietnamese side that these linguistic comments should be solved by Vietnamese side.

- Technical Regulation Vol.3: total 32 comments
- Technical Regulation Vol.4:total 113 comments

2) Request by JICA Team for the technical solution especially the in house wiring in Vol.3 of Technical Regulation

Because there are big differences of the material and the installation method between both countries, JICA Team requested Vietnamese side to develop the articles about this point by themselves. Both sides cooperate to develop these parts both Technical Regulation and Guideline.

(13) Discussions in the 22nd Working Group Meetings (Network) on May. 17, 2012

JICA Network Team and the Vietnamese counterparts discussed following items regarding guideline Vol.3 and 4.

1) Confirmation of the template of the Guideline

- Numbering
- Correspondense with Technical Regulations
- The blank case, when there are additional supplemental contents
- Expression of the sources, such as IEC, JIS etc.

2) Schedule confirmation

3) Measurement the quality of the linguistic problems

(14) Discussions in the 23rd Working Group Meetings (Network) on May. 18, 2012

JICA Network Team and the Vietnamese counterparts discussed following items regarding guideline Vol.5.

1) Special request to develop the Technical Regulation and Guideline of Vol.5
2) Schedule confirmation
   - Current problems of Vol.5
   - The concept to develop Vol.5
   - Related document of the existing inspection method

(15) Discussions in the 24th Working Group Meetings (Network) on Jul. 9, 2012

JICA Network Team and the Vietnamese counterparts discussed following items regarding technical regulation.

1) Review of Technical Regulation
   - Article I.1.2, 6, 7, 8 in Vol.1
   - Article I.3.47, 48, 50 in Vol.1
2) Modification the numerical values for safety

   Vietnam side opines that such regulations are recommended to be put in Guideline

(16) Discussions in the 25th Working Group Meetings (Network) on Jul. 11, 2012

JICA Network Team and the Vietnamese counterparts discussed following items regarding technical regulation.

- Article I.3.50, 74, 88, 107, 108, 110 in Vol.1

(17) Discussions in the 26th Working Group Meetings (Network) on Jul. 13, 2012

JICA Network Team and the Vietnamese counterparts discussed following items regarding technical regulation.

- Article I.3.118, 124, 126, 134,136,143 in Vol.1

(18) Discussions in the 27th Working Group Meetings (Network) on Jul. 16, 2012

1) Confirmation of minutes

   JICA Team and Vietnamese side agreed with the conclusion of WG meeting

2) Schedule Confirmation
   - The deadline of draft Guideline Vol.3, 4, 5 is extended to August 26, 2012
   - Guidelines have to be revised according to comments from Vietnamese side.
   - JICA Teams will complete the Guideline Vol.3, 4, 5 including the parts which have not been sent to Vietnam's side.

(19) Discussions in the 28th Working Group Meetings (Network) on Aug. 1, 2012

1) Explaining project procedure for developing the Guideline
2) Discussion about the contents of the guideline as follows,

- Article 267, 271, 274, 277, 298, 300 Guideline on Vol.4
- Article 90, 98, 103, 120, 121, 124, 126, 127, 138, 160, 180, 212 Guideline on Vol.3

(20) Discussions in the 29th Working Group Meetings (Network) on Aug. 3, 2012

1) Confirming the project procedures and the measurements for developing the Guideline.
MOIT requested JICA to revise the Guideline on Vol.5 according to the comments by ETC.

JICA Team will dispatch the consultants in charge of Vol.5 at the end of August.

Both MOIT and JICA confirmed the deadline to submit the Draft Guideline and its comments table below.

The deadline is as follows,

- Vol.1 1st draft Guideline until 15th, September
- Vol.3 2nd Draft Guideline and its comment table until 26, August
- Vol.4 2nd Draft Guideline and its comment table until 26, August
- Vol.5 2nd Draft Guideline and its comment table until 26, August

2) Discussion about the contents of the guideline as follows,
- Article 213, 214, 219, 236, 248 Guideline on Vol.4

3) Discussion about the low voltage wiring guideline in Vol.3
- JICA Team will make their Guideline of in-house wiring temporary utilizing the existing VN standard (QCVN:QTĐ 08:2010/BCT) and discuss them in the upcoming WG
- general rule for naming the title in Guideline

4) Discussion about the Vol.4

(21) Discussions in the 30th Working Group Meetings (Network) on Aug. 31, 2012

1) Explaining the Guideline of withstand voltage test
- Article 27, 28, 29, 30, 31, 32, 33, 34, 36, 37 on Vol.5

(22) Discussions in the 31st Working Group Meetings (Network) on Oct. 23, 2012

1) Confirmation of the comment on ”Area classification” on Technical Regulation Vol.1
- Article I.1.1 22), I.1.8 4) and all article in Chapter 3-3-8 and 3-3-9,on Vol.1

2) Confirmation of the presentation of WS and the comment from VN consultant
JICA Team agreed that the deadline of comments is 1st week of December.

(23) Discussions in the 32nd Working Group Meetings (Network) on Jan 17, 2013

1) Confirmation of all the comment on on Technical Regulation and Guideline
JICA Team agreed to revise the result of this discussion and will make the final draft.

(24) Discussions in the 33rd Working Group Meetings (Network) on Apr 18, 2013

1) Request from MOIT Safety departments about Technical Regulation and Guideline,

MOIT Safety departments revise the contents by themselves after they finish issuing the new decree.

- Minimum requirement of the electric field strength for line man
- Inhabited area under the high voltage transmissions line

2) Confirmation of the presentation documents of 7th JMC on 24th April

11.2 Site Visits

No site visit was conducted by Network Group in the 2nd Stage so far.

11.3 Workshops

MOIT held their own workshop in the 2nd Stage to discuss the draft of Technical Regulation and Guideline as follows:

(1) 3rd Workshop in HCMC (Network) on October 26, 2012

1) Explanation of framework for Technical Regulation and Guideline
2) Confirmation of work schedule and task allocation for development of Guideline
3) Discussion on the revision of the final draft of Technical Regulation Vol.1
   The seven items as follows should be considered to describe in the Technical Regulation Vol.1. And JICA and Vietnamese counterparts had consultation how to post them in the article.
   - Area classification:
   - Oil supplying system for oil cables:
   - Distances to car road
   - Installation of different voltage level Overhead Lines on the same pole
   - Overhead lines that traverse or cross with water surface.
   - Cross the suspended cable lines and pipelines
   - Fire Protection
4) Discussion on the comments and contents on the draft of Guideline Vol.1, 3, 4 and 5
   The three items were discussed whether to be described in the Guideline. And participants agreed that these items should not be included in Guideline. It shall refer in manufacture manual.
   - Requirement on ground resistance of a pole
   - Measuring method of ground resistance
   - Alarm setting on oil level in conservator of a transformer
5) Collection of comments from Vietnamese parties

Comments for draft guidelines were collected from participants and their parties by MOIT from 30/Nov/2012

(2) 3rd Workshop in Hanoi (Network) on October 30, 2012

1) Explanation of framework for Technical Regulation and Guideline
2) Confirmation of work schedule and task allocation for development of Guideline
3) Discussion on the revision of the final draft of Technical Regulation Vol.1
   The seven items as follows should be considered whether to be described in the Technical Regulation Vol.1. And JICA Team and Vietnamese counterparts had consultation how to post them in the article.
   - Area classification:
   - Oil supplying system for oil cables:
   - Distances to car road
   - Installation of different voltage level Overhead Lines on the same pole
   - Overhead lines that traverse or cross with water surface.
   - Cross the suspended cable lines and pipelines
   - Fire Protection

   Workshop participants commented that the regulation on distance between overhead line and water surface should be revised according to existing Decree, etc. (article I.3.115)
4) Discussion on the comments and contents on the draft of Guideline Vol.1, 3, 4 and 5
   The three items described in the Guideline were discussed. And participants agreed that these items should not be included in Guideline. It shall refer in manufacture manual.
   - Article 248 in Guideline Vol.3 should be modified to make it easily understanding.
   - Measuring method of ground resistance will be considered at WG.
5) Collection of comments from Vietnamese parties
   Comments for draft guidelines were collected from participants and their parties by MOIT from 30/Nov/2012

11.4 Finalization of Draft Technical Regulations

(1) Revision the agreed technical regulation according to the comment table

MOIT insisted that there were inconsistencies related to the structure in the current draft Technical Regulation. MOIT asked JICA Team to solve the problems that there is incompatibility in the contents when two or more articles in old technical regulations are combined for restructuring.

In conclusion, the followings were agreed for finalizing the draft Technical Regulations:

- JICA Team will prepare the conclusion tables which classify the demarcation of responsibility based on the results of discussions agreed by MOIT in WG Meetings.
- JICA Team will update the English version of Technical Regulation based on the conclusion in WG Meetings and fix the inconsistencies in the Technical Regulations.
- MOIT will review and refine the Vietnamese version of Technical Regulation.

(2) The main comments submitted by Vietnamese side

After long time discussions, JICA received the comments from Vietnamese side to revise the Technical Regulation and both side agreed to revise them with mutual cooperation by March, 2013.

1) Vol.1 Technical Regulation
   - Classification of areas I.1.1 22), I.3.109, I.3.107
   - Safety Corridor I.1.7 (Cable), I.1.7 (Subst.), I.1.8 (OHL), I.1.13
   - Network line definition by Voltage Article I.1.6 1)-I.1.8 1)
   - Minimum distance from power cable line I.3.49
   - Installation of Cables under the Sea I.3.66
   - Minimum cross-sectional area of conductor according to voltage I.3.74-2
   - Crossing Areas with Water I.3.115
   - Prohibition of Installation on Same Poles I.3.128
   - Values of rated insulation levels and Minimum clearances I.4.27
2) Vol.3 Technical Regulation
   - Transportation of large equipment, Article 64.
   - Requirement for installation of lights Article 187
3) Vol.4 Technical Regulation

   No comments are received.
4) Vol.5 Technical Regulation
   - Insulation Oil Test Article 27 – 29
   - Cable Inspection, Aticle26-a1, 48
   - DC voltage test and measurement of leakage current, Aticle27
   - The inspection item for Gas Insulated Switchgear (GIS), Article 67

11.5 Development of Draft Guidelines

(1) Confirm the best procedures and preparation to develop guideline

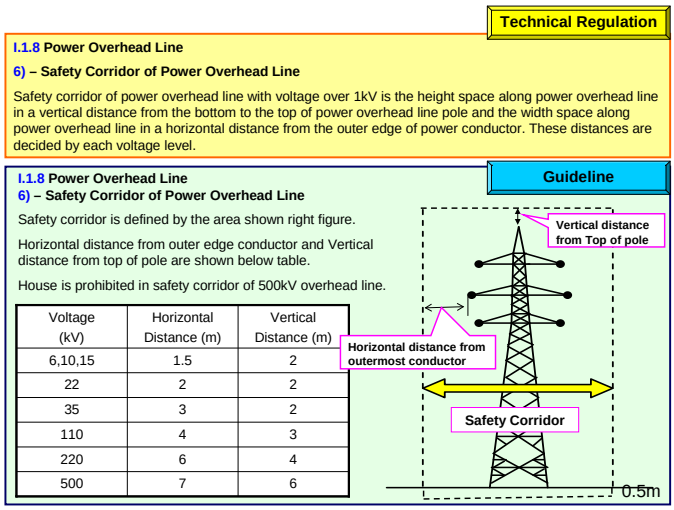
The main discussions was started to confirm the procedures and the work allocation of the assignment for both Vietnamese side and Japanese side. JICA Team agreed to develop the guideline corresponding with newly developed technical standard.

- VN side collects related documents for new GL
  (Company's Manual, Circulars, Notifications and other documents)
- VN side inform JICA team *"What kind of Guideline are needed?"*
  - JICA team will concentrate to know the most appropriate GL in VN.
  - JICA team will start developing GL and make draft
- JICA recommend to have WG as many as possible.
- Make it clear between MOIT_WG and EVN_WG
- Prepare specific field of experts for detail understand
- Procedure of developing Guideline
  - JICA team will submit draft GL before WG
  - Vietnamese side revise this draft GL
  - ETC shall report the contents of EVN WG to JICA
  - Collect all the results in Vietnamese and submit them to JICA

(2) New guideline that is easy understanding

As it is the first time to create a guideline in Vietnam, JICA Team will develop the draft guidelines to be the sample of the guidelines on a trial basis and to be the sample of the proposed guidelines. Image of the guidelines with tables and figures for making the Vietnamese side to understand it easily is as shown on the right.

Both side agreed to develop the guideline with as many table and figures as possible.



Technical Regulation

I.1.8 Power Overhead Line

6) – Safety Corridor of Power Overhead Line

Safety corridor of power overhead line with voltage over 1kV is the height space along power overhead line in a vertical distance from the bottom to the top of power overhead line pole and the width space along power overhead line in a horizontal distance from the outer edge of power conductor. These distances are decided by each voltage level.

Guideline

I.1.8 Power Overhead Line

6) – Safety Corridor of Power Overhead Line

Safety corridor is defined by the area shown right figure.

Horizontal distance from outer edge conductor and Vertical distance from top of pole are shown below table.

House is prohibited in safety corridor of 500kV overhead line.

Voltage (kV)	Horizontal Distance (m)	Vertical Distance (m)
6,10,15	1.5	2
22	2	2
35	3	2
110	4	3
220	6	4
500	7	6

(3) Purposed schedule for developing four guidelines

As there are more than 1,300 articles throughout Network Guidelines, JICA Team recommended to start developing Vol.3 and Vol.4 first, and after developing the best way to create the guidelines, JICA Team proceeded with development of guidelines Vol.1 and Vol.5 which are more effortful parts.

During the mission in Hanoi, JICA Team members explained all the contents of draft guidelines to Vietnamese side and JICA Team received comments from Vietnamese side to revise them.

(4) Appropriate Role Allocation and Preparation Schedule to Develop Guideline

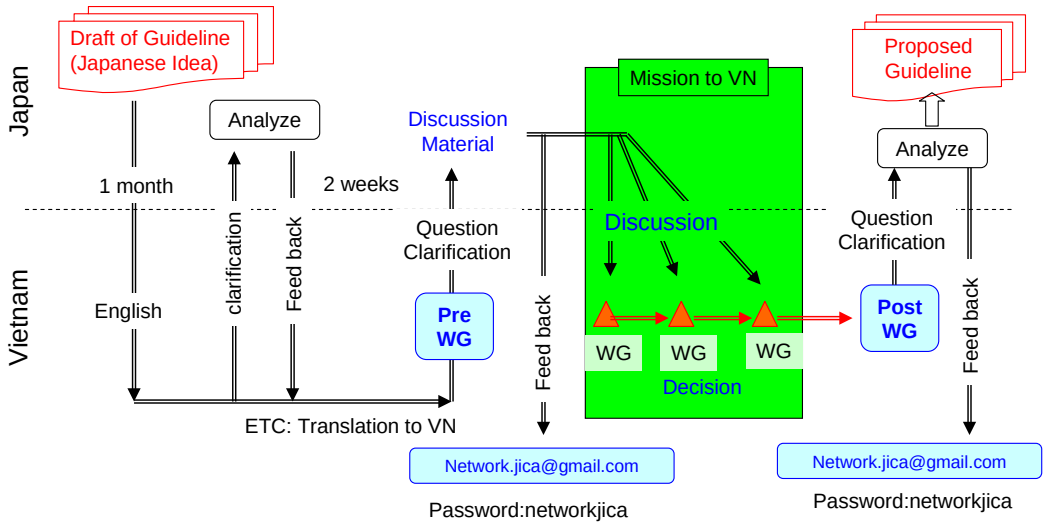
JICA Team suggested the appropriate task allocation to the Vietnamese members of Working Group to encouraging them to have better sense of ownership of Vietnamese side, and MOIT should be responsible for overall revision on Vietnamese version of the draft Technical Regulation.

1) JICA produce contents each part & each volume in Guideline.
2) JICA send produced contents in Guideline to ETC who send to MOIT & EVN (one month before)
3) ETC let JICA know some contents which Vietnam sides need to discuss at WG, after ETC organize opinions from MOIT, EVN and themselves. (one week before WG)
4) JICA provides WG presentation about the contents.
5) JICA and Vietnam sides discuss and confirm about the contents at WG
6) ETC translates Guideline into Vietnamese, which is agreed by both side at WG.
7) JICA presents Translated Guideline at WS
8) JICA complete Guideline to reflect comments of WS.

	JICA	ETC		VN_WG MOIT
Create Draft of Guideline	○	△Assist Translation		△(*2)
Review / Comment manage	○ENGLISH	△Assist Translation		○ Vietnamese
WG discussion	○ENGLISH	△Assist Translation		○ Vietnamese
Work Shop	○	△Assist Translation		○
Refine / Brush up(*1)	○ENGLISH	△Assist Translation		○Vietnamese
Finalize and promulgate	△ENGLISH	△Assist Translation		○Vietnamese

***1) Only Technical study, (*2) Part that JICA can not create**

The preparation work is very important to have efficient discussion. JICA Team proposed the proper schedule to develop the guideline as follows. In this way, both sides agreed with the best task allocation each other to develop the guidelin.



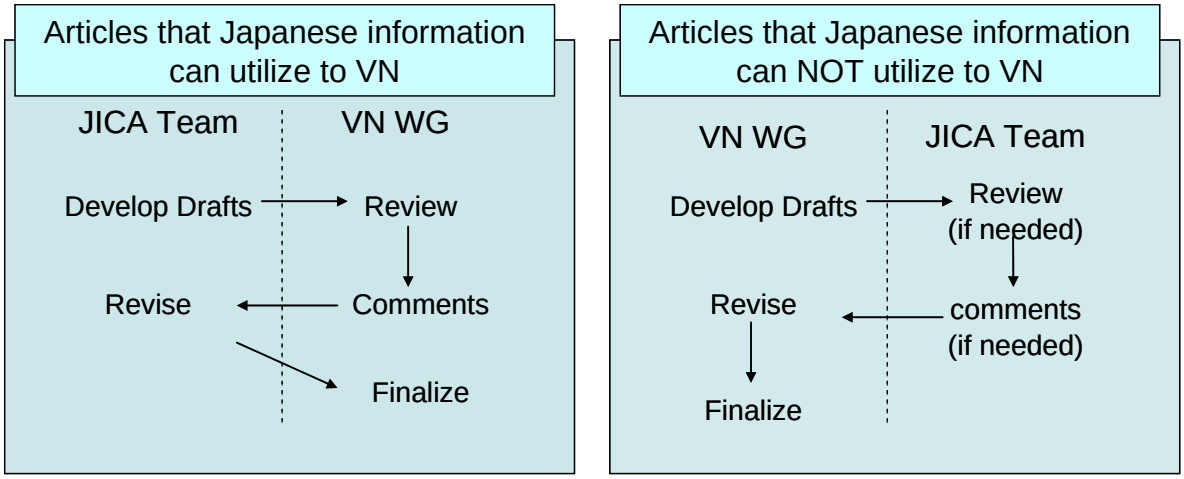
(5) Measures to improve the quality of the contents

JICA Team sorted out the priority, “Technical analysis & its efficient discussion”, since there is not enough time to make good quality of Guidelines, and it would make articles of Vietnamese’ version unclear to discuss the contents.

JICA Team suggested these measures to save the time during the Vietnamese mission.

1) Vietnamese WG members of Network Group will hold a meeting to confirm the contents of Guidelines (Vol.3 and Vol.4)
2) JICA Team will receive the comment table about Vol.3 and Vol.4 from Vietnamese WG members of Network Group.
3) JICA Team will also prepare a draft of Vol.1 (Design) and Vol.5 (Inspection) in parallel and will send its English Version to ETC for translation into Vietnamese.
4) There are some items which are considerably different comparing with Japanese system and it is very difficult for JICA team to develop. In this part JICA suggested Vietnamese side would have initiative to create the Guideline as follows.

