添付資料 6-2-5

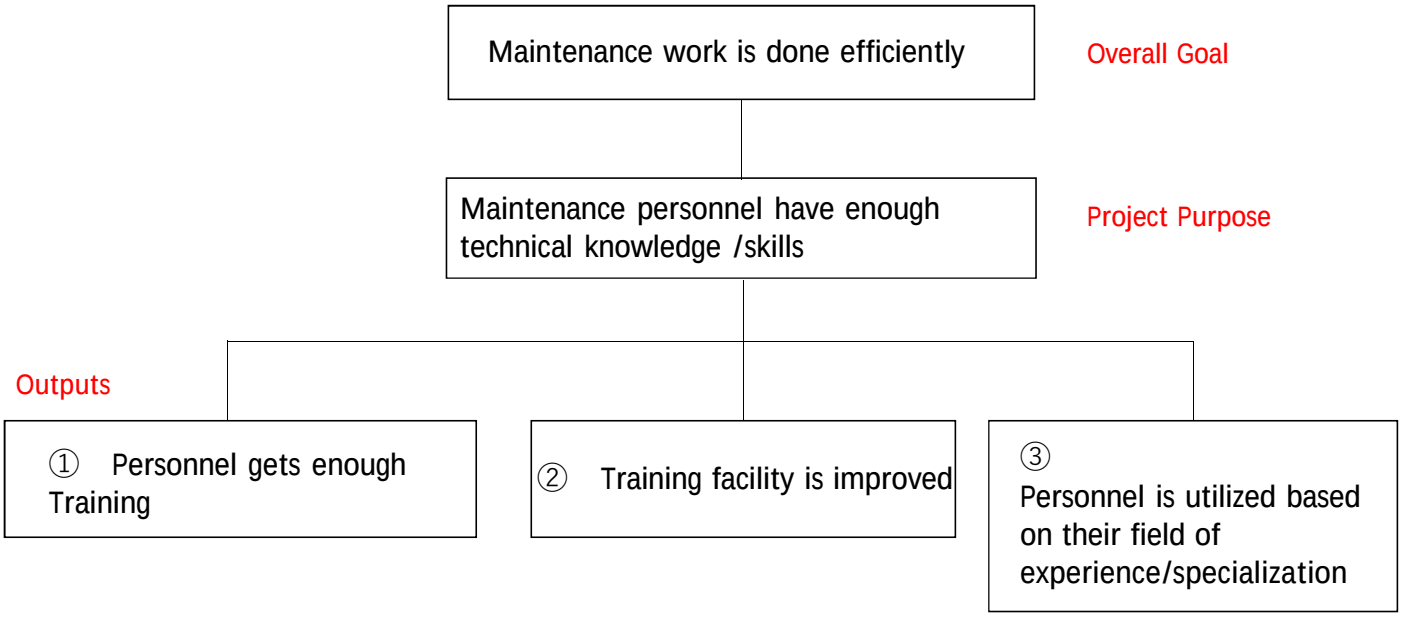
研修員作成アクションプラン

(1)　第 1 回本邦研修員作成のアクションプラン

Capacity Development for Operation & Maintenance of Thermal Power Stations, Bangladesh 2017

(Engineer)

Action Plan



Action Plan ①Training

Title of the Training	
Skill Improvement of power plant personnel.	
Person/Section in charge	
Superintending Engineer/ Executive Engineer/ Engineer Having 8+ Experience in O&M of power plant.	
Things that have to be considered in implementing the Training.	
- Venue: - Power Plant Training Centre of concerned organization. - Facilities, equipment etc.: Presentation Projector, Snacks, hard copy and soft copy of training materials. Test kits (in applicable cases like model, dummy parts of blade, turbine/valve/pump with sectional cut off structure, analyzer, practice simulator), Honorarium for Lecturers. - Lecturers: Executive Engineer and Sub Divisional Engineer. (Or Any B.Sc Engineer having 5years of Experience in Power Plant O&M) - Financial source: Company's Own or GOB. - Risks (possible obstacles): a) Manpower, Participant and Trainer Management sparing within or after regular O&M works. b) Arrangement of Test kits, model, analyzer, practice simulator etc. c) Active field implementation and follow up of the training.	
Target Group of the Training - Entry-level engineers with less than 3 years of Experience in Power Plant O&M - Intermediate-level engineers with 3-6 years of experience in Power Plant O&M - Advanced-level engineers with more than 6 years of experience in Power Plant O&M	
Schedule With Outline & Time Frame  JICA ACtion Plan.xls	Remarks:- Total duration for implementation shall be 24 months.

Action Plan ② Improvement of Training Facility

Overall Goal:	
Maintenance work is done efficiently	
Project Purpose:	
Maintenance personnel have enough technical knowledge/ skills	
Outputs/ Activities:	
Improvement of Training facility	
Person/Section in charge	
Top Management/ Chief Engineer	
Things that have to be considered:	
- Venue: - - Facilities, equipment etc.: Experimental equipment's - Lecturers: Trained and Experienced in specialized sector. - Financial source: Company Own Fund or Sponsored by Third party or Govt. of Bangladesh. - Risks (possible obstacles): Cost, Lack of experienced persons, Lack of proper planning for training	
Actions (with timeframe)	Time Frame
1. Make a proposal for improvement of existing training facility. 1.1 Making a complete list of experimental equipment's available in our different training centers/ academy. Based on the above list making proposal for repair of disordered items (if any). 1.2 Planning and procurement of such kind of tools/ equipment's if higher management agrees. 2 Make a proposal for establishment of a Parts/ Equipment display learning hall, Modern Vibration analysis lab and Advanced NDT equipment's.	1.1 Two months 1.2 Depends on approval from the management. 2. Six months

Action Plan③ Utilizing Experienced Personnel

<table>
<tr><td colspan="2">Overall Goal:
Maintenance Work is done efficiently.</td></tr>
<tr><td colspan="2">Project Purpose:
Maintenance personnel have enough skills/ knowledge.</td></tr>
<tr><td colspan="2">Outputs:
Personnel are to be utilized based on their field of experience/ specialization.</td></tr>
<tr><td colspan="2">Person/Section in charge: Management Team of Power Plants</td></tr>
<tr><td colspan="2">Things that have to be considered:
- Venue: All state owned power plants of Bangladesh.
- Facilities, equipment etc.: Skill Human Resources.
- Lecturers: N/A
- Financial source: Organizational Own Fund.
- Risks (possible obstacles): Approval by the Top Level Management.</td></tr>
<tr><td colspan="2">Target Group of the Training: Technicians/ Engineers of State Owned Power Plants</td></tr>
<tr><td><u>Actions</u>:

Proposing that the personnel is to be utilized based on their filed of experience/ Specialization to the management:

1) After completion of Training program against Newly Installed Power Plant Project conducted by OEM, the Trained Engineers/Technicians must be posted to the respective Power Plant for at least a certain period of time.