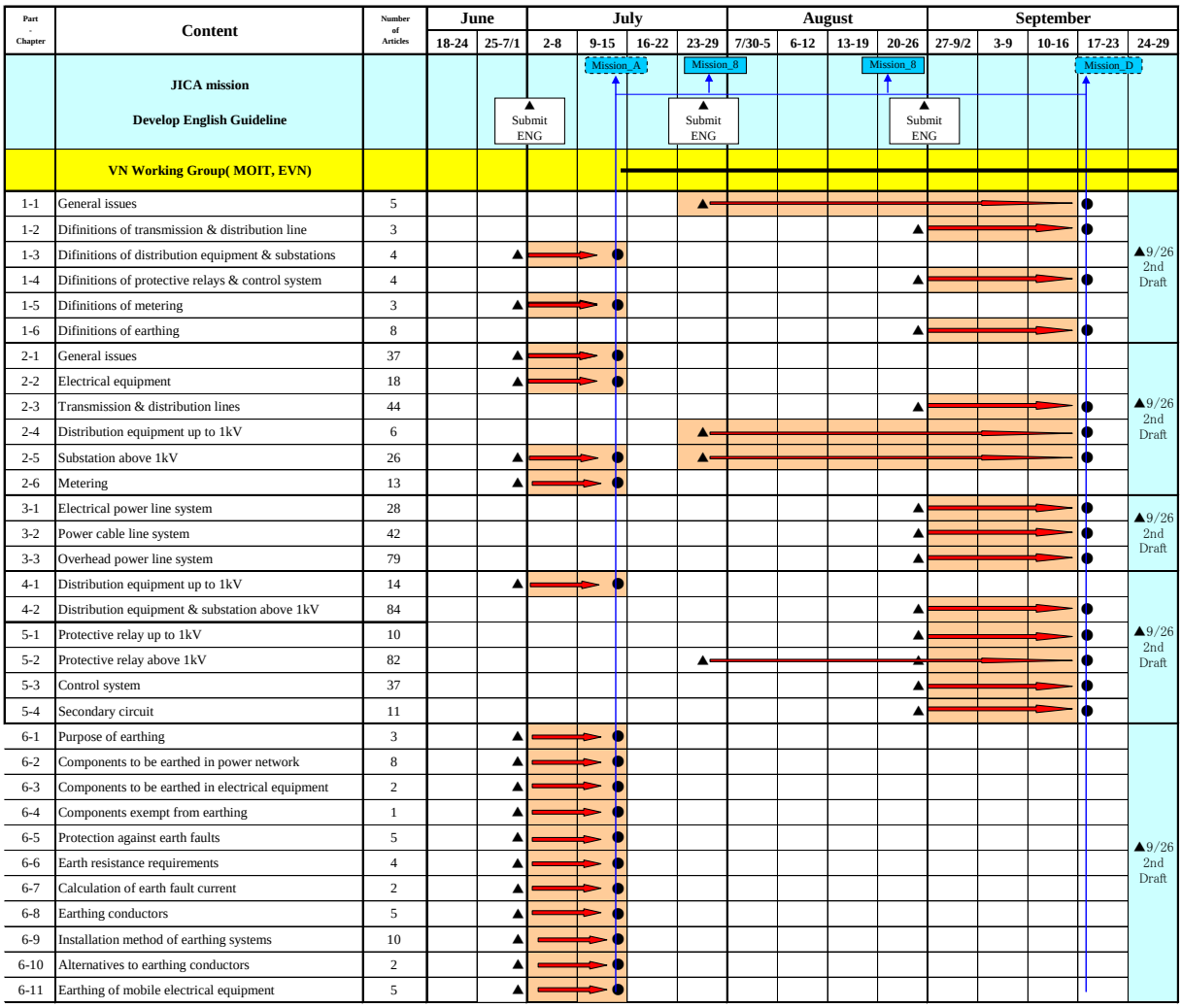
JICA Team also pointed out that it is difficult for JICA Team to understand and prepare a complete draft due to the local technical issues related to low voltage wiring which is exclusively applied in Vietnam. In this regard, JICA Team stated that it would take time to prepare a draft of low voltage network portion from the viewpoint of Vietnamese side without initiative of MOIT in the Guidelines. MOIT stated that the Guideline should be prepared mainly based on the Vietnam’s old technical regulation documents by both MOIT and JICA Project Team in this case.



(6) Development schedule the guideline of Vol.1 (Design)

Even though Vol.1 of Guideline was scheduled to be developed in the spring of 2012, the original schedule was forced to delay for 3 months because of the additional works to review and revise the agreed draft technical regulations. Therefore, each member of JICA Network Team has been working apart in parallel and will do the best to finish the Vol.1 at the second step.

JICA Team completed the first half of English draft in the end of June 2012, and submitted the Vietnamese draft to MOIT in the middle of July 2012. Regarding the last half of the draft, JICA Team completed the English version in the end of August 2012 and submitted the Vietnamese version to MOIT in the middle of September 2012.

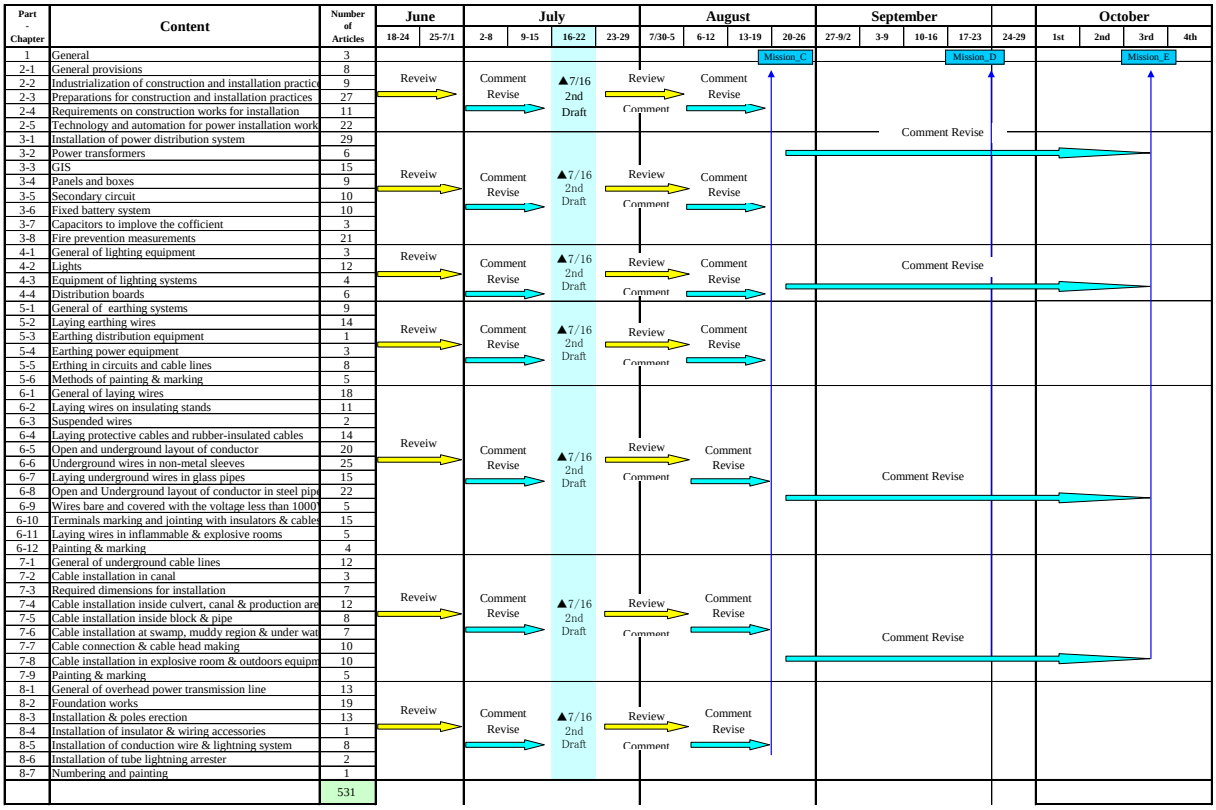


(7) Development schedule the guideline Vol.3 (Construction)

The 1st draft of Guideline Vol.3 was submitted to MOIT in March 2012 after revising the content according to the result of discussion during 1st to 9th WG meeting in November, 2011. Currently Vietnamese WG members are reviewing it to complete the comment table that is expected to be submitted to JICA Team in June or July 2012.

JICA Team revised the contents according to the comments and submitted the 2nd draft to MOIT after one month from the time when JICA Team received the comments from Vietnamese WG. The Expected schedule is as follows,

Part - Chapter	Content	Number of Articles
1	General	3
2-1	General provisions	8
2-2	Industrialization of construction and installation practice	9
2-3	Preparations for construction and installation practices	27
2-4	Requirements on construction works for installation	11
2-5	Technology and automation for power installation work	22
3-1	Installation of power distribution system	29
3-2	Power transformers	6
3-3	GIS	15
3-4	Panels and boxes	9
3-5	Secondary circuit	10
3-6	Fixed battery system	10
3-7	Capacitors to implove the cofficient	3
3-8	Fire prevention measurements	21
4-1	General of lighting equipment	3
4-2	Lights	12
4-3	Equipment of lighting systems	4
4-4	Distribution boards	6
5-1	General of earthing systems	9
5-2	Laying earthing wires	14
5-3	Earthing distribution equipment	1
5-4	Earthing power equipment	3
5-5	Erthing in circuits and cable lines	8
5-6	Methods of painting & marking	5
6-1	General of laying wires	18
6-2	Laying wires on insulating stands	11
6-3	Suspended wires	2
6-4	Laying protective cables and rubber-insulated cables	14
6-5	Open and underground layout of conductor	20
6-6	Underground wires in non-metal sleeves	25
6-7	Laying underground wires in glass pipes	15
6-8	Open and Underground layout of conductor in steel pipe	22
6-9	Wires bare and covered with the voltage less than 1000V	5
6-10	Terminals marking and jointing with insulators & cables	15
6-11	Laying wires in inflammable & explosive rooms	5
6-12	Painting & marking	4
7-1	General of underground cable lines	12
7-2	Cable installation in canal	3
7-3	Required dimensions for installation	7
7-4	Cable installation inside culvert, canal & production are	12
7-5	Cable installation inside block & pipe	8
7-6	Cable installation at swamp, muddy region & under wat	7
7-7	Cable connection & cable head making	10
7-8	Cable installation in explosive room & outdoors equipm	10
7-9	Painting & marking	5
8-1	General of overhead power transmission line	13
8-2	Foundation works	19
8-3	Installation & poles erection	13
8-4	Installation of insulator & wiring accessories	1
8-5	Installation of conduction wire & lightning system	8
8-6	Installation of tube lightning arrester	2
8-7	Numbering and painting	1
		531

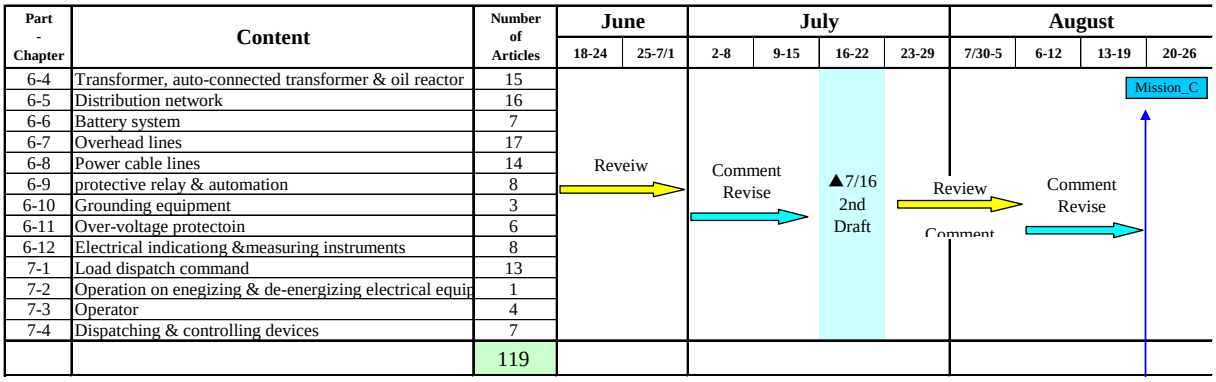


(8) Development schedule for the guideline Vol.4 (Operation)

The 1st draft of Guideline Vol.4 was submitted to MOIT in March 2012 after revising the contents according to the result of discussion during 1st to 9th WG meeting in November, 2011. Currently Vietnamese WG members are reviewing it to complete the comment table that is expected to be submitted to JICA Team in June or July 2012.

JICA Team revised the contents according to the comments and submitted the 2nd draft to MOIT after one month from the time when JICA Team received the comments from Vietnamese WG. The Expected schedule is as follows;

Part - Chapter	Content	Number of Articles
6-4	Transformer, auto-connected transformer & oil reactor	15
6-5	Distribution network	16
6-6	Battery system	7
6-7	Overhead lines	17
6-8	Power cable lines	14
6-9	protective relay & automation	8
6-10	Grounding equipment	3
6-11	Over-voltage protectoin	6
6-12	Electrical indicationg &measuring instruments	8
7-1	Load dispatch command	13
7-2	Operation on enegizing & de-energizing electrical equip	1
7-3	Operator	4
7-4	Dispatching & controlling devices	7
		119



(9) Development schedule for the guideline Vol.5 (Inspection)

The 1st draft of Guideline Vol.5 was submitted to MOIT in May 2012. Vietnamese WG members are reviewing it to complete the comment table that is expected to be submitted to JICA Team in July 2012. JICA Team revised the contents according to the comments and

submitted the 2nd draft to MOIT after one month from the time when JICA received the comments from Vietnamese WG. The Expected schedule is as follows,

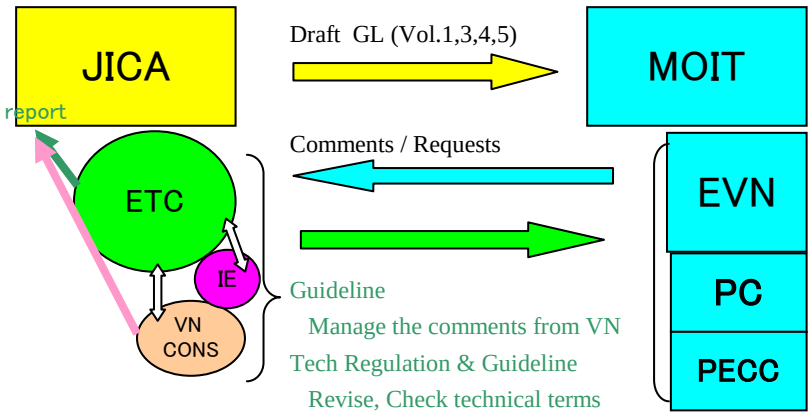
Part - Chapter	Content	Number of Articles	June		July				August				September				
			18-24	25-7/1	2-8	9-15	16-22	23-29	7/30-5	6-12	13-19	20-26	27-9/2	3-9	10-16	17-23	24-29
1	General	-															
2-1	General provisions of transmission lines and substations	1															
2-2	Organizations & management of operation & maintenan	2	Reveiw		Comment Revise		▲7/16 2nd Draft		Review		Comment Revise						
2-3	Acceptance inspection	2															
2-4	In progress inspection	31															
2-5	Completion inspection	16															
2-6	Periodic inspection	17															
3	Hydro power plants	-															
4	Thermal power plants	-															
		69															

(10) Contents of Subcontract-2C

JICA Team asked the Sub-consultant (VINACINSULT) to assign these tasks as listed below.

- (Scope-1) Finalization for the Electric Power Technical Regulation
- (Scope-2) Finalization for the Guideline of Electric Power Technical Standards
- (Scope-3) Supports for Mutual Communications among WG Members

VINACONSULT (sub-consultant 2C), performed to help JICA Team to finalize both Technical Regulation and Guideline and it also supported JICA Team to communicate with Vietnamese counterpart.



Additionally, VINA Consult conducted the interviews with PECC about the draft Technical Regulation and Guideline as follows,

- PECC1 in Hanoi : 26 to 27 November 2012
- PECC2 in Ho Chi Minh City: 3 to 4 December 2012
- PECC3 in Ho Chi Minh City: 5 to 6 December 2012.
- PECC4 in Nha Trang: 29 to 30 November 2012

(11) The main comments submitted by Vietnamese side

JICA Team reflected all the amendments to the Guideline after revision of Technical Regulation. And JICA also revised the Guideline according to the comments from Vietnamese side.

The main topics are as follows,

1) Vol.1 Guideline
   - Voltage Drop in Indoor Power Systems I.2.24
   - Cross-Sectional Areas I.2.56
   - Noise Regulations I.2.126
   - Oil Collecting Systems I.2.128
   - Electricity Meters I.2.131-135
   - Oil Supply Systems, I.3.33, I.3.39
   - Crossing Areas with Water I.3.115
   - Crossing or Going Nearby Communication and/or Signal Lines, Chapter 3-3-12
2) Vol.3 Guideline
   - Laying Earthing Wires, Chapter 5
   - Protection of wires at the output of boxes, conduits, Article 254.
3) Vol.4 Guideline
   - Interlock, Article 291
   - Indicator for switching position of breakers, Article 294
   - Installation and maintenance of warning plate and barriers, Article 312
   - Inspection of protective relay, automation facilities, Chapter9 article340
4) Vol.5 Guideline
   - The inspection item for Current Transformer (CT), Article 67.

12. JMC/ JCC Meetings and General Meetings

12.1 Joint Management Committee (JMC)

JMC Meetings were held four (4) times during the 2nd Stage of the Project. Main points of discussions in the 5th to 8th JMC Meetings are summarized as follows:

12.1.1 Discussions in the 5th JMC Meeting (November 17, 2011)

In the 5th JMC Meeting, the following issues were discussed and concluded among the participants:

(1) Work Plan of the 2nd Stage

After explanation of the work plan of the 2nd Stage by the JICA Project Team, the JICA Project Team and Vietnamese authorities concerned exchanged opinions on the Project as follows:

- Considering the actual demand, the number of JICA Team mission will be increased from 3 times (original plan) to 7 times in order to have discussions frequently and more efficiently.
- JICA Project Team will give high priority to the translation of documents for meetings into Vietnamese and deliver the documents in Vietnamese one month prior to the meetings in principle in order to have discussions efficiently.
- The Vietnamese side proposed to shift the schedule of 11th and 12th missions from January 2013 and February 2013 to March 2013 and May 2013 respectively by extending the Project term.
- Regarding the mission schedule, each party agreed that JICA Project Team would adjust the schedule of missions so as to have effective discussions as much as possible taking into account the opinion of Vietnamese counterpart.
- The Vietnamese side proposed that the number of site investigation should be decreased and that the number of working group meeting should be increased instead. JICA Project Team agreed with the Vietnamese side provided that site visits would be conducted depending on the necessity in preparation of draft guidelines.
- JICA Project Team proposed to conduct the baseline surveys in the second stage for 1) accidents and power outages in 2010 and 2011, 2) degree of satisfaction to technical regulations and 3) needs of technical regulations and guidelines. The Vietnamese side recommended JICA Team to conduct the three kinds of baseline surveys simultaneously in one set of questionnaire. JICA Team agreed to the recommended idea.

(2) General Policy for Development of Guidelines

JICA Project Team explained and each party reconfirmed the basic concepts for development of the Guidelines and their position.

The Vietnamese counterpart requested JICA Project Team not to provide the Guidelines with general or obvious explanation but to provide practical information and also not to have contradictions with the existing laws and regulations. JICA Project Team agreed to the request.

(3) Confirmation of PDM and PO of the Project

Each party agreed to maintain the current PDM without change for the present provided that revision would be required if the promulgation schedule of Technical Regulation is changed.

12.1.2 Discussions in the 6th JMC Meeting (November 01, 2012)

In the 6th JMC Meeting, the following issues were discussed and concluded among the participants:

(1) Results of the 3rd Workshop

The results of the 3rd Workshop were reported from MOIT for each group except the hydropower group. The major points of the reports are as follows:

1) Network Session

Still there is a gap in the opinions on draft Technical Regulations among the parties concern, and there are some discrepancies between the contents of the existing relevant regulations and the draft of revised technical regulation.