2) In the case of sophisticated Maintenance Works in any power plant, the soundest Technical personnel from all power plants of Bangladesh could be attached with that works with that of local technical group to enhance work quality & knowledge share.

3) During Such sophisticated Maintenance Works, the procedures of work including expertise comments could be kept as record as education material for all other power plants of the country. Such document might be submitted to Member, Generation, BPDB by the respective Power Plant’s Manager.

4) As a mother organization, BPDB (Member, Generation) may maintain a list of such expert’s; inform and request all power plants’ management to utilize those experts in the best level when needed.

5) All power plants’ management needs more kind attention to transfer/ posting such experts to his/her relevant field.</td><td><u>Time Frame</u>

One Month</td></tr>
</table>

Training Schedule for Capacity Development of O&M for Power Sector of Bangladesh.
Date: 15/ February/2018.
Venue: JICA Kansai Centre.

Serial	Training Topic	Beginner (0~3yr Exp)		Intermediate (3-6yr Exp)	Advanced (More Than 6yr)	Duration	Targets To Achieve
		OJT	THEORY	THEORY	THEORY		
1	Analysis of Vibration and Unbalance in Rotary Equipment.	Y*	Y	Y	Y	Type: Theoretical Training Duration: 12hr (6hr X 2 Days) for all level. *OJT Will be performed on work site basis situation.	To be able to read the signals, identification of initial problems/ reason/ analysis/countermeasure of vibration.
2	Advanced Training on Gas Turbine Technology.	N	Y	Y	Y	(6hr X 2 Days), for beginner & intermediate, (6hr X 1 Day) for others.	To understand the development of efficiency improvement for GT as well as CCGT.
3	Non Destructive Inspection- PT,UT,MT.	Y	Y	Y*	Y	Type: Theoretical Training Duration: 6hr (6hr X 1 Day) for all level. Type: OJT for 3 Days Only on PT for beginner and Intermediate* level. # UT -OJT depends on work site requirement.	To be able to understand application and methodology as well as implementing in work stages.
4	Fundamental of Operation Work for Maintenance Personnel (Procedure-Record Keeping-Experience Share)	Y	N	Y*	N	For Beginners and *Intermediate OJT 3Days.	To be able to understand operational procedure and regulations. Being familiar with critical situations and overcoming ways.
5	Fundamentals of Maintenance Work for Operation Personnel (Procedure-Record Keeping- Experience Share).	Y	N	Y*	N	For Beginners and *Intermediate OJT 3Days.	To be able to understand maintenance work procedure, planning and regulations. Being familiar with critical situations and overcoming ways.
6	Maintenance of CCGT.	Y	Y	Y**	Y	For Beginners & ** For Intermediate **OJT during such work on site.** For All group 6hr Theory training (2hr X 3 session)	Topics To Covered: Overhauling Works and Inspection, Various Measurements , Assembly and De Assembly precaution, Maintenance Work Planning.
7	Quality Control in Power Stations	N	Y	Y	Y	3hr Theory class.	To earn the proper concept of TQM and guideline to implement TQM.
8	Heat Efficiency Management	N	N	N	Y	3hr Theory class.	To earn the proper concept impacting the performance of plan and guideline to implement
9	Industrial Safety Practice	N	Y	Y	Y	4hr Theory Class, (1hr X 4 sessions)	Fall-Trip, Work at height, Electrical Safety, PPE.
Implementation Time -24months.							

Summary of O&M Training results

[Trainer]

Dispatch to Japan: .....

Name: .....

Company: .....

TPP: .....

Workplace: .....

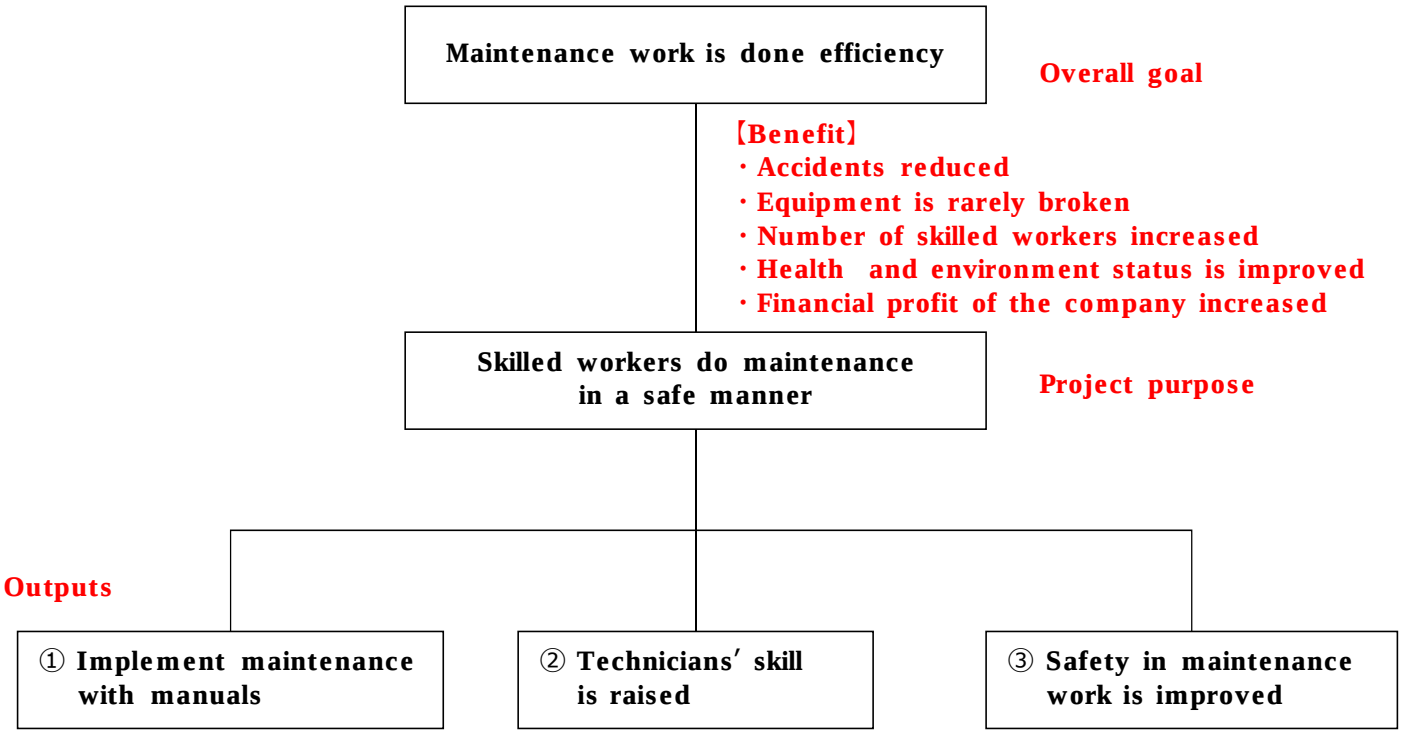
Position: .....

Training course		Year	2018												2019												2020												Total
No	Name	Month	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
1	Analysis of Vibration and Unbalance in Rotary Equipment	Number of times																																					0
		Number of trainees																																					0
2	Advanced Training on Gas Turbine Technolog	Number of times																																					0
		Number of trainees																																					0
3	Non Destructive Inspection- PT,UT,MT	Number of times																																					0
		Number of trainees																																					0
4	Fundamental of Operation Work for Maintenance Personnel (Procedure-Record Keeping- Experience Share)	Number of times																																					0
		Number of trainees																																					0
5	Fundamentals of Maintenance Work for Operation Personnel (Procedure-Record Keeping- Experience Share).	Number of times																																					0
		Number of trainees																																					0
6	Maintenance of CCGT	Number of times																																					0
		Number of trainees																																					0
7	Quality Control in Power Stations	Number of times																																					0
		Number of trainees																																					0
8	Heat Efficiency Management	Number of times																																					0
		Number of trainees																																					0
9	Industrial Safety Practice	Number of times																																					0
		Number of trainees																																					0
10		Number of times																																					0
		Number of trainees																																					0

Capacity Development for Operation & Maintenance of Thermal Power Stations, Bangladesh 2017

(Technician)

Action Plan



Action Plan (1) Manuals

Overall Goal (Core Objective)	Maintenance work is done efficiently
Project Purpose	Skilled worker do maintenance in a safe manner
Outputs (Positive effects by implementing the Activities)	Implement maintenance with manuals
Activities	1-1. Make manuals available on demand for technicians and determine how to store manuals. 1-2. Provide technicians of copy of manuals, according to related subject (pump, valve, turbine, gearbox, etc.) 1-3. Conduct training → Understanding drawing → Understanding how to read manual 1-4. Collect maintenance schedule before work start in order to study how to work 1-5. Supply preparation work sheet
Person / Section in Charge	In charge officer
Financial Source	
Risk (Possible Obstacles)	Time constraints due to unexpected maintenance work
Target Group of the Training	Four Days in a Month, 5 Persons in each group, 16 hour's time duration, (Daily 4 hours).

Action Plan (2) Skills Training

Overall Goal (Core Objective)	Maintenance work is done efficiently
Project Purpose	Skilled worker do maintenance in a safe manner
Outputs (Positive effects by implementing the Activities)	Technicians' skill is raised.
Activities	1. Conduct training for technicians 1-1. How to use about measuring tools. (Practical) → measuring tap, caliper, micrometer, level gauge, filler gauge, taper gauge, block gauge, bore gauge, torque wrench. 1-2. How to use proper working tools/drawing. (Theoretical/Practical) → Adjustable wrench, ring, open-end, socket, hammering, pipe wrench, jack, vice, pulley, claw bar, hack-saw, plier, screw driver, hammer, chisel, grinding machine, drill machine, etc. 1-3. To work as per guide manual. (Theoretical) 1-4. How to identify fault. (Theoretical/Practical) → visual, MT, PT, UT, measurement. 1-5. How to load and unload equipment (Theoretical/Practical) → Wire rope, D-shackle, I-bolt in proper use and equipment handling properly. 1-6. How to record procedure. (Theoretical/Practical) → to use checklist, record sheet, box numbering 1-7. Importance of discussion about work (e.g. fault & remedy) to share details among work team. (Theoretical) 1-8. Storage system (Theoretical/Practical) → tag, numbering, shelf, register maintain 2. Establish proper storage system → tag, numbering, shelf, register maintain 3. Set meeting as a routine activity to share result of work (e.g. fault & remedy) among work team.
Person/ section In charge	In charge officers
Financial Source	
Risk (Possible Obstacles)	Work load due to unexpected maintenance work
Target Group of the Training	Eight Days in a Month, 5 Persons in each group, Daily 4 hours.

Action Plan (3) Safety

Overall Goal (Core Objective)	Maintenance work is done efficiently
Project Purpose	Skilled worker do maintenance in a safe manner
Outputs (Positive effects by implementing the Activities)	Safety in maintenance work improved
Activities	1. Conduct training on safety 1-1. Personal Protection Equipment → safety helmet, goggles, mask, hand gloves, shoe, harness 1-2. Confined space → barricade with danger tape, supply air, to use DC light, collect extinguisher 1-3. Equipment safety → equipment will be put on its position, to make safety guard on the equipment, proper oil and cooling supply to proper equipment 1-4. Environment safety → liquid, powder, chemical firing things separately collect → to use neutralization system → to storage used jute, liquid, chemical powder 1-5. Chemical & Fire Safety → to use gas mask, gum boot, chemical gloves, safety goggles → every chemical separately collect 2. Establish "Safety Committee" with five persons, representing different sections (e.g. environment, finance, chemical, mechanical and safety), to promote safety at work.
Person/ section In charge	In charge officer
Financial Source	
Risk (Possible Obstacles)	Work load due to unexpected maintenance work
Target Group of the Training	Five Days in a Month, 5 Persons in each group, 20 hour's time duration, (Daily 2 hours theoretical + 2 hours practical).