In conclusion, the Vietnamese side will unify existing practices and legal documents in the Technical regulations, and the JICA Team shall support the revision of draft Technical regulations and draft Guidelines accordingly.

2) Thermal Power Session

EVN reported the result of Workshop of Thermal Power Session as follows:

- There are some provisions in which comments of Vietnamese side have not been reflected.
- The contents of draft Guideline are not practical in the Vietnamese circumstances.

In the above regard, JICA Team requests Vietnamese counterpart to understand the status and position of Guideline as JICA Team has explained so far.

(2) Overall Workflow

JICA Team explained the overall workflow from November 2012 to June 2013 and both sides agreed to dispatch the 10th Mission in January 2013.

(3) Procedure and Schedule for Finalizing Draft Guidelines (MOIT Scope)

Both of the Vietnamese side and the Japanese side agreed to the following procedure for finalizing the draft Guideline under MOIT's scope:

1) Comments of Workshop participants will be received by MOIT by the end of November 2012.
2) MOIT will consolidate the comments and deliver them to JICA Team by December 05, 2012.
3) JICA Team will prepare proposal of solutions and deliver to Vietnamese side by the beginning of January 2013.

4) Final solutions shall be concluded in the 10th Mission of JICA Team in January 2013.
5) "Final draft Guideline for Approval" shall be submitted by the middle of March 2013 and approved in the 7th JMC Meeting to be held in April 2013.
6) Final Draft Guideline will be submitted to JICA headquarters by June 26, 2013.

(4) Procedure and Schedule for Finalizing Technical Regulations (MOIT Scope)

Both of the Vietnamese side and the Japanese side agreed to the following procedure for finalizing the draft Technical Regulation under MOIT's scope:

1) Comments of Workshop participants will be received by the end of November 2012.
2) MOIT shall consolidate the comments and shall propose solutions for finalizing the Technical Regulation by MOIT.
3) JICA Project Team will provide Vietnamese side with technical support, if necessary, upon the request of Vietnamese side.

(5) Procedure and schedule of promulgation of Technical Regulations and Guidelines (MOIT Scope)

MOIT reported the current situation regarding the schedule of promulgation of Technical Regulations and Guidelines as follows:

- Technical Regulations will be promulgated under the responsibility and control of MOIT..
- However, promulgation of Guideline is unexampled in Vietnam and MOIT considers that it is out of scope of MOST as the status of Guideline is different from that of TCVN. Therefore, the matter is still unclear and under consideration for the present.

JICA Project Team recommended MOIT not to take the idea that Guideline would be promulgated as the appendix of mandatory Technical Regulations. In this regard, JICA Team recommended MOIT to publish the Guidelines in an applicable manner as the voluntary documents.

(6) Procedure and schedule of promulgation of Technical Regulation (MOC Scope)

Both of Vietnamese side and Japanese side agreed to the following procedure for finalizing the draft Technical Regulation under MOC's scope as follows:

1) Comments of Workshop participants will be received by the end of November 2012.
2) JICA Project Team will provide MOC with technical support together with Local Sub-consultant in preparing the proposed solutions.
3) MOC will hold an internal Workshop by the end of December 2012 inviting Vietnamese experts including the experts from MOIT.
4) Final solutions shall be concluded in the 10th Mission in the middle of January 2013.
5) "Final draft Technical Regulation for Approval" shall be submitted to MOC by the middle of March 2013 for approval in the 7th JMC Meeting in April 2013.

6) Final draft Technical Regulation will be submitted to JICA headquarters by June 26, 2013.

(7) Procedure and Schedule for Finalizing Draft Guideline (MOC Scope)

Both of Vietnamese side and Japanese side agreed to the following procedure for finalizing the draft Guideline under MOC's scope as follows:

1) Tentative 1st draft Guideline will be prepared based on the current draft of Technical Regulation and submitted to MOC by JICA Team by December 25, 2012.
2) MOC will hold an internal Workshop in the middle of January 2013 to collect the comments on tentative draft Guideline.
3) Preliminary Final draft Guideline will be prepared based on the comments received in the MOC's Workshop in January 2013 and submitted to MOC by the beginning of March 2013.
4) MOC will hold an internal Workshop in order to conclude the final solutions by the beginning of April 2013.
5) Final draft Guideline shall be approved in the 7th JMC Meeting to be held in April 2013 during 11th Mission of JICA Team.
6) Final Draft Guideline will be submitted to JICA headquarters by June 26, 2013.

(8) Procedure and schedule of promulgation of Technical Regulations and Guidelines (MOC Scope)

MOC reported the current situation regarding the schedule of promulgation of Technical Regulation and Guideline as follows:

1) Technical Regulation will be promulgated under the responsibility and control of MOC.
2) As the promulgation of Guideline is unexampled in Vietnam and as the status of Guideline is different from that of TCVN, MOC has an idea to promulgate the Guideline by only publishing it as a handbook for Technical Regulation.

(9) Baseline Surveys

The followings are agreed regarding the Baseline Surveys to be conducted by ETC:

1) The baseline survey in accidents and power outages will be conducted for the years 2009, 2010 and 2011 in the same manner as conducted in the 1st Stage.
2) The baseline survey on degree of satisfaction to the existing technical regulations will be conducted by sending questionnaire to selected power companies and power stations in Vietnam.
3) he needs survey on actual needs of technical regulations and guidelines will be conducted by sending questionnaire to selected major power companies and power stations in Vietnam.

12.1.3 Discussions in the 7th JMC Meeting (April 24, 2013)

In the 7th JMC Meeting, the following issues were discussed and concluded among the participants:

(1) Current status of draft Guidelines (Report of JICA Project Team)

JICA Project Team submitted the Final Draft Guideline for Approval on March 15, 2013 and explained the current status of the draft Guidelines as follows:

1) Contents of the draft Guidelines Vol.1 to Vol.5 under MOIT scope were agreed at the WG meeting in January 2013 in general and the Final Draft for Approval of each volume was submitted on March 15, 2013.

2) On the other hand, the draft Guideline for Technical Regulation on Hydropower Civil Works under the scope of MOC is still under formulation by JICA Team due to delay if finalization of Technical Regulation, and the final draft will be submitted before the 8th JMC Meeting held in June 2013.

(2) Current status of draft Technical Regulations (Report of JICA Project Team)

JICA Project Team explained the current status of the draft Technical Regulations as follows:

1) Contents of the draft Technical Regulations Vol.1 to Vol.5 under MOIT scope were agreed in the WG meetings held so far in general, and the revised Final Draft will be submitted in June 2013 after further revision particularly on the network part.

2) On the other hand, the draft Technical Regulation on Hydropower Civil Works under the scope of MOC is still under development and is expected to be finalized by the end of April 2013.

(3) Receipt of the draft Guidelines by JMC

It was confirmed that the Vietnamese side agreed to receive the Final Draft for Approval of Guidelines Vol.1 to Vol.5 under the scope of MOIT submitted by JICA Project Team on March 15, 2013.

In the above regard, the Vietnamese side requested JICA to support the Vietnamese side in the process of the further revision of the Guidelines if necessary during the 2 months period by the end of this Project.

(4) Finalization of Draft Technical Regulations (Report of MOIT/MOC)

Vietnamese side explained the status of finalization of the draft Technical Regulations as follows:

1) MOIT

Although some differences in the opinions between the Vietnamese side and JICA Team still remain in the thermal power part, MOIT will agree to receive the final draft of Technical Regulations in the JMC Meeting in June 2013. In addition, as the revision of the Electricity Law is planned to be promulgated in July 2013 and related legislative decrees will be enacted by MOIT, necessary revisions will be made on the draft Technical Regulations by Vietnamese side according to the stipulations in the new Electricity Law and related decrees.

2) MOC

The process of drafting the Technical Regulation on Hydropower Civil Works is in delay mainly due to the effect of incidents occured at Son Tranh 2 Hydropower Project of which the causes are attributed to design and construction of dam structure and also the precepts are being reflected in the stipulations of the draft Technical Regulations. Soon after the completion of drafting scheduled in April 2013, MOC will collect opinions of the relevant organizations on the draft, and then finalize the Technical Regulation for promulgation. MOC would ask JICA to give a support to MOC for finalizing the Technical Regulation.

(5) Policy for dissemination of Guidelines

JICA Project Team provided the Vietnamese side with the recommendations on policy for dissemination of Guidelines as follows:

- To disseminate the Guidelines through proper publishing measures by defining its status clearly as a voluntary reference document.

Vietnamese side explained the policy for dissemination of Guidelines as follows:

1) MOIT

MOIT recognizes that Guidelines will be helpful for EVN and IPP groups such as PV Power and Vinacomin Power as well as operators of power plants and network operation units. However, the measures for the dissemination of Guidelines which shall conform to the relevant laws and regulations are still under consideration.

2) MOC

MOC recognizes necessity of Guideline. The Guideline for Hydropower Civil Works to be proposed in this Project will be informative and helpful for MOC as a material for defining the specification of the project and also be useful for human resource development in Vietnam.

12.1.4 Discussions in the 8th JMC Meeting (June 05, 2013)

In the 8th JMC Meeting, the following issues were discussed and concluded among the participants:

(1) Submission of Project Output by the JICA Project Team

JICA Project Team submitted the following documents to JMC as the output of the Project:

1) Revised Final Draft Technical Regulation Vols.1 to 5 (under MOIT scope)
2) Final Draft Technical Regulation on Hydropower Civil Works (under MOC scope)
3) Final Draft Guideline Vols.1 to 5 (under MOIT scope)
4) Final Draft Guideline on Hydropower Civil Works (under MOC scope)
5) Completion Report (draft)

(2) Report of JICA Project Team about Project Completion Report

JICA Project Team explained the outline and main points of the Project Completion Report as follows:

- The Report describes the activities performed throughout the Project period from March 2010 to June 2013.
- The Report also describes the evaluation and conclusion of the Project from the view points of lesson learned and recommendation in the project activities including the following:
  - Recommendation regarding the promulgation of Technical Regulations
  - Recommendation regarding the organizational structure after promulgation
  - Recommendation regarding the status of Guidelines and their dissemination
  - Lesson learned regarding the configuration of the WG members
  - Lesson learned regarding the mutual understanding

(3) Approval of Project Output by JMC

JMC approved the draft Technical Regulations, draft Guidelines and the Project Completion Report submitted by the JICA Project Team as listed in the above (1).

In the above regard, MOIT and MOC committed to proceed with procedures for promulgation of Technical Regulations and dissemination of Guidelines after finalizing the draft submitted by the JICA Project Team.

12.2 Joint Coordination Committee (JCC)

JCC Meetings were held five (5) times during the 2nd Stage of the Project. Main points of discussions in the 2nd to 6th JCC Meetings are summarized as follows:

12.2.1 Discussions in the 2nd JCC Meeting (November 17, 2011)

In the 2nd JCC Meeting, the following issues were discussed and concluded among the participants:

(1) Current Status of Preparation of Final Draft Technical Regulations

It is expected that further revisions on Technical Regulations will be required during the process of development of draft Guidelines.

JICA Project Team will provide with the technical support to the activities of Vietnamese counterpart for finalization of Technical Regulations for promulgation.

EVN informed that the independent working groups were established in EVN for hydropower, thermal power and network fields and these working groups would review the final draft of Technical Regulations until April 2012 and would make the final revisions during the 8th mission of JICA Project Team scheduled in July 2012.

As the Technical Regulation for hydropower civil works under MOC is a new one, the development time of its final draft should be extended (according to results of previous meetings) and will be proceeded in the following schedule:

1) JICA Team will submit the pre-final draft (3rd draft) within November 2011.
2) MOC will hold a workshop and provide JICA Team with comments within December 2011.
3) JICA Team will submit the final draft within January 2012.

(2) Procedure and Schedule of Promulgation of Technical Regulations

MOIT proposed that the Technical Regulations and Guidelines Vol.1 to Vol.5 would be promulgated simultaneously. This issue will be discussed in the JICA's Mid-term Review Mission scheduled in February 2012 as the revision of PDM is required for the change of promulgation schedule with regard to the verification index for achievement of project purpose.

On the other hand, MOC expressed his intention to promulgate the Technical Regulation on Hydropower Civil Works in June 2012.

12.2.2 Discussions in the 3rd JCC Meeting (February 17, 2012)

The 3rd JCC Meeting was held during the Mid-term Review Mission of JICA and the following issues were discussed and concluded among the participants:

(1) Report of Mid-term Review by JICA

Mr. Tomitani, a member of the JICA Mid-term Review Mission, explained the major points in the results of Mid-term Review as follows:

- Technical Regulations under MOIT scope
  The final review on the current draft of Technical Regulations under the MOIT scope will be completed by the end of March 2012 by both Vietnamese side and JICA Team. The result of review will be discussed in April 2012 in order to finalize the draft of Technical Regulations. MOIT should be responsible for refining and finalizing the draft in Vietnamese for promulgation.
- Implementation process for drafting the Guidelines
  It is recommended to improve the implementation process for drafting the Guidelines in order to improve productivity of the JICA Team and the WGs.
- Project implementation structure of Vietnamese side
  It is recommended to take a constructive process for finalizing the draft of Technical Regulations and Guidelines by Vietnamese side.
- Project implementation structure of Japanese side
  It is recommended to improve the structure for implementation of the Project activities by Japanese side based on the experiences obtained so far.
- Revision of PDM
  It is recommended to review and revise the current PDM based on the draft of revised PDM (version 2) proposed in the Mid-term Review Report.

- Extension of Project Term
  It is recommended to extend the Project term by several months taking into account the result of review on the draft of Technical Regulations and the efficient process of drafting Guidelines.

(2) Discussion on the result of Mid-term Review

- The representative of MOIT suggested the further review on the achievement of the Project so far and further discussion on the recommendations in the Mid-term Review Report.
- The representative of MOC expressed his intention to promulgate the Technical Regulation under scope of MOC in June 2012 and to discuss the workflow for development of Guideline and extension of Project term in April 2012.
- The representative of EVN expressed his agreement to extend the Project term until June 2013 and also expressed the plan to hold a series of intensive meetings in EVN in March 2012 to review the draft of Technical Regulation and to send the comments to MOIT. To ensure the quality of comments from EVN, EVN proposed JICA to concentrate on the quality of English version as well as the translation quality of Vietnamese version.
- EVN proposed that the Technical Regulations and Guidelines shall be promulgated simultaneously and during the revision process JICA would collaborate/cooperate with MOIT and EVN positively to finalize the documents.

(3) Overall Conclusion on Mid-term Review Report

Each party agreed to the contents of Mid-term Review Report and the Minutes of Mid-term Review and the minutes was signed by the representatives of MOIT, MOC and JICA.

12.2.3 Discussions in the 4th JCC Meeting (May 16 & 17, 2012)

In the 4th JCC Meeting, the following issues were discussed and concluded among the participants:

(1) Current Status and Activity Plan for Technical Regulation

- MOIT insisted that there are still inconsistencies related to the structure in the current draft Technical Regulation mainly in Vol.1 and these inconsistencies should be corrected in the final version of Technical Regulations.
- JICA Project Team replied that the Final Draft had been prepared based on the concept and policy for drafting the Technical Regulations which had been agreed in the initial phase of the Project. JICA Project Team also insisted that MOIT should responsible for overall revision on Vietnamese version of the draft Technical Regulations.
- MOIT expressed that the concept and policy for drafting the Technical Regulations is completely agreed. MOIT wants JICA to focus on correcting technical incompatibility in the Technical Regulations.
- In conclusion, the following are agreed for finalizing the draft Technical Regulations:

1) JICA Team will prepare the conclusion tables which classify the demarcation of responsibility among MOIT, JICA Team and ETC (for translation issues only for ETC) based on the results of discussions in WG Meetings and with agreement by MOIT. The tables will be submitted by the end of May 2012.
2) JICA Team will update the English version of Technical Regulations based on the conclusion in WG Meetings and fix the inconsistencies in the Technical Regulations. The updated English version will be submitted to MOIT within one month (by end of June 2012) and also translated Vietnamese version within two month (by the end of July 2012).
3) MOIT will review and refine the Vietnamese version of Technical Regulations by the beginning of September 2012.

- MOIT expressed its intention that MOIT would submit the draft Technical Regulations to MOST for its review in the September 2012.
- MOC expressed the current status of the Project stating that there were no serious problems in the draft Technical Regulation on Hydropower Civil Works under the MOC scope.

(2) Current Status and Activity Plan for Guideline

- JICA Project Team insisted that there were local technical issues related to low voltage particularly applied in Vietnam which were difficult for JICA Project Team to understand for preparing a complete draft especially for network portion. In this regard, JICA Project Team stated that it would take time to prepare a draft of low voltage network portion satisfactory from Vietnamese point of view without initiative of MOIT in finalization of the Guidelines. MOIT stated that in this case, the Guidelines should be prepared mainly based on the Vietnam's old technical regulation documents by both MOIT and JICA Project Team.
- JICA Project Team explained the current status and schedule of development of draft Guidelines and the overall schedule for Guidelines was agreed as proposed in the meeting.
- In the above regard, it was agreed to hold the Workshop one time in October 2012 during the 9th Mission of JICA Project Team and to cancel the Workshops in August 2012 and January 2013 in order to provide sufficient time for participants for reviewing the draft Guidelines and providing with comments before the Workshop for efficient and effective discussion. In this regard, it was agreed that JICA Project Team would submit the draft Guidelines two months before the Workshop as requested by MOIT and EVN.
- In addition, it was agreed to adjust the schedule of the 10th Mission and the succeeding missions after receiving the comments on draft Guidelines in the Workshop in October 2012 to set an appropriate mission schedule for efficient discussion for preparation of final draft of Guidelines.
- Concerning the 1st draft of Guideline submitted to MOIT in March and April 2012, MOIT informed that it would provide JICA Team with the comments by the middle of June 2012.

(3) Work Plan of 2nd Stage (Extension of Project Term)

Based on the discussion concerning the current status and activity plan for finalizing the draft Technical Regulations and development of draft Guidelines stated above, the Work Plan of the 2nd Stage was agreed as shown in the Work Flow attached to the minutes of meeting.

As the result, it was agreed among the parties concerned to extend the project term by 3 months from "March 2010 to March 2013" to "March 2010 to June 2013" as recommended in the Mid-term Review Mission of JICA subject to official agreement between JICA and Vietnamese counterpart (MOIT and MOC) to be made by updating the Record of Discussion.

(4) Revision of PDM and PO

JICA Project Team explained the purpose of the Revision of PDM based on the recommendation of the Mid-term Review Mission of JICA as follows:

- To change the overall goal to more concrete target.
- To change the project purpose to the target achievable within the Project period.

Each party agreed to revise the PDM and PO as shown in Appendix-1 and Appendix-2 of this report as recommended in the Mid-term Review Mission of JICA.

12.2.4 Discussions in the 5th JCC Meeting (April 24, 2013)

In the 5th JCC Meeting, the following issues were discussed and concluded among the participants:

(1) Report of JICA Terminal Evaluation Mission

JICA Evaluation Mission explained the result of the evaluation as follows:

1) JICA side requests the Vietnamese side to finalize by themselves the drafts of Technical Regulations and Guidelines proposed by JICA Team to be the documents effectively used in Vietnam. Also, the most important thing is to utilize and manage these documents effectively by updating and improving them consecutively. In order to achieve this target, it is recommended for Vietnamese side to continuously conduct the PDCA process.
2) The JICA Evaluation Mission proposed the PDM Version 3 by updating the indicators for Overall Goal as follows:
   - Number of approved large-scale project after the promulgation of the Technical Regulations,
   - Number of completion inspection reports to a committee concerned and No of order for improvement, and
   - Internal operational regulations according to the Technical Regulations prepared by facilities owned by EVN and other operators.

The Vietnamese side agreed to the revisions of the indicators for Overall Goal proposed in PDM Version 3.