Summary of O&M Training results

[Trainer]

Dispatch to Japan: .....

Name: .....

Company: .....

TPP: .....

Workplace: .....

Position: .....

Training course		Year	2018												2019												2020												Total
No	Name	Month	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
1	How to use about measuring tools	Number of times																																					0
		Number of trainees																																					0
2	How to use proper working tools/drawing	Number of times																																					0
		Number of trainees																																					0
3	How to identify fault	Number of times																																					0
		Number of trainees																																					0
4	How to load and unload equipment	Number of times																																					0
		Number of trainees																																					0
5	How to record procedure	Number of times																																					0
		Number of trainees																																					0
6	Personal Protection Equipment	Number of times																																					0
		Number of trainees																																					0
7	Confined space	Number of times																																					0
		Number of trainees																																					0
8	Equipment safety	Number of times																																					0
		Number of trainees																																					0
9	Environment safety	Number of times																																					0
		Number of trainees																																					0
10	Chemical & Fire Safety	Number of times																																					0
		Number of trainees																																					0

(2)　第 2 回本邦研修員作成のアクションプラン

Action Plan

Capacity Building & Strengthening of Thermal Power Generation Operation & Maintenance (Engineer Group 1)

[Feb.24 – Mar.30 2019]

独立行政法人 国際協力機構

Index

1. Framework of the Program

Confirmation of the project framework

- Bilateral co-operation between the government of Bangladesh & the government of Japan.
- Target Type of Power Generation: Gas Turbine Combined Cycle (GTCC)
- Target Sites: BPDB, EGCB, NWPGCL, APSCL, RPCL & CPGCBL .

Overall goal: Capacity of O&M of Thermal Power Plants (TPP) is strengthened.

Project Goal: Training Capacity on O&M of thermal Power stations is strengthened.

Beneficiaries: Engineers & Technicians who will be core instructors and their trainees.

2. Issue Analysis (1/3)

Purpose

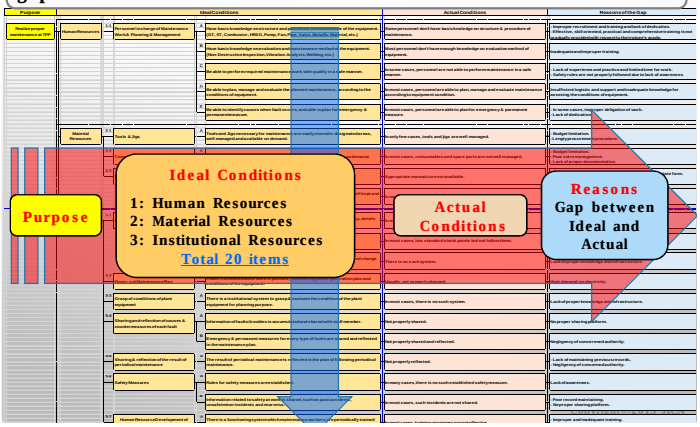
Realization of proper maintenance

Method of Analysis

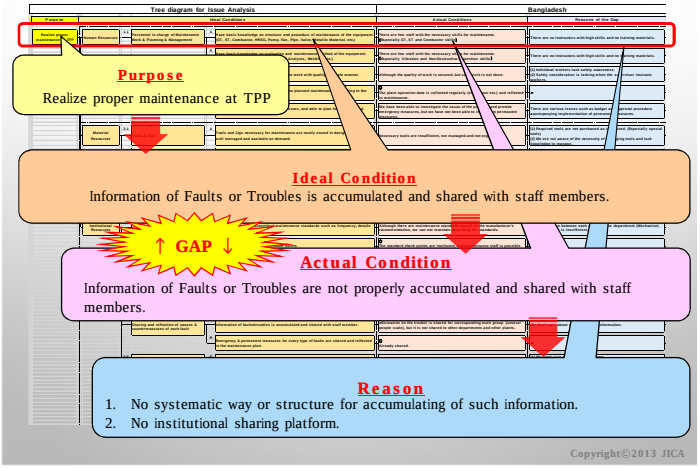
We recognize the current issue referring the ideal situation. This issue analysis helps us make the Action Plan over what should be enhanced and what should be disseminated by us.

2. Issue Analysis (2/3)

We analyzed the Ideal Conditions, Actual Conditions and Reason of gap between ideal and actual condition.



2. Issue Analysis (3/3)



3. Making the Action Plan (1/8)

Reason for making the Action Plan

1. To plan actions to improve situations at TPP.
2. To commit the AP after going back to Bangladesh.
3. To disseminate acquired knowledge and skill.

Action Plan

1. **Training for technical personnel of TPP:**
   - 1.1 Overview of TPP (GTCC, CFPP)
   - 1.2 Basic of Vibration.
   - 1.3 Pump Alignment (Centering).
   - 1.4 Service Life Diagnosis.
   - 1.5 Non-Destructive Inspection.
   - 1.6 Experience based Safety Training & Lessons learned from accidents.
2. **Activity on actual work:**
   - 2.1. Toolbox Meeting.
   - 2.2. Record keeping of Major Incidents/ Accidents.
   - 2.3 5S Methodology

3-1. Training for technical personnel on TPP (2/8)

Ideal Condition

- Have basic knowledge on structure and procedure of maintenance of the equipment. (GT, ST, Boiler, HRSG, Pumps, Fan, Valve)
- Have basic knowledge on Vibration analysis, NDT, Alignment etc.

Actual Condition

Some personnel don't have proper basic knowledge.

Reason

Insufficient and improper training on respective subject.

Training Item

1.1Overview of TPP (GTCC, CFPP)
1.2 Basic of Vibration.
1.3 Pump Alignment (Centering).
1.5 Non-Destructive Inspection.

3-1. Training for technical personnel on TPP (3/8)

Ideal Condition

Be able to plan, manage and evaluate the planned maintenance according to the condition of the equipment.

Actual Condition

Not done with proper technique/approach

Reason

Inadequate knowledge for assessing the condition of equipment.

Training Item

1.4 Service Life Diagnosis.

3-1. Training for technical personnel on TPP (4/8)

Ideal Condition

- Rule of safety measures are established.
- Information related to safety shared such as past accident, unsafe incident and near miss.