(2) Schedule of promulgation of Technical Regulations and dissemination of Guidelines

The Vietnamese side confirmed the target schedule of promulgation of Technical Regulations and dissemination of Guidelines as follows:

1) Promulgation of Technical Regulations under MOIT scope: by the end of 2014
2) Promulgation of Technical Regulations under MOC scope: by the end of 2013
3) Dissemination of Guidelines under MOIT scope: by the end of 2014
4) Dissemination of Guidelines under MOC scope: by the end of 2014

(3) Overall Conclusion on Terminal Evaluation Report

Each party agreed to the contents of Joint Terminal Evaluation Report and the Minutes of Meeting of Terminal Evaluation and the minutes was signed by the representatives of MOIT, MOC and JICA as attached hereto:

12.2.5 Discussions in the 6th JCC Meeting (June 05, 2013)

In the 6th JCC Meeting, the following issues were discussed and concluded among the participants:

(1) Report of MOIT about promulgation and dissemination plan of Technical Regulations and Guidelines

MOIT reported the plan of promulgation and dissemination of Technical Regulations and Guidelines as follows:

1) Science and Technology Department of MOIT will continuously take responsibility for promulgation of Technical Regulations and dissemination of Guidelines under the scope of MOIT.
2) MOIT will establish the task force together with EVN for reviewing the draft and promulgation and dissemination of Technical Regulations and Guidelines by the end of 2014.
3) MOIT has the plan to promulgate the Technical Regulations and disseminate the Guidelines at the same time.
4) MOIT would like to request the JICA Project Team to provide technical support in the promulgation process.

(2) Report of MOC about promulgation and dissemination plan of Technical Regulations and Guidelines

MOC reported the plan of promulgation and dissemination of Technical Regulations and Guidelines as follows:

1) MOC plans to finalize the draft Technical Regulation on Hydropower Civil Works in June or July 2013 based on the result of Workshop held by MOC on May 31, 2013.
2) Then, MOC intends to promulgate the Technical Regulation jointly with MOIT by the end

of 2013.

3) MOC plans to finalize the draft Guideline by the experts and disseminate it by the end of 2014 as a reference document.

4) MOC also would like to request the JICA Project Team to provide technical support in the promulgation process.

(3) Other issues

1) JICA Project Team reminded MOIT and MOC about the objectively verifiable indicators for overall goal of the Project in PDM to be evaluated at the ex-post evaluation by JICA.

2) JICA Project Team and JICA replied to MOIT and MOC about the technical support after the Project as follows:

- JICA Project Team will provide technical support as much as possible but it will be limited to a manner that the JICA Team replies to queries through communication on email basis.
- Mr. Kubo of JICA recommended MOIT and MOC that it is necessary for JICA to receive an official request to provide further technical support after the Project in the case that substantial technical support such as dispatching experts is required.
- MOIT and MOC understand the reply of JICA Project Team and JICA.

12.3 General Meetings

In addition to the JMC and JCC Meetings, general meetings were held during Mid-term Review Mission and Terminal Evaluation Mission of JICA in February 2012 and April 2013 respectively as follows:

12.3.1 General WG Meeting (February 07, 2012)

The General WG meeting was held to discuss the following two (2) issues among EVN, MOIT and JICA:

1) Necessary further action to finalize draft Technical Regulations as Vietnamese laws
2) Improvement in efficiency of discussions on development of draft Guidelines

The discussions and conclusions of the meeting are summarized as follows:

(1) EVN's opinion

Mr. Viet, general project coordinator of EVN, stated the EVN's replies to the questionnaire issued to EVN by JICA Team and EVN's opinion on finalization of draft Technical Regulations and development of draft Guidelines as follows:

- There are some inadequacies in the final draft Technical Regulations, and some EVN comments on the 2nd draft Technical Regulations are not properly reflected in the final draft Technical Regulations.

- Many technical terms in the draft Technical Regulations and draft Guidelines in both English version and Vietnamese version are not appropriate, so that the contents of the draft Technical Regulations and draft Guidelines are difficult to understand. On the other hand, in the discussion in WG meetings at the 6th JICA mission in November 2011, the contents of draft Guidelines could be understood by the explanation of JICA Team experts through the translators from Japanese to Vietnamese.
- EVN requests MOIT to establish Vietnamese working group to discuss the draft Guidelines submitted by JICA by itself before technical meeting with JICA.

(2) JICA Project Team's reply

JICA Project Team replied to EVN's opinion as follows.

- In JICA Team's opinion, there are few modifications in the final draft Technical Regulations, because Technical Regulations include only basic requirements and necessary requirements have been already added.
- The development of the draft Guidelines shall be started immediately. The reason is that it takes a long time to develop the draft Guidelines, because the volume of the draft Guidelines is much larger than that of the draft Technical Regulations. In this regard, JICA Team cannot await development of the draft Guidelines until the draft Technical Regulations are finalized by Vietnam side.
- It is difficult to discuss all articles of the draft Guidelines in the WG meetings between JICA and Vietnamese side. Therefore, most of the articles shall be reviewed by only Vietnamese side to complete check of all articles. However, whole of the draft Guidelines cannot be reviewed at one time by Vietnamese side, considering volume of the documents to be reviewed. Therefore, JICA Team proposes that the draft Guidelines should be reviewed and discussed step by step and part by part.
- Regarding technical terms and other descriptions in English, JICA Team is improving the quality of English expressions. Regarding technical terms and other descriptions in Vietnamese, it is not required to modify expressions in draft Guidelines in Vietnamese beyond necessity, and both JICA Team and Vietnamese side should focus on technical issues.
- JICA Team will consider comments from Vietnamese side carefully at development of the draft Guidelines.

(3) Conclusion

Both Vietnamese side and JICA Project Team confirmed that there were some matters to be corrected in draft Technical Regulations and draft Guidelines. The ways to finalize the draft Technical Regulations and develop the draft Guidelines are as follows:

1) Final draft Technical Regulations
   - Vietnamese side and JICA Team will review the final draft Technical Regulations, pick up the matters to be modified and put them in writing by the end of March 2012.

- The final draft Technical Regulations shall be finalized based on the discussions in WG Meetings on the above-mentioned comments.
- MOIT is responsible for finalization of the final draft Technical Regulations, and MOIT will establish working groups to discuss this issue in order to complete the finalization.

2) Draft Guidelines
- JICA Team will submit the draft Guidelines as early as possible in order to ensure the duration for review by Vietnamese side.
- Vietnamese side will establish working groups to review the draft Guidelines proposed by JICA Team, and will pick up issues to be discussed with JICA Team in order to have effective discussion between JICA Team and Vietnamese side.

12.3.2 Mid-term Review Meeting (February 13, 2012)

The Mid-Term Review Team organized by JICA and headed by Mr. Teruyuki ITO visited Vietnam from February 5 to 18, 2012 for the purpose of conducting a mid-term review study on Electric Power Technical Standard Promotion Project in Vietnam.

During the stay in Vietnam, the Team had a series of discussions, exchanged views, and compiled a mid-term review report with the authorities concerned of the Government of Vietnam over the matters for the successful implementation of the Project.

As a result of the discussions, both sides agreed upon the matters as follows:

(1) Recognition of the Mid-Term Review Report

Both sides recognized that the Mid-term Review Report was proper, and accepted the recommendations mentioned in the report.

(2) Modification of Project Design Matrix (PDM)

Based on the results of mid-term review, it is recommended to modify PDM for successful implementation of the Project in the remaining period. The modification of the PDM shall be finalized and agreed by both Japanese and Vietnamese sides at a JMC Meeting scheduled in April, 2012.

(3) Extension of the Project Period

Based on the results of mid-term review, extension of the project period is recommended in order to finalize the Technical Regulations and Guidelines in a successful manner. Taking into account the work volume and the time frame for drafting the Guidelines, extension of the project period by approximately 3months from “March, 2010 to March 2013” to “March, 2010 to June, 2013” may be reasonable. Details will be discussed in the above mentioned JMC Meeting in April, 2012, in which the revision of work flow of the remaining project period shall also be discussed. After the JMC, both JICA and the Vietnamese authorities shall proceed to revise the Record of Discussion signed on November 26, 2009.

12.3.3 Terminal Evaluation Meeting (April 22, 2013)

The Terminal Evaluation Team organized by JICA and headed by Mr. Teruyuki ITO visited Vietnam from February 15 to 24, 2013 for the purpose of conducting a terminal evaluation on Electric Power Technical Standard Promotion Project in Vietnam.

During the stay in Vietnam, the Team had a series of discussions, exchanged views, and compiled a terminal evaluation report with the authorities concerned of the Government of Vietnam over the matters for the successful implementation of the Project.

As a result of the discussions, both sides agreed upon the matters as follows:

(1) Recognition of the Terminal Evaluation Report

After the discussion between the Terminal Evaluation Team and Vietnamese counterpart members, some contents of the draft report concerning the evaluation result were modified and, finally, both sides recognized that the Terminal Evaluation Report was proper after the revisions, and accepted the recommendations mentioned in the report.

(2) Modification of Project Design Matrix (PDM)

Based on the results of terminal evaluation, it is recommended to modify PDM Version 2 for effective review in the Ex-post Evaluation to be conducted 2 to 4 year after completion of the Project. The modified version of PDM (version 3) shall be confirmed and agreed by both Japanese and Vietnamese sides at the 7th JMC Meeting scheduled on April 24, 2013.

12.3.4 Joint WG Meeting (June 05, 2015)

The Joint WG meeting was held as the final WG Meeting on June 5, 2013 among MOIT, MOC, EVN and JICA Team:

The discussions and conclusions of the meeting are summarized as follows:

(1) Report of JICA Team about Final Draft Technical Regulations

1) Hydropower part

The JICA hydropower team considers that the hydropower parts of Technical Regulations have substantially completed, though the further refining for formality for promulgation is required to be done by Vietnamese side.

2) Thermal power part

The JICA thermal power team reflected the needs from Vietnamese side as much as possible while adhering to the basic policy to develop performance requirement type technical regulations. JICA Team hopes that Vietnamese side will finish the appropriate mandatory regulations by themselves by means of hearing comments from stakeholders widely by MOIT.

3) Network part

The JICA network team considers that the submitted Technical Regulations have been completed at a satisfactory level in quality, since JICA Team reflected comments from stakeholders collected by the local consultant from last year, though the numbers of issues have been pointed out on the quality of technical terms and the consistency with the guideline until last year.

(2) Report of MOIT/MOC/EVN about the activities of Project

1) Report of MOIT

The review of Technical Regulations of network part have been continued in the 2nd Stage, since the drafts which were developed in the 1st Stage was not of satisfactory. The comments were collected from EVN group companies, VTA, Technical Safety Authority, PV-power, Vinacomin and four power plant construction companies. They were discussed in the WG meetings and reflected to the draft. However, some of the comments have not been reflected. Therefore, MOIT intends to proceed with reflecting the comments under the initiative of MOIT. Regarding the Technical Regulations and Guidelines of Network part, they can be promulgated as planned, since the local consultant has contributed to reviewing the technical issues and technical terms in the 2nd Stage.

2) Report of EVN

It does not mean that all outcomes of the Project can be implemented, though we have made the effort in order to develop good Technical Regulations and framework of the the Technical Regulation has been establised in the Project. It is necessary to review and scrutinize for quality after this Project, since we have agreed to the status of Technical Regulations as legal document. Therefore, we hope further support of JICA after termination of this Project. We want to have the English version of the Technical Regulations and Guidelines of Japan to use them as a model. The workload was heavy compared to the period of the JICA Team missions and available task force of Vietnamese side. It is necessary to use guidelines carefully, since there are many units other than EVN. Therefore, it is necessary to proceed with the further revisions in cooperation with units under the initiative of MOIT. Regarding the thermal power part, which is new field to Vietnam, there were active discussions during the Project. However, the Vietnamese side intends to proceed with the further review of the draft, although it is difficult for Vietnamese side since there is a large difference in the requirements between Vietnam and Japan. Regarding the network part, the drafts are of satisfactory with good quality. Regarding the hydropower part, there is no worry about the draft since MOC has contributed to the development of draft, although it is necessary to review the part of equipment

3) Report of MOC

The draft of technical regulation on hydropower civil works has been substantially completed in cooperation with JICA, MOC and the local consultant. It seems that there is no problem to reflect comments from Workshop meeting and to submit the draft to the related

ministries and agencies for their comment, since there is no difference in the opinions collected in the two Workshops held in January and May 2013 in general. MOC intends to refine the final draft by the end of June 2013 and deliver it the related ministries for comment. MOC also intends to publish the Guideline as a document for reference.

13. Other Activities in the 2nd Stage

13.1 Employment of Local Consulting Companies in the 2nd Stage

The JICA Project Team employed local sub-consultant companies continuously from the 1st Stage for the following two companies:

1) Northern Electric Testing Company (former Electrical Testing Center, ETC) for the scope regulated by MOIT
2) Center for Water Resource and Engineering Application (CRA) for the scope regulated by MOC

In addition to the above, an additional sub-consultant was employed in the 2nd Stage in order to support the activities of Network Group which had accumulated pending issues to be solved. As such pending issues were deeply related to the current practices in application of Vietnamese standards and regulations for network facilities, it was required to reinforce the activities of Vietnamese side WG members and improve the communication between the JICA Team and Vietnamese WG members. The new sub-consultant was employed to fulfill this requirement efficiently.

As the result, the following company was selected to the 3rd sub-consultant of the Project though the competitive bidding held in September 2012.

- VINACONSULT, Joint Stock Company

13.2 Baseline Survey in the 2nd Stage

13.2.1 General

Succeeding the 1st Stage, the baseline survey was conducted also in the 2nd Stage by the local sub-consultant company during the period from March to May 2013 for the following items:

1) Baseline Survey on accidents and power outages in electric power supply (for the years 2010 to 2012)
2) Baseline Survey on degree of satisfaction to the technical regulations and guidelines
3) Needs Survey on actual needs of technical regulations and guidelines

The baseline surveys were conducted in the manner as follows:

(1) Survey on accidents

The following questionnaires were delivered to the selected main units.

1) Questionnaire for Power Plants
   Q1: Questionnaire on general issues

   Q2: Questionnaire on each accident or trouble

2) Questionnaire for Network System
   Q1: Information about transmission and distribution lines

Q2: Information about Transformer, Circuit Breaker, Disconnector and other equipments in the power station .

(2) Survey on actual needs

The following questionnaires were delivered to the selected main units.

Q1: Design outline of major project components of existing hydropower stations, thermal power stations and network units and the applied technical standards and/or technical regulations for each power station and network unit.

Q2: Actual performance of completion and periodic inspections, and its conformity, problems and needs in use of the existing technical regulations at the existing power stations and network units.

Q3: Actual performance of plant and facility operation, and its conformity, problems and needs in use of the existing technical regulations at the existing power stations and network units.

Q4: Actual performance of construction/installation, and its conformity, problems and needs in use of the existing technical regulations at the existing or new power stations and network units.

Q5: Background and needs of Guidelines for technical regulation.

(3) Survey on degree of satisfaction

The following questionnaires were delivered to the selected main units.

Q1: Actual situation of use of the existing technical regulations.

Q2: Degree of satisfaction to the Technical regulations.

Q3: Preparation of company level manuals or guidelines based on the provisions in the existing technical regulations.

Q4: Particular framework and activities for promotion of the existing technical regulations such as seminars, staff education.

The following units replied to the questionnaire for each survey.

- Hydropower Plant: 8units among 35 units
- Thermal Power Plant: 12 units among 37 units
- Network Unit: 4 units among 28 units

In the Joint WG Meeting on June 5, 2013, the ETC (the local consultant assigned for Baseline Survey) reported the results of Baseline Survey as follows:

13.2.2 Baseline Survey on Hydropower Facilities

(1) General Information

Baseline surveys for hydropower field were conducted through the questionnaires. The questionnaires were delivered to the 35 units including hydropower plants and other organizations related to hydropower engineering but the answers were collected only from 8 units.

(2) Survey on degree of satisfaction to the Technical Regulations

The conclusion of the survey on degree of satisfaction to the existing technical regulation for hydropower facilities is summarized as follows.

- Tecnical regulation for design is used only 50% of the answered units.
- The provisions in the existing techncial regulations are fullfilling more that 80% of the requirements of hydropower plants.
- The contents of provisions in existing technical regulations are evaluated to be moderately sufficient with technical requirements.
- All of the answered hydropower plants are conducting examinations on level of understanding of the existing technical regulations for technical staff, operating workers.
- On the other hand, most of the hydropower plants do not have any activity to promote the techncial regulations to workers.

(3) Survey on actual needs of the Technical Regulations and Guidelines for power facilities

The conclusion of the survey on actual needs of the Technical Regulations and Guidelines for hydropower facilities is summarized as follows.

- For the hydropower plants which do not use the technical regulation for design use the international standards such as: IEC, IEE, ISO, DIM.
- Most of the hydropower plants are satisfied with the application of the existing technical regulation for inspection at the levelnof more than 80 %.
- Most of the hydropower plants are satisfied with the application of the existing technical regulation for operation at the levelnof more than 80 %.

(4) Baseline Survey on Accidents

The conclusion of the survey on accidents at hydropower facilities is summarized as follows.

- Accidents occurred at the answered hydropower plants counted 84% for Type-4 (forced power supply outage) and 11% for Type-6 (accident or trouble on civil work structures or reservoir).
- The cause of accidents occurred at the answered hydropower plant counted 53% for the equipment trouble, 16% for natual dissaster, 13% for human error and 5% for maintenance trouble.

- According to the survey result, the following are recommentded for each hydropower unit to reduce number of accidents:
  - To improve testing and checking procedures for equipment to ensure its safety and realibilty.
  - To strengthen the investigation and supervision in regular basis for equipment during operation in order to detect any damages and defects in a timely manner.
  - - To provide trainings, improve the competency of workers and investigator and maintainace personnel in order to prevent damages and accidents caused by human errors.

13.2.3 Baseline Survey on Thermal Power Facilities

(1) General Information

Baseline surveys for thermal power field were conducted through the questionnaires. The questionnaires were delivered to the 37 units including thermal power plants and other organizations related to thermal power engineering but the answers were collected only from 11 units.

(2) Survey on degree of satisfaction to the Technical Regulations

- The current Technical Regulations have been applied in many thermal power plants.
- The contents of the current Technical Regulations are understood by the many technical staffs in thermal power plants.
- The procedures or technical handbooks in many thermal power plants have been made based on the current Technical Regulations. However, some power plants have not used them.

(3) Survey on actual needs of the Technical Regulations and Guidelines for power facilities

- In many thermal power plants, the current Technical Regulations are understood that the provisions of inspection and operation have been stipulated sufficiency.
- The following items have been understood at many thermal power plants.
  - The contents of requirements of " Law of standards and regulations: No.68/2006/QH11".
  - The current Technical Regulations will be revised to ensure security and safety in compliance with" Law of standards and regulations: No.68/2006/QH11".
  - Each thermal power plant shall develop own administration manual.
  - The new Guidelines will be useful for the power plants.

(4) Baseline Survey on Accidents

- The first highest cause of trouble is the failure of equipment (42.47%), and the second highest cause is the natural disaster (also related to the quality of equipment, 32.88%).
- As a feature of the result of this survey, the third highest cause of trouble is the human error (10.96%).

13.2.4 Baseline survey in Network facilities

(1) Survey on degree of satisfaction to the existing Technical Regulation

The conclusion about degree of satisfaction to existing technical regulation as follows.

- All QCVNs are now widely being applied in the Network located in Viet Nam.
- The existing QCVNs are filling almost technical requirements of Network.
- The contents of provisions in existing QCVNs are highly sufficient with technical requirements.

Table 13.2.4-1 Summary of degree of satisfaction to the existing Technical Regulation

Survey item / Scope	Actual situation of Usage	Level of understanding by technical staff	Preparation of company level manuals
Design Vol.1-4	○80%	○80%	○80%
Complete Inspection Vol.5	○80%	○80%	△60%
Periodic Inspection Vol.5	△60%	○80%	△60%
Operation Vol.6	△60%	○80%	○80%
Installation Vol.7	○80%	○80%	○80%

(2) Survey on actual needs of the technical regulations and guidelines

Survey on actual situation of using the existing Technical Regulations in design of major project components of existing Network is conducted by sending questionnaires company to study what were the applied regulations in design stage of each Project network in Viet Nam.

Result of survey:

- 50% of companies used the existing Technical Regulations in design of major project components.
- 50% of companies did not use them and they used international standards such as IEC, IEE etc., instead.

There are some more result of actual performance and conformity of the Technical Regulation Vol.5 for inspection. The some of the power companies replied that they are “partly satisfactory” about the contents of the existing Technical Regulations Vol.5. But regarding Technical Regulation Vol.6 (Operation), they replied that more than 80% target has been achieved.

(3) Baseline Survey on Accidents

1) Outline of survey result

After conducting baseline survey, JICA Team understood that there were no formal data related electric failures in Vietnam and many power companies managed these data

themselves. Then the data below are the collecting data by ETC from Transmission Power Companies and Load Dispatch Center.

According the data of "Transmission line accidents", 78% of the accidents caused by lightning, a kind of natural factor, but the second main cause which counts 8% are by object contact. Contact with wire due to the lack of maintenance and inspection tour. JICA Team concluded the necessity of the enhancement of operation manual especially for safety corridor, the design of transmission line, and supervision and management of transmission lines.

Table 13.2.4-2 Summary of Transmission Line Accidents

Transmission Line accident 500kv+220kV (3Years 2007-2009)

Cause	times	brackout time[m]	
Lightning	322	8,304	
Damaged insulator (without lightning)	16	25	
Touch with object /tree	33	301	
Breaking of wire (without lightning)	6	3,067	
Others	36	4,509	length[km]
Total	413	16,206	13,158

According the data of "Transformer accidents" below, most common cause is "protecting relay" due to the malfunction of the relay. These results gave the evidence to be lack of operation knowledge of protecting relay. Next cause is "fire accident" which is big disaster for Power Company and it is possible to reduce it to enhance the operation and designs Regulation.

Table 13.2.4-3 Summary of Transformer Accidents

Transformers accident 500kv+220kV (3Years 2007-2009)

Cause	times	brackout time[m]	
Protection Relay	29	3,577	
Fire	7	83,957	
Damaged insulator	1	420	
Others	26	3,314	No. of TR[Unit]
Total	63	91,268	127

2) Statistic number of accident in three year 2010 – 2012

Through the statistics of investigation results, it is realized that issues arising from equipment failure have the highest rate of accidents (73%) and other sources.

Through summarizing and analyzing the investigation results, the company groups have some recommendations as following:

- Improve testing and checking procedures for equipment to ensure safety and reliability.
- Strengthen the investigation and supervision in regular basis for equipment during operation in order to detect any damages and defects in a timely manner.
- To train and improve the competency of workers, investigators and maintenance personnel in order to prevent damages and accidents caused by human errors.
- To regularly and continuously check the compliance of engineering staff with the procedures, regulations and technical standards

Part 4 Evaluation and Conclusion

14. Development of Draft Technical Regulation

14.1 Draft Technical Regulation Vol.1 (Design of Network Facilities)

To develop and revise the Technical Regulation Vol.1 is the most challengeable task for both parties, and it takes a lot of time to reach the consensus among related organization. At the result, all the WG members agreed to unify one “Design Regulation” as Vol.1 from four volumes.

Additionally, big efforts were needed to organize and restructure the appropriate parts and chapters in the volume. In these efforts the accomplished Technical Regulation Vol.1 has been newly born as an easily understandable regulation and detailed part was shifted to the Guideline Vol.1. The major points in the development of new Vol.1 are as follows:

- Solid definitions are added international standards and up-to-date information
- Minimum requirement are added to understand the mandatory criteria in each material
- Repeated expressions are put group that makes the volume simple
- Safety articles are remained in mandatory regulation and reference data are shifted to Guideline, especially minimum clearance are arranged in appropriate order
- Area classifications are revised for engineers to decide easily the proper material and specifications in each case.
- Latest technology such as SCADA , underground equipments and gas insulations are added
- Tables and figures are added as requested
- Relay coordination are revised and added to maintain safety for workers
- Eathing installation are organized properly to add the sample cases
- Since UHV transmission system (1,000kV class) that requires the specific technology has not yet adapted in Vietnam, provisions for UHV are not included in the draft Technical Regulation Vol.1. When UHV is needed in the future in Vietnam, it is necessary to add the new technology and appropriate contents about UHV to the Technical Regulation.

14.2 Draft Technical Regulation Vol.2 (Design of Thermal Power Facilities)

(1) Evaluation and conclusion

1) It is considered that the business objective for Vol.2 which was referred to JICA Thermal Power Team experts have been achieved without excess or deficiency in a given resource.
2) However, JICA Thermal Power Team experts were not enough to unify different opinions between Vietnamese parties about the ideal situation of technical regulation Vol.2, since there is big difference in the basic part without unify between stakeholders. In this regard, it was agreed between JICA Team and Vietnamese side, in the Terminal Evaluation meeting on

April 22, 2013 and the Joint WG Meeting and the 8th JMC/6th JCC Meeting on June 5, 2013, that MOIT will unify the opinions of Vietnamese side after the Project.

(2) Major points in development of Technical Regulation Vol.2

1) The technical regulation Vol.2 was developed mainly based on the "Japanese technical regulation for thermal power facility", "Japanese technical regulation for electric facility" which is promulgated by Ministry of Economy, Trade and Industry (METI) Japan.
2) The Japanese technical regulations mentioned above are ones replaced from the "specification type regulation" into the "performance requirement type one" in order to match with the global standard of WTO-TBT rule about 15 years ago. Since the requirement of "Law on standards and technical regulation No.68/2005/QH11" of Vietnam is quite same as such replacement, the new draft technical regulation for Vietnam was established in line with the policy of "performance requirement type one" as much as possible.
3) Technical Regulation Vol. 2 (design of thermal power facilities) has been proposed as the performance requirement type according to the requirement of "Law on standards and technical regulation No.68/2005/QH11" quite differently from the type of Old Norm. We have provided the Vietnamese side with the draft which might be needed in Vietnam, considering the requirements of the Standard Law and the initial request from Vietnamese side.

   Comments have been issued from a large number of parties for the draft provided by JICA Thermal Power Team experts and JICA Team experts have reflected the necessary matters on the draft T/R and GL calmly and sincerely as an engineer on the analysis and review.

   Initially, there was a demand of the Technical Regulation corresponding to the individual facility such as the super-critical plant, ultra super-critical plant and combined-cycle. The technical requirement for security and safety such as the prevention of expansion of risk, the prevention of destruction due to high-temperature and high-pressure, the prevention of destruction due to thermal expansion, the prevention due to over-speed and imbalance, the prevention of electric shock and fire, the prevention of electrical and magnetic interference, the prevention of power supply disturbance and the prevention of public pollution are specified in the technical regulation which is developed as the performance requirement type one. JICA Team has explained and got understanding in the WG meetings that such requirement does not change depending on the generation method, type of facility and change of era. For an example of high-temperature materials, the materials for steam turbine body and boiler tube and piping have been introduced in the guidelines for boiler and steam turbine. Therefore, the present guideline is applicable until the material for next 700oC class will be commercialized.

   It has been agreed in the WG meeting in the initial stage of the Project that the generation by municipal waste, agricultural waste and forestry waste which might be introduced in future in Vietnam are not interst in this Project, since the combination of the furnace and fuel is diversifying.

However, it is clear that such major issues as 5) to 14) have not been understood until this moment, since even the opinion that the Old Norm is the best has come out yet and also it is judged from the circumstance of the comment in WS, WG in the 2nd Stage of the Project. Therefore, it is suspected that the only collection and processing of comments from parties have proceeded without presentation of the fundamental orientation.

JICA Thermal Power Team experts dare to advise about the major directions in order to promulgate the T/R and publish GL of thermal power plant by MOIT smoothly and quickly, though JICA is not responsible for promulgating Law and Regulation of Vietnam and also JICA Thermal Power Team experts are not responsible for contracting with Vietnamese side to establish law and regulation of Vietnam.

4) It must not be hasty when establishing new law and regulation in order to satisfy the original purpose, since it is necessary to finish ripening from consult widely with interested parties. However, JICA Thermal Power Team experts is not in the position to collect opinions, coordinate and persuade parties such as MOIT, relative ministerial, generation companies, consultants and related organizations. It is the core obligation of MOIT. Moreover, it is the responsibility of MOIT to finalize something which matches actual situation of Vietnam after execution of the proposed solution, though JICA Thermal Power Team experts is capable to advise the ideal situation.
5) Demands at first from Vietnam side:
   Prior to the commencement of the Project, the request of Vietnamese side was transfered to the Project formulation mission of JICA without organizing the objective or demand. It was not clear whether it is contribution of draft law and regulation, or contribution of the missing information in Vietnam, or contribution of the necessary manuals. This situation caused a confusion in the Project. It is necessary to scrape off the unnecessary part from the current draft T/R in accordance with the theory, though the draft GL from JICA can be utilized.
6) Quotation from regulation of other ministries:
   The quotation from other law and regulation must be deleted from the T/R, though it is possible to describe the quoted information in the MOIT's GL for thermal facility. When quoting from reference material, it is necessary to describe the quoted source accurately and it should be updated in every amendment.
7) Treatment of equipment regulated by other ministry:
   Stipulations on equipment regulated by other ministries must be removed from the T/R for thermal power facility of MOIT after confirming that they are prescribed in another law and regulation properly. For example, environmental facility, fire prevention and extinguishing equipment, port facility, railway facility, vehicle, mining machine, storage facility for hazardous materials, boiler regulated by labor department and the like. They can be described in the GL taking into consideration the convenience for the business operator.
8) Subject to application of technical regulation: (by facility or act)

Originally, T/R should be the requirements for equipment and should not be those for the actions such as inspection, operation and the like. The variety of option for inspection and operation should be ensured as long as the requirements relating to safety and security for equipment are conformed.

9) Subject to application of technical regulation (by scale):
Originally, T/R must be applied to all thermal power plants above certain scale as the common minimum safety requirement.

10) Subject to application of technical regulation (by type of equipment):
The facility which might lead to casualties, destruction of facilities, and a large-scale accident, a large scale supply interruption in the short term or instantaneously should be the target for regulation, while the facilities for which degradation is proceeding in the medium to long term operation are not necessarily to be the target since it is possible to grasp the daily safety status and prevent the facilities from disasters.

11) Subject to application of technical regulation (by type of business):
Essentially, T/R shall be applied to all thermal power facilities in Vietnam regardless of project status such as national, BOT, IPP and private power plant. In addition, owner or operator of power plant should be responsible for the execution of obligation.

12) Content of technical regulation:
The technical regulation is different from the operation, inspection, maintenance manual and design manual. It prescribes the technical, minimum requirement for safety and security. The administrative, managerial, economical and state-controlled matters other than the technical and safety matters must be prescribed in upper laws and regulations or in the ordinance or MOIT should add their own necessary content into proposed draft.

13) Collateral of force for technical regulation:
If there is no system that is functioning realistically, force does not work. It is necessary to create the system of collateral force and verification system such as notification, on-the-spot inspection, penalty and the like.

14) Performance requirement type technical regulation:
MOIT must reconfirm the requirement of “Law on standards and technical regulation No.68/2005/QH11” and notify the amendment policy in advance sufficiently.

15) Therefore, it is preferable to finalize the T/R to reflect the above proposed solutions to the proposed final draft.

16) Future responding to introduction of new technology
Owner is requested to develop the new purchase specification or administ5ration manual corresponding to the new thermal technology when the new thermal generation method that is not exist in Vietnam at this moment is employed, although update of the design Technical Regulation is basically unnecessary. The content of guideline will go missing if there is any

technological progress, though guidelines are usuful as the reference for the time being. Owner must refer the reliable voluntary standards taking their own risk in this case. To do this, it is necessary to enhance TCVNs.

14.3 Draft Technical Regulation Vol.3 (Construction of Network Facilities)

The technical regulation for construction of network facilities was revised by the former JICA Study in 2007 and promulgated as QCVN Vol.7 in 2008. In this Project, JICA Team revised the current Vol.7 again by reviewing if there are additional problems or not in it after the restructuring of Techncial Regulation Vol.1 for design of network facilities.

Some of the articles in the former Vol.1 to Vol.4 “Design Regulations” include the articles related to the installation of compartment, battery and other devises in substation. These articles described the issues about fire prevention measurement, then, JICA Team suggested to shift them to the new Vol.3 which is the technical regulation for construction of network facilities.

JICA Team also made revisions mainly for the following items.

- Supplemental tables, figures and photos were added
- GIS installations and SF6 gas handling method were added concretely
- Some articles that is out of date or do not exist anymore in Vietnam were deleted

14.4 Draft Technical Regulation Vol.4 (Operation and Maintenance of Power Facilities)

The draft Technical Regulation Vol.4 was prepared by revising the existing Technical Regulation Vol.6 (QCVN-QTD Vol.6) promulgated in December 2008 based on the background and policies mentioned in Chapter 2 of this report. The major objective of the revision was to update the Technical Regulation Vol.6 as “performance requirement type regulation” in line with the policy of the Law on standards and technical regulations (No.68/2006/QH11). The result of revisions proposed in the Final Draft Technical Regulation Vol.4 is evaluated for each of general part, hydropower part, thermal power part and network part as follows:

14.4.1 General Part

(1) Evaluation and conclusion

The general part of the Technical Regulation Vol.4 consists of the following three Parts which provide fundamental general requirements to be commonly applied for the operation of power plants and network facilities:

- Part 1: General
- Part 2: Organization and system for operation
- Part 3: Plan, Houses and Power Plants

The contents of each part in the existing QCVN-QTD Vol.6 and their revisions proposed by the JICA Team and Vietnamese side were discussed in the WG meetings and finally reached conclusions after the agreement between JICA Team and Vietnamese side without objection or pending issues in general.

In conclusion, it is considered that the contents of general part (Part 1 to Part 3) of Final Draft Technical Regulation Vol.4 are appropriate as provisions of mandatory technical regulation for operation and maintenance of power plants and grid. However, it is necessary for Vietnamese side to finalize the draft of Vietnamese version submitted by JICA Team for promulgation in terms of linguistic and formality issues as agreed between JICA side and Vietnamese side.

(2) Major points of revisions made on the exiting version (QCVN-QTD Vol.6)

Major points of revisions discussed and concluded in the Project are summarized as follows:

1) Part 1: Article 2 “Scope of application” and Article 3 “Definition”

   The scope of application for hydropower plants was revised to cover all power plants connected to “National Grid” including the plants with installed capacity less than 30MW and civil works of the hydropower plants with special dams defined by the Government Decree No. 143/2003/ND-CP.

   Also, the scope of application for thermal power plants was revised to cover all power plants connected to “National Power Transmission Network”. In this regard, the definition of “National Power Transmission Network” was provided in Article 3.

2) Part 2:

   As most of the articles in Part 2 of the existing QCVN-QTD Vol.6 are of originally drafted by Vietnamese side before its promulgation in 2008 based on the Vietnamese practices, substantial revisions were not made on each article except for an article of which a detailed stipulation were moved to Guideline and for the following article.

   Article 35 “Investigation of accident” was deleted and combined with Article 27 “Investigation and report of accident” in order to make the stipulation clear.

3) Part 3:

   As Part 3 provides fundamental requirements for operation and maintenance of power plant and network facilities, substantial revisions were not made on the original stipulations in the existing QCVN-QTD Vol.6 except for the following:.

   Article 46 “Checking powerhouse’s chimney” was deleted because the check of chimney is conducted only in the completion inspection and periodic inspections.

   Article 48 “Corrosion protection of metal structures” was revised to suit the purpose of Vol.4

14.4.2 Hydropower Part

(1) Evaluation and conclusion

The hydropower part of the Technical Regulation Vol.4 consists of the following Part which provides fundamental general requirements to be applied for the operation and maintenance of hydropower plants including civil works, hydromechanical works and electrical equipment:

- Part 4: Civil Works, Water Sources, and Management of Hydraulic Turbine and Powerhouse

The contents of Part 4 in the existing QCVN-QTD Vol.6 and their revisions proposed by the JICA Team and Vietnamese side were discussed in the WG meetings and finally reached conclusions after the agreement between JICA Team and Vietnamese side without objection and pending issues in general.

In conclusion, it is considered that the contents of hydropower part (Part 4) of Final Draft Technical Regulation Vol.4 are appropriate as the provisions of mandatory technical regulation for operation and maintenance of hydropower plants. However, it is necessary for Vietnamese side to finalize the draft of Vietnamese version submitted by JICA Team for promulgation in terms of linguistic and formality issues as agreed between JICA side and Vietnamese side.

(2) Major points of revisions made on the exiting version (QCVN-QTD Vol.6)

Major points of revisions discussed and concluded in the Project are summarized as follows:

1) Article 49 “Definitions”
   The technical terms related to hydropower works to be defined in Part 4 were rearranged by adding to and deleting from the existing QCVN-QTD Vol.6 mainly for terms relating to the inspection types and the new classification of dams by Decree No.72/2007/ND-CP on management of dam safety.

2) Article 50 “Preparation and preservation of necessary documents”
   A provision was added based on the requirements in the related existing Vietnamese laws and regulations.

3) Article 63 “Steel Penstock”, Article 64 “Wooden penstock” and Article 65 “Reinforced plastic penstocks”
   As the provisions in these article were too detail for the mandatory technical regulation, they were moved to Guideline Vol.4.

4) Article 66 “Emergency programs”
   Provisions of this article were modified based on Article 20 of Decree No. 72/2007/ND-CP and Article 12 of Circular No.34/2010 /TT-BCT.

5) Article 70 “Investigation of monitoring data”
   Provisions were added to describe monitoring items in detail according Article 12 of Decree No.72/2007/ND-CP.

6) Article 78 “Water discharge and storage regime” and Article 80 “Operating manuals for spillway”
   Provisions were added according to Article 10 of Decree No.72/2007/ND-CP.

7) Article 82 “Discharge capacity for design flood and check flood”
   Provision was revised considering the provision of TCXDVN-285 7.4.3 as the original provision did not include outlet works under management of other sectors.

8) Article 82-a1 “Warning on dam failure”, Article 82-a2 “Measurement of downstream water level” and Article 82-a3 “Protection of downstream areas from inundation”
   These articles were agreed to be added according to the request of Vietnamese WG members.

9) Article 86 “Use of hydro-meteorological data for safe operation”
   Provision was added according to Article 12 of Decree No.72/2007/ND-CP.

10) Article 91 “Oil treatment”
    Article 91 was moved to Article 382-a1 in Part 6 as this issue is regarded as the requirement commonly applied to not only hydropower facilities but also thermal power and network facilities.

11) Article 93 “Changeable operation mode”
    The “pumping mode” was added to the operating mode to cover the pump/turbine for pumped storage power plants.

12) Article 99 “Hydraulic pressure inside penstock”
    The description for the situation of hydraulic pressure in the penstock was deleted because there are many cases of operation in load rejection which shall be defined in the Guideline.

14.4.3 Thermal Power Part

(1) Evaluation and conclusion

1) It is considered that the business objective for Vol.4 which was referred to JICA Thermal Experts expert has been achieved without excess or deficiency in a given resource.
2) However, JICA expert team was not enough to unify different opinions between Vietnamese parties about the ideal situation of technical regulation Vol.4, since there is a big difference in the basic part without unified among stakeholders. In this regard, it was agreed between JICA Team and Vietnamese side, in the Terminal Evaluation meeting on April 22, 2013 and the Joint WG Meeting and the 8th JMC/6th JCC Meeting on June 5, 2013, that MOIT will unify the opinions of Vietnamese side after the Project.

(2) Positioning of technical regulation for operation and maintenance

1) The technical regulation for operation and maintenance has been promulgated by MOIT in 2008 after the previous JICA project. It is impossible to develop mandatory regulation which can be applied uniformly to all power plants originally, since operation of power plants are

specific to each individual plant, though JICA Thermal Experts have carried out review of them.