Actual Condition

- In sufficient established safety measures.
- In most cases Information related to safety, past accidents, unsafe incident etc. are not properly accumulated and shared with staff members.

Reason

- Lack of awareness.
- Poor record maintaining.

Training Item

1.6 Experience based Safety Training & Lessons learned from accidents.

3-2. Activity on Actual Work (5/8)

Ideal Condition

- Be able to perform required maintenance works with quality in a safe manner.

Actual Condition

- In most cases personnel are not able to perform required maintenance works with quality in a safe manner.

Reason

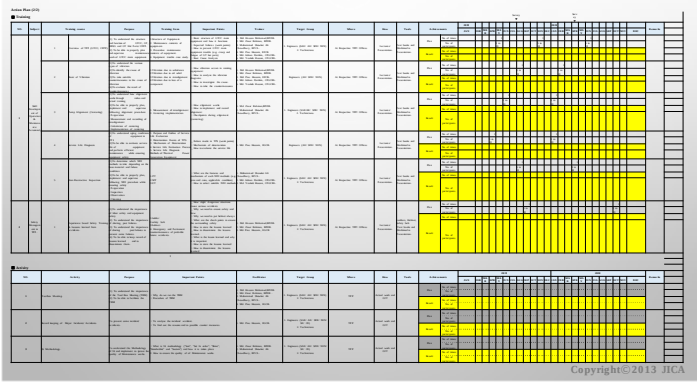
- Lack of practice in organized or standard method.
- Lack of awareness towards safety and quality to be maintained during works.

Activity

2.1. Toolbox Meeting.
2.2. Record keeping of Major Incidents/ Accidents.
2.3 5S Methodology

3-3. Making the Action Plan Format (6/8)

We made the detail Action Plan (inc. schedule, magnitude, frequency etc.) as below. This format will be utilized to record our activities and report to JICA Expert Team.



3-3. Making the Action Plan Format (7/8)

For instance, we will explain one of the Action Plan regarding Service life diagnosis.

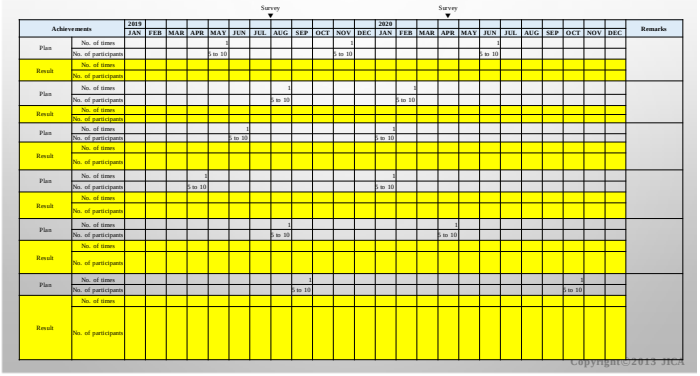
Action Plan (2/2)

■ Training

NO.	Subject	Training Course	Purpose	Training Item	Important Points	Trainer	Target Group	Where	How	Tools
1	Skill Development of Operation & Maintenance Personnel.	Basic of Vibration	(1)To understand the various types of vibration (2)To identify the cause of vibration (3)To take suitable countermeasures to the cause of vibration (4)To evaluate the result of countermeasures	1.Vibration due to unbalance 2.Vibration due to oil whirl 3.Vibration due to misalignment 4.Vibration due to loss of a component	・How vibration occurs in rotating equipment ・How to analyze the vibration diagrams ・How to investigate the cause. ・How to take the countermeasures	1. Md. Hassan Mahamud,BPDB. 2. Md. Ziaur Rahman, BPDB. 3. Md. Pias Hossain, EFCB.. 4. Md. Adnan Ibrahim, CPGCBL. 5. Md. Yeakub Hossan, CPGCBL.	Engineers (AE/ SDE/ XEN)	At Respective TPP/ Offices	Lectures/ Presentation.	Text books and Multimedia Presentation.

3-3. Making the Action Plan Format (8/8)

We made a feasible schedule as below.
We will report our activities to JICA Expert Team by filling this format.



4. Impressions Regarding the JICA Training

- **The whole training program was well organized and planned. we are enchanted by the program management.**
- **The program is adorned with relevant contents like, Overview of TPP, Vibration analysis, NDT, 5S, RBM, Alignment, Safety etc.**
- **Chance for discussion on various important matters with trainer and among ourselves were very fruitful.**
- **We got some hands-on experience on vibration analysis, alignment, NDT & safety etc. which are very effective for achieving the objectives of these courses.**
- **Several site visit programs were arranged by JICA which were very much helpful to assess the safety, store management, Human resources, 5S, technical processes and so on.**
- **We are very much impressed by the commitment of Kansai Electric Power Company Limited (KEPCO) and JICA personnel to identify our laggings and to provide guideline to rectify the issues by arranging such informative and relevant training content.**

Thank you for your attention.

Action Plan Engineer Group 1

■ Basic information

Country	**Bangladesh**
Target TPP	**1. Barishal Gas Turbine Power Station, BPDB.** **2. Shahjibazar 330 MW CCPP, BPDB.** **3. Mymensingh 210 MW CCPP, RPCL.** **4. Haripur 412 MW CCPP, EGCB** **5. Matarbari 2X600 MW USC CFPP (Project), CPGCBL.**
Name of the Trainers (JICA-trained participants)	**1. Md. Hassan Mahamud, BPDB.** **2. Md. Ziaur Rahman, BPDB** **3. Mohammed Showkat Ali Chowdhury, RPCL.** **4. Md. Pias Hossain, EGCB.** **5. Md. Adnan Ibrahim, CPGCBL.** **6. Md. Yeakub Hossan, CPGCBL.**
Overall goal	**Capacity of O&M of Thermal Power Plants (TPP) is Strengthened**
Project goal	**Training Capacity on O&M of thermal power stations is strengthened**
Subjects	**[Training]** **1. Skill Development of Operation & Maintenance Personnel:** **1.1. Overview of TPP (GTCC, CFPP)** **1.2. Basic of Vibration.** **1.3. Pump Alignment (Centering).** **1.4. Service Life Diagnosis.** **1.5. Non-Destructive Inspection** **2. Safety Management in TPP:** **2.1. Experience based Safety Training & Lessons learned from accidents.** **[Activity]** **1. Toolbox Meeting.** **2. Record keeping of Major Incidents/Accidents.** **3. 5S Methodology.**