2) In addition, the content of mandatory regulation for operation and maintenance of thermal power plant at the time when it was developed will not be capable to use in the future as it is, since an advanced control system will be developed and the automation will be expanded. There is the problem whether it is possible to reflect advances of technology quickly into the mandatory regulation or not.
3) From the above point of view, it is necessary to understand that it can be prescribed only fundamental principle which is not affected much by technological progress. From this point of view, it is necessary to change the specification type technical regulation to the performance requirement type one in the future, since there is a limit of the specification type technical regulation.
4) In other words, if the technical regulation provides mandatory matters in detail, it may give rise to bad effect that it is enough to comply with only prescribed matters, or conversely, only prescribed matters can be applied.
5) In more forward, even in the absence of the technical regulation for operation and maintenance, it can be a pawl for the safe operation and maintenance on a voluntary basis, if there is a penalty by occupation safety regulation or a penalty on the electric supply contract.

(3) Activity based on administration manual

1) The many opinions that the technical matters relating to actual operation should be included in the technical regulation have been issued from Vietnamese side in the process of developing the technical regulation. However, actual operation of the plant should be performed according to the O&M Manual which has delivered to each individual power plant by the equipment manufacturers and EPC Contractor faithfully.
2) In order for that, it is necessary to develop the operation procedure of facilities, managing items, inspection items during operation, emergency response, training and education of staff and plans for annual operation based on a O&M Manual which is supplied by manufacturer or EPC Contractor in every power plant as a administration manual.
3) The technical regulation requires to be developed with the classification as same level as of administration manual, though the content of it will defer in each power plant.

14.4.4 Network Part

Operation regulation was revised by the former JICA Study in 2007 and promulgated as QCVN Vol.6 in 2008. In this Project, JICA Team revised it again by reviewing if there are additional problems in it after the restructure of Design regulation.

As there are duplicated articles with other volumes in part 6 and part 7 of Vol.6 (current Vol.4) which are related to power networks, JICA Team deleted and shifted these articles to the proper volumes such as grounding earthing operation. Additionally the detailed contents such as the specific values

like allowable voltage rise and construction work area were reviewed and revised according to the practices in Vietnam.

JICA Team also made revisions on Technical Regulation Vol.4 mainly for the following items.

- Supplemental tables, figures and photos were added
- The contents of battery maintenance were added
- Over load operation methods and safety area during underground cable works were added
- The new method of power facilities planed outage using SCADA were added
- Some articles that is out of date or do not exist anymore in Vietnam were deleted

14.5 Draft Technical Regulation Vol.5 (Inspection of Power Facilities)

The draft Technical Regulation Vol.5 was prepared by revising the existing Technical Regulation Vol.5 (QCVN-QTD Vol.5) promulgated in December 2008 based on the background and policies mentioned in Chapter 2 of this report. The major objective of the revision was to update the Technical Regulation Vol.5 as "performance requirement type regulation" in line with the policy of the Law on standards and technical regulations (No.68/2006/QH11). The result of revisions proposed in the Final Draft Technical Regulation Vol.5 is evaluated for each of general part, hydropower part, thermal power part and network part as follows:

14.5.1 General Part

(1) Evaluation and conclusion

The general part of the Technical Regulation Vol.5 consists of the following Part which provides fundamental general requirements to be commonly applied for the inspection of power plants and network facilities:

- Part 1: General

The contents of Part 1 in the existing QCVN-QTD Vol.5 and their revisions proposed by the JICA Team and Vietnamese side were discussed in the WG meetings and finally reached conclusions after the agreement between JICA Team and Vietnamese side without objection or pending issues in general.

In conclusion, it is considered that the contents of general part (Part 1) of Final Draft Technical Regulation Vol.5 are appropriate as provisions of mandatory technical regulation for the inspection of power system facilities.

(2) Major points of revisions made on the exiting version (QCVN-QTD Vol.5)

Major points of revisions discussed and concluded in the Project are summarized as follows:

1) Part 1: Article 2 "Scope of application" and Article 3 "Definitions"

The scope of application for hydropower plants was revised to cover all power plants

connected to “National Grid” including the plants with installed capacity less than 30MW and civil works of the hydropower plants with special dams defined by the Government Decree No. 143/2003/ND-CP.

Also, the scope of application for thermal power plants was revised to cover all power plants connected to “National Power Transmission Network”. In this regard, the definition of “National Power Transmission Network” was provided in Article 3.

14.5.2 Hydropower Part

(1) Evaluation and conclusion

The hydropower part of the Technical Regulation Vol.5 consists of the following Part which provides fundamental general requirements to be applied for the inspection of hydropower plants including civil works, hydromechanical works and electrical equipment:

- Part 3: Hydropower Plants

The contents of Part 3 in the existing QCVN-QTD Vol.5 and their revisions proposed by the JICA Team and Vietnamese side were discussed in the WG meetings and finally reached conclusions after the agreement between JICA Team and Vietnamese side without objection and pending issues in general.

In conclusion, it is considered that the contents of hydropower part (Part 3) of Final Draft Technical Regulation Vol.5 are appropriate as the provisions of mandatory technical regulation for the inspection of hydropower plants. However, it is necessary for Vietnamese side to finalize the draft of Vietnamese version submitted by JICA Team for promulgation in terms of linguistic and formality issues as agreed between JICA side and Vietnamese side.

(2) Major points of revisions made on the exiting version (QCVN-QTD Vol.5)

Major points of revisions discussed and concluded in the Project are summarized as follows:

1) Article 74 “Definitions”
   The technical terms related to hydropower works to be defined in Part 3 were rearranged by adding to and deleting from the existing QCVN-QTD Vol.5 for the terms relating to the dam types, inspection types, etc.

2) Article 76 “Management of Operation and Maintenance”
   Some items of requirements were added pursuant to the stipulation in Article 23 of Decree No. 72/2007/ND-CP.

3) Article 78 to Article 86 related to in-progress inspections of electrical equipment
   The stipulations which are too detail as requirements of the mandatory technical regulation were deleted.

4) Article 83 ”Characteristic test of Generator” and Article 87 “Vibration measurement”

Articles 83 and 87 were moved from the Chapter 3 “In-progress Inspection” to Chapter 4 “Completion Inspection” as Articles 93-a1 and 98-a1 respectively after the stipulations which were too detail as requirements of the mandatory technical regulation were deleted.

5) Article 83-a1 “Characteristic measurement of excitation system”, Article 86-a1 “Neutral grounding equipment test” and Article 86-a2 “Fire extinguisher system test”
Articles 83-a1, 86-a1 and 86-a2 were added as the additional test items of the in-progress inspection in accordance with the result of discussion in WG meeting.

6) Articles 87-a1 to 87-a9 related to Power Plant Equipment
Articles 87-a1 to 87-a9 were added as the required test items for the in-progress inspection of power plant equipment (PPE).

7) Articles 88-a1 “Insulation resistance measurement”
Articles 88-a1 was added as a required test item for the completion inspection.

8) Article 89 to Article 98 related to the completion inspection of electrical equipment
The stipulations which are too detail as requirements of the mandatory technical regulation were deleted.

9) Article 98-a2 “Power plant equipment test” and Article 98-a3 “Trial operation/run”
Articles 98-a2 and 98-a3 were added as the required test items for the completion inspection of power plant equipment (PPE) and as the requirements for trial operation/run in the completion inspection respectively.

10) Article 100 to Article 104 relating to the periodic inspection of dams and spillways
Provisions regarding the periodic inspection for dams and spillways were substantially revised by providing new provisions according to laws and regulations in Vietnam such as Decree No.72/2007/ND-CP and Circular No.34/2010/TT-BCT. Accordingly, Articles 100 to 104 were rearranged into Articles 100-a1 to 100-a11 for each of the “periodic inspection for flood control”, “periodic inspection for dam safety” and “periodic inspection for overall power plants facilities”.

11) Article 120-a1 “Water quality in reservoir”
Articles 120-a1 was added as an additional inspection item of the periodic inspection in accordance with the result of discussion in WG meeting.

12) Articles 126 to 129 and 131 to 133 related to periodic inspection of electrical equipment
Stipulation was omitted for Articles 126 to 129 and 131 to 133 to avoid reiteration of the same in two articles as the same provisions are stipulated in Articles 79, 80, 93-a1, 98-a1, 85, 86 and 91 respectively.

13) Article 131-a1 “Generator inspection” and Article 133-a1 “Trial operation / run”
Articles 131-a1 and 133-a1 were added as the required test items for the periodic inspection of generators and as the requirements for trial operation/run in the periodic inspection respectively.

14.5.3 Thermal Power Part

(1) Evaluation and conclusion

1) It is considered that the business objective for Vol.5 which was referred to JICA Thermal Power Team experts have been achieved without excess or deficiency in a given resource.
2) However, JICA Thermal Power Team experts were not enough to unify different opinions between Vietnamese parties about the ideal situation of technical regulation Vol.5, since there is big difference in the basic part without unify among stakeholders. In this regard, it was agreed between JICA Team and Vietnamese side, in the Terminal Evaluation meeting on April 22, 2013 and the Joint WG Meeting and the 8th JMC/6th JCC Meeting on June 5, 2013, that MOIT will unify the opinions of Vietnamese side after the Project.

(2) Positioning of technical regulation for inspection

1) The technical regulation for inspection has been promulgated by MOIT in 2008 after the previous JICA project. It is impossible to develop mandatory regulation which can be applied uniformly to all power plants originally, since inspection of power plants are specific to each individual plant, though JICA Thermal Power Team experts have carried out review of them.
2) In addition, the content of mandatory regulation for inspection of thermal power plant at the time when it was developed will not be capable to use in the future as it is, since an advanced new prime mover will be developed and a new combined cycle generation system will be expanded. There is the problem whether it is possible to reflect advances of technology quickly into the mandatory regulation or not.
3) From the above point of view, it is necessary to understand that it can be prescribed only fundamental principle which is not affected much by technological progress. From this point of view, it is necessary to change the specification type technical regulation to the performance requirement type one in the future, since there is a limit of the specification type technical regulation.
4) In more forward, even in the absence of the technical regulation for inspection, it can be a pawl for the safe operation on a voluntary basis, if there is a penalty by occupation safety regulation or a penalty on the electric supply contract.

(3) Activity based on administration manual

1) The many opinions that the technical matters relating to actual inspection should be included in the technical regulation have been issued from Vietnamese side in the process of developing the technical regulation. Basically, the actual inspection of equipments should be carried out according to O&M Manual supplied by manufacturers or the voluntary standard in each power plant. The frequency, timing and content of inspections carried out in the large-scale power plants must be planned and implemented in accordance with the state of each power plant.
2) It is necessary to monitor the latest inspection method suitable for own power plant and introduce.

3) Although Owners have to have responsibility of inspection services, the ratio of outsourcing to a special maintenance company or inspection company would be higher in the future.

14.5.4 Network Part

Inspection regulation was revised by the former JICA Study in 2007 and promulgated as QCVN Vol.5 in 2008. In this Project, JICA Team revised it again by reviewing if there are additional problems in it after the restructure of Design regulation.

JICA Team suggested that numerical criteria are not appropriate in Technical Regulation and shift to Guideline.

Basic three concepts for revising the Technical Regulaiton Vol.5 are as follows:

- The items of regulation are the minimum requirement of the test in each equipment and facilities own can add necessity inspection, if needed.
- The owner of the facilities shall conduct the entire test stipulated in Vol.5
- Technical Regulation stipulates only the outline of the test and detail numerical values are set in Guideline or the company's manual.

The main items revised in Techncial Regulation Vol.5 are as follows:

- Supplemental tables, figures were added
- Voltage strengthening tests, oil insulation test were added according to the actual situation in Vietnam
- Some articles that was out of date or do not exist anymore in Vietnam were deleted

14.6 Draft Technical Regulation on Hydropower Civil Works

(1) Background and process of development of the new technical regulation

The draft Technical Regulation on Hydropower Civil Works (hereafter referred to as "TR Vol.HC") was developed as a mandatory technical regulation to be promulgated by MOC. In the initial stage of the Project, the following framework consisting of 4 parts was proposed by JICA Team taking into consideration the scope of TR Vol.HC agreed in the initial stage of the Project.

- Part 1: General
- Part 2: Design
- Part 3: Construction
- Part 4: Completion Inspection

As the result of review on the situation in Vietnam with respect to the existing standards and regulations related to the hydropower civil works, it was decided to develop TR Vol.HC based on the current and latest practices of Vietnam mainly referring to the following documents:

- TCXDVN 285:2002: Hydraulic Structures – The basic stipulations for design

- TCXDVN 335:2005: Son La Hydropower Project – Technical Design Standard
- QCVN 04 - 05 : 2012/BNNPTNT: National technical regulation on Hydraulic Works - Basic stipulations for design (promulgated in 2012 by MARD)
- Guidelines issued by USACE and FERC

During the 1st Stage of the Project, the 1st draft and 2nd draft were proposed by JICA Team based on the above mentioned framework and policies. However, MOC proposed fundamental revisions on the policy of TR Vol.HC related to status of QCVN 04-05 of MARD and American standards after receiving the comments of participants in the MOC's Workshop held on April 28, 2011, so that it was agreed to postpone the submission of Final Draft by JICA Team until the 2nd Stage.

Further discussions were made on the draft TR Vol.HC in the WG Meetings and MOC's Workshops held by May 2012. During this time, MOC decided to reinforce the safety measures for dams by providing stricter requirements in the relevant technical regulation after the occurrence of serious incidents at some existing dams such as Song Tranh 2 dam. Against the background of the above situation, MOC made its own study by employing a local consultant and proposed its own draft to JICA Team. Then, JICA Team finally compiled the Final Draft based on the review on the draft of TR Vol.HC proposed by MOC, and submitted it in June 2013 with the following structure:

1. Scope of application
2. Reference documents
3. Nomenclatures and definitions
4. Classification of works
5. Main design criteria
6. Requirements for safety coefficient
7. Main technical requirements for hydropower works
8. Hydromechanical equipment
9. Stipulation of management
10. Organization for implementation

Appendix A: Major works and minor works (mandatory)

Appendix B: Calculation of general safety coefficient of works and work item (mandatory)

Appendix C: Calculation for design of Gravity Concrete Dam according to American Standard (reference)

(2) Evaluation and conclusion

At first, JICA Team intended to propose the draft of TR on Hydropower Civil Works (TR Vol.HC) as a new technical regulation for hydropower civil works in a form of "performance requirement type regulation" in line with the policy of the Law on standards and technical

regulations (No.68/2006/QH11) by eliminating the numerical criteria in the old technical standards such as "TCXDVN 285:2002: Hydraulic Structures – The basic stipulations for design" as much as possible. On the other hand, JICA Team also considered that it was important to reflect practical requirements executed in Vietnam into TR Vol.HC as long as it is practical, since the hydropower civil works are closely related to local conditions.

In the above regard, JICA Team agreed to the contents of draft prepared by MOC, which contains some numerical criteria, in general, since it still accepts the application of foreign standards as initially proposed by JICA Team. However, it shall be noted that a mixture of foreign standards which was proposed in the draft of MOC (mixture of USACE standard and FERC standard) shall be carefully reviewed by the Vietnamese side for actual application, since such mixture sometimes cause improper application which may require a high investment cost to achieve unnecessarily high safety level or may fail to achieve proper safety level.

It shall be noted that the draft Technical Regulation for Hydropower Civil Works is of prepared to apply to the hydropower civil structures and hydromechanical equipment in general including those of pumped storage projects. Particular issues to be taken into consideration in the design of civil works particularly for pumped storage projects are beyond the scope of technical regulations and shall be studied individually as the issue of each project.

In conclusion, it is considered that the contents of Final Draft Technical Regulation on Hydropower Civil Works are appropriate in principle as the provisions of mandatory technical regulation for the design and construction of hydropower civil works. However, it is necessary for Vietnamese side to finalize the draft of Vietnamese version submitted by JICA Team for promulgation in terms of linguistic and formality issues as agreed between JICA side and Vietnamese side.

(3) Major points of provisions in the draft Technical Regulation on Hydropower Civil Works

1) Chapter 1 "Scope of application"
   It was agreed to apply TR Vol.HC for hydropower plants forming reservoirs and other types of hydropower plants without reservoir with installed capacity equal to or greater than 30 MW. However, it is allowed to apply this technical regulation for hydropower civil works of hydropower plants with installed capacity less than 30 MW depending on the judgment of investor of that hydropower plant.

2) Chapter 3 "Nomenclatures and definitions"
   The technical terms were selected and defined mainly in accordance with the practices in Vietnam and also the terms originally used in international standards such as Maximum credible earthquake (MEC) were defined in Chapter 3 for application of international standards.

3) Chapter 4 "Classification of works"

Classification of works to be applied for the hydropower civil works in Vietnam was determined based on stipulation of QCVN 04-05 of MARD which is the latest regulation in Vietnam promulgated in 2012.

4) Chapter 5 “Main design criteria”
   The main design criteria including the guarantee level for service of hydropower works and the flow frequency as well as the highest water levels of hydropower works to be applied for the hydropower civil works in Vietnam were determined mainly based on stipulation of QCVN 04-05 of MARD which is the latest regulation in Vietnam promulgated in 2012.

5) Chapter 6 “Requirements for safety coefficient”
   The safety coefficients to be applied for the hydropower civil works in Vietnam were determined mainly based on stipulation of QCVN 04-05 of MARD which is the latest regulation in Vietnam promulgated in 2012 as well as based on the American standards of USACE and FERC.

6) Chapter 7 “Main technical requirements for hydropower works”
   The main technical requirements to be applied for the hydropower civil works in Vietnam were determined mainly based on stipulations of the existing various TCVN in Vietnam.

7) Chapter 8 “Hydromechanical equipments”
   The technical requirements to be applied for the hydromechanical equipments of hydropower plants in Vietnam were determined mainly based on stipulations of the Japanese technical standards.

15. Development of Draft Guidelines

15.1 Draft Guideline for Technical Regulation Vol.1 (Design of Network Facilities)

As mentioned in Section 14.1, JICA Team and Vietnamese counterpart reformed and unified "Design Regulation" as Vol.1, Guideline Vol.1 also needs to correspond to Technical Regulation. JICA Team made carefully consultation one article by one with the comments from Vietnamese side.

Basic concepts to develop Guideline Vol.1 are as follows,

- Utilize effectively the document and information from the existing volumes, if it is still useful
- Revise them to match the up-to-data technology comparing with Vietnamese actual situations
- Add some of the contents according to the request form Vietnamese side
- Omit the information which should be describe in company's manual
- Confirm carefully NOT to have conflict with Technical Regulation and other regulations
- Refer the data from international standard such as IEA and IEEE

15.2 Draft Guideline for Technical Regulation Vol.2 (Design of Thermal Power Facilities)

(1) Evaluation and conclusion

Each power plant or power facility must be planned and purchased by Owner conforming to the technical regulation. The practical and concrete specification is necessary in order to purchase appropriate plant or facility, though the minimum technical requirement for safety and security is prescribed in the design technical regulation. The EPC Contract or purchase specification is the necessary real document in order to purchase good and reliable power plant or facility

(2) Major points in development of Guideline Vol.2

1) Nature and positioning of guideline Vol.2

   The guideline is not the bylaw or appendix of mandatory regulation. It is the reference book which MOIT explains his intension in order to implement T/R smoothly, though GL has no legal force. Moreover, GL is not the manual to design power facilities, though it introduces the interpretation of T/R and sample for implementation. MOIT is required to advertise such status. It is recommended to be published from a lower department of MOIT.

2) Degree and coverage of guideline Vol.2

   It is necessary to notify that the range of guideline is limited, since it is impossible to be subject to all facilities installed in each power plant. Finally, the scope and depth of guideline will depend on the decision by JICA Thermal Power Team experts.

3) Nature and positioning of EPC Contract or purchase specification

   It is necessary to advertise that the Owner or his consultant firm must develop appropriate EPC Contract or purchase specification in order to purchase good and reliable power plant

or facility. The Owner must establish appropriate EPC Contract or purchase specification referring to TCVN, international standard, regional standard, industrial standard, manufacture's catalog, design book, publications and literature although the guideline would be helpful as a source by himself.