■ Training

NO.	Subject		Training course	Purpose	Training Item	Important Points	Trainer	Target Group	Where	How	Tools	Achievements		2019 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	2020 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Remarks
1	Skill Development of Operation & Maintenance Personnel.	1	Overview of TPP (GTCC, CFPP).	(1) To understand the structure and function of GTCC, GT, HRSG and GT Hot Parts / CFPP. (2) To be able to properly plan and supervise maintenance work of GTCC main equipment.	1. Structure of Equipment. 2. Maintenance contents of equipment. 3. Preventive maintenance contents of equipment. 4. Equipment trouble case study.	・Basic structure of GTCC main equipment and how it functions ・Expected failures (weak points) ・How to prevent GTCC main equipment trouble (e.g. creep and fatigue of GT hot parts) ・Root Cause Analysis	1. Md. Hassan Mahamud, BPDB. 2. Md. Ziaur Rahman, BPDB. 3. Mohammed Showkat Ali Chowdhury, RPCL. 4. Md. Pias Hossain, EPCB.. 5. Md. Adnan Ibrahim, CPGCBL.. 6. Md. Yeakub Hossan, CPGCBL..	1. Engineers (SAE/ AE/ SDE/ XEN) 2. Technicians	At Respective TPP/ Offices	Lectures/ Presentation.	Text books and Multimedia Presentation.	Plan	No. of trns					1						1									1							
													No. of participants					5 to 10					5 to 10							5 to 10							
												Result	No. of trns																									
													No. of participants																									
		2	Basic of Vibration	(1) To understand the various types of vibration (2) To identify the cause of vibration (3) To take suitable countermeasures to the cause of vibration (4) To evaluate the result of countermeasures	1. Vibration due to unbalance 2. Vibration due to oil whirl 3. Vibration due to misalignment 4. Vibration due to loss of a component	・How vibration occurs in rotating equipment ・How to analyze the vibration diagrams ・How to investigate the cause. ・How to take the countermeasures	1. Md. Hassan Mahamud, BPDB. 2. Md. Ziaur Rahman, BPDB. 3. Md. Pias Hossain, EPCB.. 4. Md. Adnan Ibrahim, CPGCBL.. 5. Md. Yeakub Hossan, CPGCBL..	Engineers (AE/ SDE/ XEN)	At Respective TPP/ Offices	Lectures/ Presentation.	Text books and Multimedia Presentation.	Plan	No. of trns								1						1													
													No. of participants							5 to 10						5 to 10												
												Result	No. of trns																									
													No. of participants																									
		3	Pump Alignment (Centering)	(1) To understand how alignment works through video and actual training. (2) To be able to properly plan, implement and supervise following alignment procedure - Preparation - Measurement and recording of misalignment - Calculation of centering - Implementation of centering	1. Measurement of misalignment 2. Centering implementation	・How alignment works ・How to implement and record alignment ・Check points during alignment (centering)	1. Md. Ziaur Rahman, BPDB. 2. Mohammed Showkat Ali Chowdhury, RPCL.	1. Engineers (SAE/AE/ SDE/ XEN) 2. Technicians.	At Respective TPP/ Offices	Lectures/ Presentation.	Text books and Multimedia Presentation.	Plan	No. of trns						1							1												
													No. of participants						5 to 10						5 to 10												
												Result	No. of trns																									
													No. of participants																									
		4	Service Life Diagnosis	(1) To understand aging conditions of equipment in TPS (2) To be able to evaluate service life of equipment and perform efficient maintenance while ensuring equipment safety	1. Purpose and Outline of Service Life Evaluation 2. Deterioration Events of TPS 3. Mechanism of Deterioration 4. Service Life Evaluation Process 5. Service Life Diagnosis Methods of Thermal Power Generation Equipment	・Failure mode in TPS (weak points) ・Mechanism of deterioration ・How to evaluate the service life	1. Md. Pias Hossain, EGCB.	Engineers (AE/ SDE/ XEN)	At Respective TPP/ Offices	Lectures/ Presentation.	Text books and Multimedia Presentation.	Plan	No. of trns				1										1												
													No. of participants				5 to 10							5 to 10													
												Result	No. of trns																									
													No. of participants																									
		5	Non-Destructive Inspection	(1) To determine which NDI methods to take depending on the base material and failure condition (2) To be able to properly plan, implement and supervise following NDI procedure while ensuring safety - Preparation - Inspection - Observation - Cleaning	1. PT 2. MT 3. UT	・What are the features and mechanism of each NDI methods (e.g. pros and cons, applicable condition) ・How to select suitable NDI methods	1. Mohammed Showkat Ali Chowdhury, RPCL. 2. Md. Adnan Ibrahim, CPGCBL.. 3. Md. Yeakub Hossan, CPGCBL..	1. Engineers (SAE/ AE/ SDE/ XEN) 2. Technicians	At Respective TPP/ Offices	Lectures/ Presentation.	Text books and Multimedia Presentation.	Plan	No. of trns								1										1							
													No. of participants							5 to 10										5 to 10						
												Result	No. of trns																									
													No. of participants																									
2	Safety Management in TPP.	1	Experience based Safety Training & Lessons learned from accidents.	(1) To understand the importance of labor safety and equipment safety (2) To understand the importance of sharing, past failures. (3) To understand the importance of sharing past failures to prevent same failures. (4) To be able to keep record of lessons learned and to disseminate them.	1. ladder 2. safety belt. 3. helmet. 4. Emergency and Permanent countermeasures of probable future accidents.	・How slight dangerous situations cause serious accidents ・Why we need to ensure safety and how ・Why we need to put helmet always ・What are the check points to ensure the surrounding safety ・How to store the lessons learned ・How to disseminate the lessons learned. ・What is the lesson learned and why it is important ・How to store the lessons learned ・How to disseminate the lessons learned	1. Md. Hassan Mahamud, BPDB. 2. Md. Ziaur Rahman, BPDB. 3. Md. Pias Hossain., EGCB	1. Engineers (SAE/ AE/ SDE/ XEN) 2. Technicians	At Respective TPP/ Offices	Lectures/ Presentation.	Ladders, Helmet, Safety belt. *Text books and Multimedia Presentation.	Plan	No. of trns									1												1				
													No. of participants								5 to 10											5 to 10				
												Result	No. of trns																									
													No. of participants																									

■ Activity

NO.	Activity	Purpose	Important Points	Facilitator	Target Group	Where	How	Tools	Achievements		2019 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	2020 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Remarks
1	Toolbox Meeting.	(1) To understand the importance of the Tool Box Meeting (TBM) (2) To be able to facilitate the TBM	・Why do we run the TBM ・Procedure of TBM	1. Md. Hassan Mahamud, BPDB. 2. Md. Ziaur Rahman, BPDB. 3. Mohammed Showkat Ali Chowdhury, RPCL. 4. Md. Pias Hossain, EGCB.	1. Engineers (SAE/ AE/ SDE/ XEN) 2. Technicians	TPP	Actual work and OJT		Plan	No. of trns																										
										No. of participants																									
									Result	No. of trns																									
										No. of participants																									
2	Record keeping of Major Incidents/ Accidents.	To prevent same incident/ accidents.	・To analyse the incident / accident. ・To find out the reasons and to possible counter measures.	1. Md. Pias Hossain, EGCB.	1. Engineers (SAE/ AE/ SDE/ XEN/ SE/ CE) 2. Technicians	TPP	Actual work and OJT		Plan	No. of trns																								
										No. of participants																									
									Result	No. of trns																									
										No. of participants																									
3	5S Methodology.	To understand the Methodology of 5S and implement to iprove the quality of Maintenance works.	・What is 5S methodology ("Sort", "Set In order", "Shine", "Standardize" and "Sustain") and how it is taken place ・How to ensure the quality of of Maintenance works.	1. Md. Ziaur Rahman, BPDB. 2. Mohammed Showkat Ali Chowdhury, RPCL.	1. Engineers (SAE/ AE/ SDE/ XEN/ SE/ CE) 2. Technicians	TPP	Actual work and OJT		Plan	No. of trns																								
										No. of participants																									
									Result	No. of trns																									
										No. of participants																									

Action Plan

Capacity Building & Strengthening of Thermal Power Generation Operation & Maintenance (Engineer Group 2) [Feb.24 – Mar.30 2019]

独立行政法人 国際協力機構

Index

1. Framework of the Program

Confirmation of the project framework

- Bilateral co-operation between the government of Bangladesh & the government of Japan.
- Target Type of Power Generation: Gas Turbine Combined Cycle (GTCC)
- Target Sites: BPDB, EGCB, NWPGCL, APSCL、RPCL & CPGCBL .

Overall goal: Capacity of O&M of Thermal Power Plants (TPP) is strengthened.

Project Goal: Training Capacity on O&M of thermal Power stations is strengthened.

Beneficiaries: Engineers & Technicians who will be core instructors and their trainees.

2. Issue Analysis (1/3)

Purpose

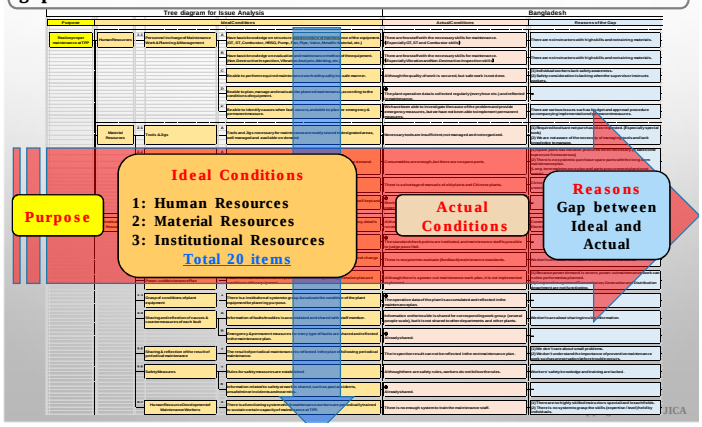
Realization of proper maintenance

Method of Analysis

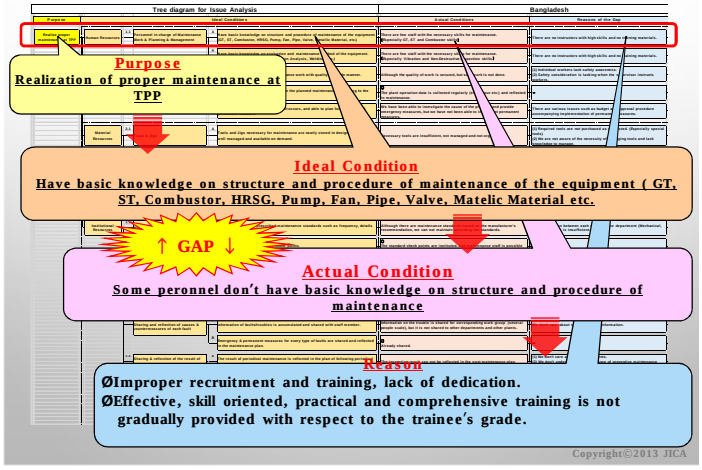
We recognize the current issue referring the ideal situation. This issue analysis helps us make the action plan over what should be enhanced and what should be disseminated by us.

2. Issue Analysis (2/3)

We analyzed the Ideal Conditions, Actual Conditions and Reason of gap between ideal and actual condition.



2. Issue Analysis (3/3)



3. Making the Action Plan (1/1)

Reason for making the Action Plan

- ØTo disseminate the acquired knowledge on Vibration and Pump alignment procedure
- ØTo develop the system of tools and jigs management
- Ø To develop the safety awareness
- Ø To create a common platform for knowledge sharing

Action Plan

1. Training for workers on TPP
   1. Basic of Vibration
   2. Pump Alignment (Centering)
2. Activity on actual work
   1. Management of tools and jigs (5S)
   2. Tool box meeting
   3. Knowledge sharing Platform
   4. Dissemination the information of Kansai EPCO HRD, H&S and Central Maintenance Data base system

3-1. Training for Colleagues on TPP (1/2)

Ideal Condition

Have basic knowledge on evaluation and maintenance method of the equipment through Vibration Analysis.

Actual Condition

Most personnel don't have enough knowledge on vibration analysis method of equipment.

Reason

Inadequate and improper training on vibration analysis.