15.3 Draft Guideline for Technical Regulation Vol.3 (Construction of Network Facilities)

As mentioned in Section 14.3, JICA Team respected the output by the former JICA Study; therefore JICA Team developed the Guideline in each Article to describe detail according to its Technical Regulation.

To easy understanding, related figures, photos and numerical values are inserted as follows:

- There are main items revised in this project.
- Proper storage and management of equipments and materials in the warehouse
- Power line and cable wire installation
- Safety measurements during the work
- Laying Earthing Connection and installation

15.4 Draft Guideline for Technical Regulation Vol.4 (Operation of Power Facilities)

15.4.1 General Part

(1) Evaluation and conclusion

The general part of the Guideline Vol.4 consists of three Parts for which Technical Regulation Vol.4 provides fundamental general requirements to be commonly applied for the operation of power plants and network facilities.

The contents of each part in the draft Guideline Vol.4 proposed by the JICA Team were discussed in the WG meetings and finally reached conclusions after the agreement between JICA Team and Vietnamese side without substantial objection.

In conclusion, it is considered that the contents of general part (Part 1 to Part 3) of Final Draft Guideline Vol.4 are appropriate as a guidebook for the stipulations of the technical regulation for operation and maintenance of power plants and grid.

(2) Major points of general part of draft Guideline Vol.4

1) The existing regulations and standards related to the important general issues such as environmental protection were listed up for easy access to reference documents.
2) Figures or photographs of general material used in the electric power facilities such as rating plate were provided for easy understanding.
3) Important parts of the existing laws and standards related to the provisions were quoted for better understanding of them.

4) Detailed information or reference information related to the general issues such as acceptance procedure of power equipment, numbering system of equipment, etc. was provided for reference.

15.4.2 Hydropower Part

(1) Evaluation and conclusion

The hydropower part of the Guideline Vol.4 consists of the following part for which Technical Regulation Vol.4 provides fundamental general requirements to be applied for the operation of hydropower plants including civil works, hydromechanical works and electrical equipment:

- Part 4: Civil Works, Water Sources, and Management of Hydraulic Turbine and Powerhouse

The contents of Part 4 in the draft Guideline Vol.4 proposed by the JICA Team were discussed in the WG meetings and finally reached conclusions after the agreement between JICA Team and Vietnamese side without substantial objection.

In conclusion, it is considered that the contents of hydropower part (Part 4) of Final Draft Guideline Vol.4 are appropriate as a guidebook for the stipulations of the technical regulation for operation and maintenance of hydropower plants.

(2) Major points of hydropower part of draft Guideline Vol.4

1) The existing ministerial ordinances and standards related to safety operation and maintenance of hydropower civil works were quoted for better understanding. In particular, some articles of “Decree No.72/2007/ND-CP on management of dam safety”, “Decree No.112/2008/ND-CP on management, protection and general exploitation the resources and environment of hydraulic and irrigational reservoirs”, “Circular No.34/2010/TT-BCT on the management of dam safety for hydropower structures”, etc. which are closely related to the safety of dams were presented in the Guideline.
2) Japanese practices related to the monitoring system of dams, etc. were introduced as examples for reference.
3) Essential information and typical practices related to provisions in Technical Regulation Vol.4 were presented in the Guideline in order to achieve the requirements stipulated in the technical regulation.
4) Figures and illustrations related to the electrical equipment such as the sequence diagram of protection system were presented in the Guideline for easy understanding.

15.4.3 Thermal Power Part

(1) Evaluation and conclusion

1) It is considered that the business objective for Vol.4 which was referred to JICA Thermal Power Team experts have been achieved without excess or deficiency in a given resource.
2) However, JICA Thermal Power Team experts were not enough to persuade the parties concerned into understanding nature and positioning of guideline Vol.4 under the situation

that there was the Vietnamese comment that the guideline should cover all facilities installed in each individual power plant in detail because most of them remain misunderstanding of the nature and positioning due to lack of notice to them.

3) Accordingly, it is necessary to notify the nature and positioning when the guideline is published.

(2) Major points in development of thermal power part of draft Guideline Vol.4

1) Nature and positioning of guideline Vol.4

The guideline is not the bylaw or appendix of mandatory regulation. It is the reference book which MOIT explains his intension in order to implement T/R smoothly, though GL has no legal force. Moreover, GL is not the manual to be used in power plant for operation, though it introduces the interpretation of T/R and sample for implementation. MOIT is required to advertise such status. It is recommended to be published from a lower department of MOIT.

2) Degree and coverage of guideline Vol.4

It is necessary to notify that the range of guideline is limited, since it is impossible to be subject to all facilities installed in each power plant. Finally, the scope and depth of guideline will depend on the decision by JICA Thermal Power Team experts.

3) Nature and positioning of administration manual Vol.4

It is necessary to advertise that each power plant must establish the administration manual by Owners themselves, since it is the cornerstone of voluntary safety and security. In order to facilitate the successful implementation, it is necessary to establish a system of notification, monitoring and a system to confirm by on-the-spot inspection by MOIT.

15.4.4 Network Part

Operation Guideline is difficult to develop as National Governmental document, because the operational know-how is the intellectual strategy owned the enterprise.

But the electric power operators such as EVN and Distribution Companies want to have this technical information.

JICA Team agreed to describe the useful information used in Japan and recommended them to utilize it here in Vietnamese for their reference.

There are main items developed in this project:

- Transmission:
- Substation: Fire prevention measurements, Interlock System, indicator
- Distribution: Patrol and Tree trimmings in right of way
- Protective Relay: numbering, singing and secondary wiring
- Earthing System: Grounding resistance measurement
- Dispatching: Control devices and load dispatching demand

- Underground Cable: maintenance and overhaul

15.5 Draft Guideline for Technical Regulation Vol.5 (Inspection of Power Facilities)

15.5.1 General Part

(1) Evaluation and conclusion

The general part of the Guideline Vol.5 consists of 4 articles in Part 1 for which Technical Regulation Vol.5 provides general stipulations for purpose, scope of application, definition of particular terms and formulation of inspection to be commonly applied for the inspection of power system facilities.

It was judged that no particular guidance were required for each article in Part 1 of Technical Regulation Vol.5, as they stipulate only self explanatory issues, and this conclusion was agreed by the Vietnamese side in the WG Meetings.

(2) Major points of general part of draft Guideline Vol.5

The sentence “As stipulated in the Technical Regulation.” was stipulated for each article of Part 1 in Guideline Vol.5.

15.5.2 Hydropower Part

(1) Evaluation and conclusion

The hydropower part of the Guideline Vol.5 consists of the following part for which Technical Regulation Vol.5 provides fundamental general requirements to be applied for the inspection of hydropower plants including civil works, hydromechanical works and electrical equipment:

- Part 3: Hydropower Plants

The contents of Part 3 in the draft Guideline Vol.5 proposed by the JICA Team were discussed in the WG meetings and finally reached conclusions after the agreement between JICA Team and Vietnamese side without substantial objection.

In conclusion, it is considered that the contents of hydropower part (Part 3) of Final Draft Guideline Vol.5 are appropriate as a guidebook for the stipulations of the technical regulation for inspection of hydropower plants.

(2) Major points of hydropower part of draft Guideline Vol.5

1) No guidance is required for Chapter 1 “General Provision” and Chapter 2 “Organization and Management of Operation and Maintenance” as they stipulate only self explanatory issues.
2) In Chapter 3 “In progress Inspection”, essential technical issues, examples of application and numerical criteria, and reference international and Vietnamese standards for the in-progress inspection and testing (mainly dry test) of electrical equipment were presented for practical application and achievement of mandatory requirements stipulated in the Technical Regulation Vol.5.

3) In Chapter 4 “Completion Inspection”, essential technical issues, examples of application and numerical criteria, and reference international and Vietnamese standards for the completion inspection and testing (mainly wet test such as initial operation/run, bearing operation/run, automatic start and stop test, load and input rejection test, etc.) of electrical equipment were presented for practical application and achievement of mandatory requirements stipulated in the Technical Regulation Vol.5.
4) In Chapter 5 “Periodic Inspection”, essential technical issues and examples of application and numerical criteria for the three types of periodic inspection (periodic inspection for flood control, periodic inspection for dam safety, and periodic inspection for overall power plants facilities including civil works, hydromechanical equipment and electrical equipment) were presented for practical application and achievement of mandatory requirements stipulated in the Technical Regulation Vol.5.
5) Figures, illustrations and photographs related to the hydropower facilities including civil works, hydromechanical equipment and electrical equipment were presented in the Guideline for easy understanding.
6) Vietnamese and international reference documents related to inspection of hydropower facilities were listed in the tables at the end of Part 3 of Guideline Vol.5.

15.5.3 Thermal Power Part

(1) Evaluation and conclusion

1) It is considered that the business objective for Vol.5 which was referred to JICA Thermal Power Team experts have been achieved without excess or deficiency in a given resource.
2) However, JICA Thermal Power Team experts were not enough to persuade the parties concerned into understanding nature and positioning of guideline Vol.5 under the situation that there was the Vietnamese comment that the guideline should cover all facilities installed in each individual power plant in detail because most of them, except MOIT, remain misunderstanding of the nature and positioning, in other words, the guideline is understood as same as inspection manual of each individual power plant, due to lack of notice to them.
3) Accordingly, it is necessary for MOIT to notify the nature and positioning when the guideline is published.
4) It was agreed between JICA Team and Vietnamese side, in the Terminal Evaluation meeting on April 22, 2013 and the Joint WG Meeting and the 8th JMC/6th JCC Meeting on June 5, 2013, that MOIT will unify the opinions of Vietnamese side after the Project.

(2) Major points of thermal power part of draft Guideline Vol.5

1) In principle, each power plant or power facility must be inspected through daily inspection, minor inspection, major inspection or periodic inspection in line with the administration manual which is established by each power plant according to the current status of each power plant and power facility.
2) At this moment, mandatory matters for inspection of power generation facility are stipulated in QCVN-QTD-5. However, the method for inspection must be selected considering the cost

as the discretion of Owner as long as the equipment meets the requirements of Vol.2 originally, since there are many options.

3) Nature and positioning of guideline Vol.5
   The guideline is not the bylaw or appendix of mandatory regulation. It is the reference book which MOIT explains his intension in order to implement T/R smoothly, though GL has no legal force. Moreover, GL is not the manual to be used in power plant for inspection, though it introduces the interpretation of T/R and sample for implementation. MOIT is required to advertise such status. It is recommended to be published from a lower department of MOIT.

4) Degree and coverage of guideline Vol.5:
   It is necessary to notify that the range of guideline is limited, since it is impossible to be subject to all facilities installed in each power plant. Finally, the scope and depth of guideline will depend on the decision by JICA Thermal Power Team experts.

5) Nature and positioning of administration manual:
   It is necessary to advertise that each power plant must establish the administration manual by Owners themselves, since it is the cornerstone of voluntary safety and security. In order to facilitate the successful implementation, it is necessary to establish a system of notification, monitoring and a system to confirm by on-the-spot inspection by MOIT.

15.5.4 Network Part

JICA Team developed the inspection Guideline using Numerical Criteria and judging requirement for the test mentioned in Technical Regulation Vol.5.

The contents of this Guideline are very important especially in the working site that develops new electrical equipments. Therefore, JICA Team decided that the contents should be developed with respect of Vietnamese counterpart especially testing company ETC and international standards.

- Insulating level
- Measurement of Insulation resistance
- Inspection of GIS
- Withstand Voltage Test
- Gas Density Detectors Test
- Sequence and Interlock Tests
- inspection item for battery system
- inspection item for protective relays and control

15.6 Draft Guideline for Technical Regulation for Hydropower Civil Works

(1) Evaluation and conclusion

The Guideline for Technical Regulation on Hydropower Civil Works provides essential technical issues, examples of application and numerical criteria, and reference international and

Vietnamese standards to be referred to for application of mandatory requirements stipulated in the technical regulation which provides fundamental basic requirements to be applied for design and construction of hydropower civil works including hydromechanical equipment.

The contents of the draft Guideline proposed by the JICA Team were discussed in the WG meetings and Workshops held by JICA Team and MOC, and finally reached the agreement between JICA Team and Vietnamese side.

In conclusion, it is considered that the contents of Final Draft Guideline on Hydropower Civil Works are appropriate as a guidebook for the stipulations of the technical regulation for design and construction of hydropower civil works.

(2) Major points of the draft Guideline on Hydropower Civil Works

1) Important and useful articles of the Vietnamese national technical standards such as TCVN to be referred to in relation to the provisions of the Technical Regulation on Hydropower Civil Works were quoted in the Guideline for better application of mandatory requirements on design and construction of hydropower civil works.
2) Also, some foreign standards such as American, Japanese, Chinese, etc which are related to some issues in the technical regulation such as hazard potential classification of hydropower dams, design and check flood levels, load combination for design, etc. were introduced as examples for reference.
3) Essential information and typical practices related to provisions in Technical Regulation on Hydropower Civil Works were presented in the Guideline in order to achieve the requirements stipulated in the technical regulation.
4) Figures and illustrations related to the provisions in Technical Regulation on Hydropower Civil Works were presented in the Guideline for easy understanding.

16. Other Activities

16.1 Baseline Survey

The baseline survey was conducted in both the 1st Stage and the 2nd Stage of the Project for the following issues:

1) Baseline Survey on accidents and power outages in electric power supply
2) Baseline Survey on degree of satisfaction to the technical regulations and guidelines
3) Needs Survey on actual needs of technical regulations and guidelines

In the 1st Stage, the baseline survey was conducted in order to set the baselines for evaluation on achievement of "overall goal" and "project purpose" of the Project which were set in the original PDM as follows:

1) The number of accidents and power outages for setting baseline of the item 1) above (overall goal)
2) Dissemination levels of technical standards and regulations and degree of satisfaction regarding guidelines to the technical staff of electric power companies for setting baseline of the item 2) above (project purpose).

Although the overall goal and project purpose in the original PDM were changed in the PDM Ver.2 after the Midterm Evaluation of JICA in the 2nd Stage, the baseline survey was conducted also in the 2nd Stage of the Project in order to promote the consciousness of safety and stability of power supply as well as the status of technical regulations in the actual use for the power plants, network units and other related organizations in the power sector of Vietnam.

As the result of the baseline survey, it was found that most of the organizations in the power sector of Vietnam understand the importance of technical regulations and applying them in the operation and inspection of power facilities in a positive manner. However, it was also found that still there were needs to improve or develop the technical regulations as well as guidelines particularly for design of power facilities in order to improve the safety and stability of power supply in Vietnam.

In conclusion, it is recommended to continuously conduct the survey by the Vietnamese side periodically after the Project as a measure to promote the positive consciousness of safety and stability of power supply and positive application of the technical regulations and guidelines for improvement of performance of power sector in Vietnam.

16.2 Counterpart Training in Japan

16.2.1 Hydropower Group

Counterpart Training of Hydropower Group was held in November 2010 as follows:

(1) Schedule of the training

The schedule of counterpart training of hydropower group in Japan is shown in Table 16.2.1-1.

Table 16.2.1-1 Schedule of Counterpart Training in Japan (Hydropower Group)

Date	Time	Curriculum	Remarks
Nov.13 (Sat)	PM	Departure from Hanoi	
Nov.14 (Sun)	AM	Move from Narita to JICA Training Center (TIC)	JICA
	PM	Free	
Nov.15 (Mon)	AM	Registration & briefing at TIC	JICA
	PM	Trip from Tokyo to Echigo-yuzawa by Sinkansen Train	JICA
Nov.16 (Tue)	AM	Visit Okukiyotsu Pumped Storage Power Plant	J-POWER
	PM	Visit to Ootori and Okudatami Hydropower Plants	J-POWER
		Trip to Tokyo	JICA
Nov.17(Wed)	AM	Lecture [Regal Framework and Outline Electric Power System in Japan]	J-Power
	PM	Lecture [Outline of Hydropower Technical Standards in Japan]	
Nov.18 (Thu)	AM	Trip from Tokyo to Naha	JICA
	PM	Trip from Naha to Nago	JICA
Nov.19(Fri)	AM	Visit Okinawa Sea Water Pumped Storage Plant	J-POWER
	PM	Trip to Tokyo	JICA
Nov.20(Sat)		Free	
Nov.21(Sun)		Free	
Nov.22(Mon)	AM	Group Discussion/ Work at J-Power Office	J-POWER
	PM	JICA Evaluation and Closing Ceremony	JICA
Nov.23(Tue)	AM	Departure from Narita	JICA
	PM	Arriving at Hanoi	

(2) Participants of the training

The list of participants in the counterpart training of hydropower group in Japan is shown in Table 16.2.1-2. Total number of trainees is 9 people and is composed of MOIT, MOC, MARD, EVN and ETC1.

Table 16.2.1-2 Member of Counterpart Training in Japan (Hydropower Group)

	Name	Position
1	Mr. Do Duc Quan	MOIT, Deputy Director General of Energy Department
2	Mr. Dinh Vu Thanh	MARD, Deputy Director General / Department of Science, Technology and Environment
3	Mr. Phan Duy Phu	MOIT, Hydropower Expert / Energy Department
4	Mr. Tran Viet Hoa	MOIT, Manager of Division / Science and Technology Department

	Name	Position
5	Mr. Duong Khac Hien	MOIT, Hydropower Expert / Science and Technology Department
6	Ms. Pham Thanh Trung	MOIT, Officer / Legal Department
7	Mr. Doan Trong Tuan	MOC, Electrical specialist, Vietnam institute of architecture, urban and rural planning
8	Mr. Tran Hong Tien	EVN, Electrical Expert / Department of Technic and Production
9	Mr. Nguyen Khac Tien Hai	ETC, Deputy Head / Measurement Department

(3) Achievement of the training

The participants of this training could obtain the outline of the Japanese power industry, Electricity Business Act, power industry regulation, technical rule and standards related to hydropower plants in Japan through the lectures provided by the Japanese experts in Tokyo. Also, the participant obtained the knowledge of design, construction, operation and maintenance of hydropower plants through the site visits to the existing plants in Japan including large scale pumped storage power plant and sea water pumped storage power plant.

After the training, all of the 9 participants were awarded by JICA for completion of the training course in Japan. JICA expects for all the participants to use effectively the result of this training after coming back to Vietnam. It is also expected that the counterparts of this Project could understand the Japanese system that is good example for Vietnamese system, and also they could make good relationship with JICA and JICA Project Team.

16.2.2 Thermal Power Group

(1) Participants of the training

The list of trainees for counterpart training of thermal power group in Japan is shown in Table 16.2.2-1. Total number of trainees is 5 people and is composed of MOIT and ETC1. A member of Working Group from EVN had planned to take part in this training. However, he could not take part in the training because of huge earthquake disaster in eastern Japan.

Table 16.2.2-1 List of Trainees for Counterpart Training of Thermal Power Group in Japan

Name	Age	Organization		Position
Nguyen Van Long	50	MOIT	Science and Technology Department	Expert
Nguyen Quoc Thuy	45	MOIT	Science and Technology Department	Senior Expert
Vu Thi Hau	25	MOIT	Science and Technology Department	Assistant
Vu Dinh Khiem	42	ETC1		Deputy Director
Trinh Van Yen	46	ETC1	Thermo-technology Department	Manager

(2) Schedule of the training

The schedule of counterpart training of thermal power group in Japan is shown in Table 16.2.2-2. The period of this training is 8 days, JICA Thermal Power Team experts introduced outline of electric power industry and electric power technical regulations in Japan to trainees and took them to two thermal power plants and LNG plant.

Table 16.2.2-2 Schedule of Counterpart Training of Thermal Power Group in Japan

Date	Time	Activities	Place
25 March	-	Arrival at Japan	-
28 March	AM	Orientation	JICA Kyushu
	PM	Lecture (Outline of Electric Power Industry and Electric Utility Law in Japan)	West JEC
29 March	AM	Lecture (Outline of Thermal Power Technical Standards System in Japan (Mechanical))	West JEC
	PM	Site visit of KARITA power plant (Coal-fired)	KARITA power plant
30 March	AM	Site visit of OITA LNG plant	OITA LNG plant
	PM	Site visit of SHIN OITA power plant (Gas Combined Cycle)	Shin OITA power plant
31 March	AM	Lecture (Outline of Thermal Power Technical Standards System in Japan (Electrical)) Group discussion	West JEC
	PM	JICA Evaluation and Closing Ceremony	JICA Kyushu
1 April	-	Departure for Vietnam	-

(3) Achievement of the training

This training was composed of lecture and site visit, we held group discussion at final day of the training to sum up the training and confirm questions from trainees. The trainees listened attentively to lectures and ask us questions in a positive way. And, we discussed problems related to product liability in Vietnam and Product Liability Law in Japan. We discussed compliance with the law in Vietnam and Japan. The trainees held the view that Vietnamese has only a superficial understanding of complying with law and it takes long time for Vietnamese to comply with law as well as Japanese. Moreover, we confirmed that they had a good opinion of lectures as the result of questionnaire. We selected KARITA PFBC power plant which not constructed in Vietnam and OITA LNG plant which is supposed to construct in the future in Vietnam for site visit. In site visit, we took necessary time for site visit, explained operation and maintenance of power plant and LNG plant and conducted question and answer adequately. Therefore, we confirmed it was significant for the trainees to go to site visit as the result of questionnaire.

16.2.3 Network Group

Counterpart Training was held according to plan.

(1) Schedule of the training

Table 16.2.3-1 Schedule of Counterpart Training in Japan (Network Group)

Date		Time	Training Syllabus	Venue
3/31	THU	10～17	Orientation	JICA Osaka
4/ 1	FRI	9～11	Lecture: Japanese Electric Power Industry & Network Facilities Discussion: Problems of Vietnamese Power Network System	JICA Osaka
		14～15	Site Survey: Nanko Power Station and Its under ground cable Urban power network system and its environmental measures	KEPCO Nanko PP
4/ 4	MON	9～ 10	Orientation in Shikoku Electric Power Co.	YONDEN
		10～11	Lecture: Central Dispatching Center	YONDEN
		14～15	Lecture: Kagawa Regional Dispatch Center	Control Center
		15～16	Site Survey: 500kV Sanuki Substation	Substation
4/ 5	TUE	10～11	Site Survey: Transformer manufactures	Shihen Tec
		14～16	Site Survey: Wide area coordination in Jpower system	Jpower
4/ 6	WED	9～10	Lecture: Japanese Electric Power Regulation	YONDEN
		10～11	Lecture: 500kV GIS O&M	
		11～12	Lecture: Smart Grid System	
		12～13	Lecture: Distribution Facilities Management System	
		13～14	Group Discussion and Q&A	
		14～15	Closing Ceremony	

(2) Participants of the training

Table 16.2.3-2 Member of Counterpart Training in Japan (Network Group)

	Name	Position
1	Mr. PHUONG Hoang Kim	MOIT, Deputy Director General of Science and Technology Department
2	Mr. TRAN Huu Ha	MOC, Deputy Director General / Department of Science, Technology and Environment
3	Mr. DANG Hai Dung	MOIT, Deputy Chief / Technical Standards, Metrology, Quality and intellectual Property Division Science and Technology Department
4	Mr. TRAN Manh Hung	IE, Head of Energy Economic, Demand Forecast & Demand Side Management Department
5	Mr. NGUYEN Tuan Anh	IPS, Manager / Energy Department
6	Ms. DO Lan Binh	EVN, Senior Expert / Technical Production Department
7	Mr. TRAN Xuan Tuan	ETC, Manager of Electro mechanic Department

(3) Achievement of the training

The participants of this training could obtain the outline of the Japanese power industry, power industry regulation, technical rule and standards in Japan. Additionally the knowledge of the structures, operation and maintenance of the network system are given to the Vietnamese participants.

It is practical for Vietnamese participants as the good example of power technical regulation development, revision and registrations to join this training. And JICA can expect for all the participants to effective use the result of this training after coming back to Vietnam.

Regarding to the project on Electric Power Technical Standards Promotion, The counterparts of this project could understand the Japanese system that is good showcase of Vietnamese system. And they could made good relationship with JICA Study Team members.

17. Overall Project Evaluation

17.1 Achievement of PDM

(1) Achievement of Project Output

The outputs required in the PDM Ver.2 as well as Ver.3 were substantially achieved by the end of Project period as summarized in the table below.

Table 17.1-1 Achievement of Outputs in PDM Ver.3

Outputs	Verifiable Indicators	Achievement
1. Report of review on existing Technical Regulations is developed.	The report is approved by JMC by July, 2010.	Achieved as planned.
2. Drafts of the Technical Regulations are developed.	2.1. The final drafts of the Electric Power Technical Regulations in English are submitted to JMC by August, 2011.	Achieved as planned except for the Technical Regulation of MOC scope. The following parts of the Technical Regulations submitted to JMC. ・ Vol.1 (Design of network facilities) ・ Vol.2 (Design of thermal power facilities) ・ Vol.3 (Construction of network facilities) ・ Vol.4 (Operation of hydropower, thermal power and network facilities) ・ Vol.5 (Inspection of hydropower, thermal power and network facilities) The final draft of MOC scope (Technical Regulation on Hydropower Civil Works) was submitted to JMC in June, 2013.
	2.2. The final draft of the Technical Regulations of the MOIT scope in Vietnamese is refined by the MOIT expert team by May, 2013.	Mostly achieved by May, 2013. Further refining works will be taken by the Vietnamese side.
	2.3. The final draft of the Technical Regulations of the MOC scope in Vietnamese is refined by the MOC expert team by June, 2012.	Mostly achieved in June, 2013 but delayed from the target deadline. Further refining works will be taken by the Vietnamese side.
3. Drafts of the Guidelines for Technical Regulations are developed	3.1 The final drafts of the Electric Power Technical Guidelines are submitted to JMC by May, 2013.	Substantially achieved by submitting the final draft for approval in March 2013 for those of MOIT scope, and finally achieved in June, 2013 including the final draft of MOC scope
	3.2 The final draft of the Technical Guidelines of the MOIT scope is refined by the MOIT expert team by the end of May, 2013.	Mostly achieved, and the drafts were approved by JMC in June, 2013. Further refining works will be taken by the Vietnamese side.
	3.3 The final draft of the Technical Guidelines of the MOC scope is refined by the MOC expert team by the end of May, 2013.	Not achieved yet, although the final draft was approved by JMC in June, 2013. Further refining works will be taken by the Vietnamese side.

(2) Achievement of Project Purpose

The project purpose established in the PDM Ver.2 as well as Ver.3 was substantially achieved by the end of Project period as summarized in the table below.

Table 17.1-2 Achievement of the Project Purpose in PDM Ver.3

Project Purpose	Verifiable Indicators	Achievement
The Electric Power Technical Regulations and Guideline are authorized by the Vietnamese authorities.	1. The final draft of the Electric Power Technical Regulations in the scope of MOIT is approved by JMC by June 2013.	Achieved in June, 2013 as planned.
	2. The final draft of the Electric Power Technical Guidelines in the scope of MOIT is approved by JMC by June 2013.	Substantially achieved in April, 2013 and finally achieved in June, 2013 as planned.
	3. The Technical Regulations concerning civil works of hydropower plants in the scope of MOC is promulgated by the end of 2012.	Not achieved yet and MOC likely to commence a promulgation process by June, 2013.
	4. The final draft of Technical Guidelines concerning civil works of hydropower plants in the scope of MOC is approved by JMC by June 2013.	Achieved in June, 2013 as planned.

The promulgation of Technical Regulation on Hydropower Civil Works under MOC scope, which had been scheduled by the end of 2012, is still not achieved yet because of the delay in its finalizing process to reinforce the technical requirements for dams required by the Vietnamese Government due to occurrence of some incidents, of which the causes are attributed to design and construction of dam structure, on the existing dams such as Song Tranh 2 Hydropower Project. However, MOC is intending to commence the procedure of promulgation in June 2013.

(3) Achievement of Overall Goal

The overall goal established in the PDM Ver.2 as well as Ver.3 is expected to be achieved by the end of 2014 after the Project as summarized in the table below.

Table 17.1-3 Prospects for Achievement of the Overall Goal in PDM Ver.3

Overall Goal	Verifiable Indicators	Prospects for Achievement
The Electric Power Technical Regulations and Guidelines shall be enforced to ensure improvement of reliability and safety of power supply in Vietnam.	1. The Electric Power Technical Regulations under MOIT are promulgated by the end of 2014.	Highly expected to be achieved by the end of 2014.
	2. The Electric Power Technical Guidelines under MOIT are disseminated through website, workshops, distribution of booklets, etc. by the end of 2014.	Highly expected to be achieved by the end of 2014.
	3. The Technical Guidelines concerning civil works of hydropower plants under MOC are disseminated through website, workshops, distribution of booklets, etc. by the end of 2014.	Highly expected to be achieved by the end of 2014.
	4. Compliance of the Technical Regulations and utilization of the Technical Guidelines are checked by the following points: -No. of approved large-scale project after the promulgation of the Technical Regulations, -No. of completion inspection reports to a committee concerned and No of order for improvement, -Internal operational regulations according to the Technical Regulations prepared by facilities owned by EVN and other operators.	To be evaluated after the Project.

17.2 Promulgation of Technical Regulations

(1) Technical Regulation under MOIT scope

It had been planned to develop the final draft technical regulations in the 1st Stage of the Project and to promulgate them in the 2nd Stage. However, in the 1st JCC Meeting held at the end of the 1st Stage on July 5, 2011, MOIT proposed an idea to promulgate the technical regulations and their guidelines at the same time. Furthermore, in the 5th JMC Meeting held on November 17, 2011, it was agreed to further review and revise the final draft of Technical Regulations submitted by JICA Project Team in August 2011 continuously in the 2nd Stage. These policies were confirmed in the JICA's Mid-term Evaluation Mission held in February 2012, and the revision of PDM (Ver.2) was approved by the 4th JCC Meeting held on May 16, 2012. Then, it

was confirmed in the JICA's Terminal Evaluation Mission held in April 2013 as well as in the 6th JCC Meeting held on June 5, 2013 to promulgate the Technical Regulations by end of 2014 after the completion of the Project.

In the above regards, the following are required for Vietnamese counterpart to promulgate the technical regulations:

- To finalize Vietnamese version of Technical Regulations in terms of form and linguistic rules required for ministerial ordinance
- To reconfirm scope of application of Technical Regulations (plant type, plant capacity, activity type, etc.)
- To confirm appropriateness of reference to ordinance of other ministries
- To confirm legal status of facilities regulated by other ministries in relation to the requirements of Technical Regulations
- To consider measures to assure compulsive status and effect of the Technical Regulations

(2) Technical Regulation under MOC scope

Also for the technical regulation under MOC scope, it had been planned to develop the final draft in the 1st Stage of the Project and to promulgate it in the 2nd Stage. However, the drafting of the technical regulation was conducted continuously in the 2nd Stage by collecting opinions of parties or experts concerned. In this situation, MOC expressed its intention, in the JICA's Terminal Evaluation Mission conducted in April 2013, to finalize the draft Technical Regulation and commence the procedure for its promulgation in June 2013, and this policy was conformed in the 6th JCC Meeting held on June 5, 2013. MOC will take actions for promulgation of Technical Regulation though circulation of draft to the relevant ministries and collection of public comments. Also, it was confirmed in the 6th JCC Meeting that MOC will promulgate the Technical Regulation under joint names with MOIT.

(3) Organizational structure after promulgation

It is required according the stipulation of Law on Standards and Technical Regulations (Law No.68-2006-QH11) that the Technical Regulations shall be reviewed and updated every 5 years or in a shorter time. In this regard, MOIT and MOC will be required to reinforce their organizational structure after promulgation of Technical Regulations. Also, in order to assure the observance of Technical Regulations, it will be required for MOIT and MOC to reinforce their organizational structure for monitoring on conformity to the requirements of Technical Regulation as well as to take applicable measures to assure compulsive status and effect of the Technical Regulations.

17.3 Dissemination of Guidelines for Technical Regulation

(1) Guidelines for Technical Regulation under MOIT scope

MOIT intends to finalize the draft of Guidelines under MOIT scope by the end of the Project period and disseminate them by themselves by the end of 2014. However, the form or measures for dissemination of Guidelines in relation to the promulgation of the Technical Regulations is still under consideration by MOIT. In this regard, it was agreed in the JICA's Terminal Evaluation Mission to indicate the measures for dissemination through website, workshops, distribution of booklets, etc. in the PDM Ver.3 as the objectively verifiable indicators for overall goal of the Project.

(2) Guidelines for Technical Regulation under MOC scope

MOC also intends to finalize the draft of Guideline under MOC scope by the end of the Project period and disseminate it by themselves by the end of 2014. However, MOC also have not decided the measures for dissemination of the Guideline, while MOC intends to promulgate the Technical Regulation in advance of the dissemination of Guideline. In this regard, MOC also agreed in the JICA's Terminal Evaluation Mission to indicate the measures for dissemination through website, workshops, distribution of booklets, etc. in the PDM Ver.3 as the objectively verifiable indicators for overall goal of the Project.

(3) Status of Guidelines and their dissemination

Regarding the status of Guidelines and their dissemination, JICA Team provides Vietnamese side with the opinions as follows:

1) It shall be noted that the Guideline is not a bylaw of the corresponding Technical Regulation and not the document which describe mandatory requirements. Therefore, it is not appropriate to promulgate the Guidelines as an appendix of the Technical Regulation.
2) Guidelines are voluntary documents which describe the interpretation and examples of application of the stipulations in the Technical Regulation in order to facilitate appropriate and smooth use of Technical Regulations. In this regard, status and purpose of the Guidelines shall be clearly clarified when MOIT and MOC disseminate the Guidelines.
3) It is required for each operation unit of electric power sector to prepare its own administration manual for safety operation of power plants and network facilities, and it is expected for such operation units to use the Guidelines as one of the technical documents which are referred to in the process of development of administration manuals.

17.4 Measures Taken and Leanings in the Project Operation

(1) Process of development of draft Technical Regulations and Guidelines

1) What JICA Team experts noted most in this Project was to develop draft of Technical Regulations and Guidelines with the most appropriate and preferable contents.
2) From the above point of view, Hydropower Team conducted finalization of final drafts through discussions about the comments and opinions provided by the Vietnamese experts

in the WG meetings and the Workshops and obtained the conclusions which can be agreed each other.

3) Also, Thermal Power Team endeavored to evaluate whether it is along the above goal with the neutrality and independence, and to reflect only those which have validity without accepting automatically request from Vietnam side in WG meetings or Workshops as it is.
4) Also, Network Team developed both Technical Regulations and Guidelines with the careful consideration of the comments from many entities, and it is important to respect the opinion from Vietnamese side and make sure not to push Japanese specific technology. JICA Team focused on usefulness of the Technical Regulations and Guidelines for the engineers in the sites.

(2) Configuration of the WG members

1) The formal counterparts and WG members of Vietnamese side were MOIT, MOC and EVN in this Project. However, as the technical regulations for security and safety must be applied to all related facilities in principle, the regulatory agency should hear public comments widely from the stakeholders.
2) From the above point of view, Hydropower Team invited experts of MARD in addition to the members of MOIT, MOC and EVN. Also, for the discussions of Technical Regulation and Guideline on Hydropower Civil Works under MOC scope, MOC invited the experts from relevant universities, Vietnamese Conference on Large Dams, local relevant consultants and hydropower IPP investors to receive the comments and opinions from various experts.
3) Also from the above point of view, it was a lesson for the Thermal Power Team that the major generation companies who will become a leader in the power generation business in the future should also be participated in the Project.
4) Although the main WG members were only MOIT, EVN and ETC, JICA Network Team dispatched local consultants to PECCs (PECC1 - PECC4) to interview the comments especially regarding Vol.4. Network Team suggested Vietnamese side that Vietnamese WG members should discuss the contents before JICA Team experts visit Vietnam to have efficient meeting. But in fact, it was not implemented sufficiently.

(3) Opinion collection from stakeholders

1) JICA Team exchanged opinion about technical regulations and guidelines with related organizations in taking advantage of opportunities of site visits and others in order to hear opinions widely from various parties as much as possible.
2) Hydropower Team visited not only the hydropower companies of EVN Group but also some private hydropower companies to receive their comments and opinions. In addition to the hydropower companies, various experts from various organizations concerned with hydropower participated in the Workshops for discussion. Also, MOC arranged the independent workshops by inviting various experts as mentioned above.
3) Thermal Power Team had opportunities to exchange the opinions on the Technical Regulations and Guidelines with VTA, PV-Power, Vinacomin-Power and IE at the meetings

arranged by MOIT in order to collect opinions of various parties as much as possible. As a result, JICA Team was able to confirm different opinions and requests that cannot be obtained in the normal WG meetings.

On the other hand, in the Workshops, Thermal Power Team provided lectures focusing on the ideas of JICA Thermal Power Team experts rather than the exchange of opinions to use the limited time efficiently.

Regarding the WG meetings, it is the impression of the experts of JICA Thermal Power Team that the perusal of drafts at each stage was insufficient necessarily, though the WG members were asked to submit their comments after distribution of the documents by MOIT arbitrarily in order to soak up the opinions.

4) In Network Team, as mentioned before, the local consultant visited some other organizations to collect the comments to reflect them in to the draft Technical Regulations and Guidelines in general. However, regarding the in-house wiring equipments, it was very difficult to visit many companies related to in-house wiring and JICA Team regret this inabilities.

(4) Site survey

1) JICA Team tried to hear the opinions of the staff in power plant or construction office and see exact status of facilities as much as possible in taking advantage of the opportunities of site visit in order to know the exact technical level of the power plant and network units in Vietnam, with regard to the purpose of the Project was to develop the draft of Technical Regulations and Guidelines.
2) Hydropower Team visited the hydropower companies of EVN Group and some private hydropower companies. In these opportunities, it was found that in-house regulation of EVN was commonly used in the existing hydropower plants of EVN group as well as private hydropower companies for the operation and maintenance of power plants and also for inspections and testing. On the other hand, it was found that foreign standards such as American standards were applied for the design of civil works of the hydropower plants under construction.
3) For Thermal Power Team, it was found in the site visits that construction, operation and management of thermal power plant were carried out based on the high technical level in Vietnam and it was kept alive to develop a realistic technical regulations and guidelines, though it was only possible to know the status of a certain moment even visiting the power plant in operation or under construction.
4) Network Team made site visits during the 1st Stage. However, since most of the comments and facilities are the same across the country, Network Team did not conduct site visits again in the 2nd Stage to utilize the time to discuss with WG members.

(5) Mutual understanding

1) Relationship of role and status of the Technical Regulations and Guidelines, which are the major output of the Project, should have been understood by Vietnamese authorities concerned especially for the WG members in early stage of this Project. However, adequate

understanding of the authorities concerned has not been achieved sufficiently as expected, although JICA Team had spent much time to fill the gap of mutual understanding regarding the role status of the Technical Regulations and Guidelines.

2) In Hydropower Team, it was difficult to understand each other the idea of appropriate status of Technical Regulation in Vietnam at the initial phase of the Project. However, both sides gradually understood the idea during and after the series of discussions about specific subjects and finally reached to mutual agreement in general. On the other hand, JICA Hydropower Team accepted some numerical criteria as the mandatory requirements of Technical Regulation on Hydropower Civil Works under MOC scope considering the local conditions and practices in Vietnam, although the policy to develop performance requirement based technical regulation was achieved in general.
3) In Thermal Power Team, it is important that common understanding of the relationship of role and status of the Technical Regulations and Guidelines have been confirmed as much as possible prior to this Project after grasping the contents and scope of work from the view point of the item1) above. Thus development of the Technical Regulations and Guidelines would have been achieved without hindrance, and the effect of cooperation would have been more fruitful.
4) In Network Team, WG members were mainly the staff working in the head office of MOIT and EVN, in this circumstance, the discussion with them started from the basic technical matters and it contributed the capacity development of them. On the other hand, it took a lot of time more than expected to explain in the detail working know-how. Network Team considers that the site engineers who know the practical work should have been included in the WG members of Network Group.