Training Item

1.Vibration due to unbalance
2.Vibration due to oil whirl
3.Vibration due to misalignment
4.Vibration due to loss of a component

3-1. Training for Colleagues on TPP (2/2)

Ideal Condition

Be able to manage and evaluate the conditions of equipment when fault occurs due to misalignment and take countermeasures.

Actual Condition

In most cases, personnel are not able to perform alignment properly.

Reason

Insufficient logistic support and inadequate knowledge on alignment procedure and its importance.

Training Item

1. Lecture on actual Pump alignment
2. Measurement of misalignment
3. Centering implementation

3-2. Activity on Actual Work (1 /4)

Ideal Condition

Tools and Jigs are necessary for maintenance works and need to be neatly stored in designated areas, well managed and available on demand by following 5S methodology.

Actual Condition

In only few cases, tools and jigs are well managed but not following 5S methodology properly.

Reason

Lack of knowledge, logistic support and not practicing of 5S methodology.

Activity

Management of tools and jigs as per 5S methodology

3-2. Activity on Actual Work (2 /4)

Ideal Condition

Be able to perform required maintenance work with quality in a safe manner by practicing Tool Box meeting.

Actual Condition

In some cases, personnel do not perform maintenance in a safe manner and don't have concept of Tool Box meeting.

Reason

- Lack of experience and practice.
- Safety rules are not properly followed due to lack of awareness.

Activity

Tool box meeting

3-2. Activity on Actual Work (3 /4)

Ideal Condition

Information of faults/troubles is accumulated and shared with staff member.

Actual Condition

Not properly shared.

Reason

No proper knowledge sharing platform.

Activity

Knowledge sharing platform

3-2. Activity on Actual Work (4 /4)

Ideal Condition

There are proper functioning systems of human resource development (HRD), Health & Safety(H&S) and Central maintenance data base system.

Actual Condition

In most cases, existing systems of HRD, H&S and Central Maintenance Data base are not functioning properly.

Reason

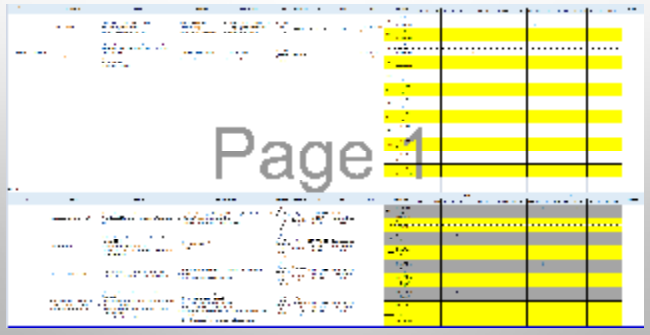
Improper and inadequate system which need to be developed.

Activity

Dissemination the information of Kansai EPCO HRD, H&S and Central Maintenance Data base system

3-3. Making the Action Plan Format (1/3)

We made the detail Action Plan (inc. schedule, magnitude, frequency etc.) as below. This format will be utilized to record our activities and report to JICA Expert Team.



3-3. Making the Action Plan Format (2/3)

For instance, we will explain one of the Action Plan regarding training on Basic of Vibration.

Action Plan (2/2)

■ Training

NO.	Subject	Training course		Purpose	Training Item	Important Points	Trainer	Target Group	Where	How	Tools
1	Technical skill development of operation and maintenance personnel	1	Basic of Vibration	(1)To understand the various types of vibration (2)To identify the cause of vibration (3)To take suitable countermeasures to the cause of vibration (4)To evaluate the result of countermeasures	1.Vibration due to unbalance 2.Vibration due to oil whirl 3.Vibration due to misalignment 4.Vibration due to loss of a component	• How vibration occurs in rotating equipment • How to analyze the vibration diagrams • How to investigate the cause. • How to take the countermeasures	Md. Ashiqur Rahman & Md. Khairul Bashar	Engineers	PFTC, APSCL	Lecture	Text book, Laptop and projector

3-3. Making the Action Plan Format (3/3)

Regarding activity, we make a feasible schedule as below.
We will report our activities to JICA Expert Team by filling this format.

Action Plan (2/2)

■ Training

Survey ▼ Survey ▼

NO.	Subject	Training course		Achievements		2019 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	2020 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Remarks
1	Technical skill development of operation and maintenance personnel	1	Basic of Vibration	Plan	No. of times														1										
					No. of participants														10										
				Result	No. of times																								
					No. of participants																								

4. Impressions Regarding the JICA Training

- The whole training program was well organized and planned. we are enchanted by the programm management.
- The programm is adorned with relevant contents like, Overview of TPP, Vibration analysis, NDT, 5S, RBM, Alignment, Safety etc.
- Chance for discussion on various important matters with trainer and among ourselves were very fruitful.
- We got some hands-on experience on vibration analysis, alignment, NDT & safety etc. which are very effective for achieving the objectives of these courses.
- Several site visit programms were arranged by JICA which were very much helpful to assess the safety, store management, Human resources, 5S, technical processes and so on.
- We are very much impressed by the commitment of Kansai and JICA personnel to identify our laggings and to provide guideline to rectify the issues by arranging such informative and relevant training content.

Thank you for your attention.

Ohkini!!

Action Plan Engineer Group 2

■ **Basic information**

Country	**Bangladesh**
Target TPP	**Ashuganj Power Station Company Limited**
Name of the Trainers (JICA-trained participants)	**1. Md. Ashiqur Rahman** **2. Md. Khairul Bashar**
Overall goal	**Capacity of O&M of Thermal Power Plants (TPP) is Strengthened**
Project goal	**Training Capacity on O&M of thermal power stations is strengthened**
Subjects	**[Training]** **1. Basic of Vibration** **2. Pump Alignment (Centering)** **[Activity]** **1. Management of tools and jigs (5S)** **2. Tool box meeting** **3. Knowledge sharing acitivity**

■ **Training**

No.	Subject		Training course	Purpose	Training Item	Important Points	Trainer	Target Group	Where	How	Tools	Achievements		2019 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	2020 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Remarks
														Survey ▼												Survey ▼												
1	Technical skill development of operation and maintenance personnel	1	Basic of Vibration	(1) To understand the various types of vibration (2) To identify the cause of vibration (3) To take suitable countermeasures to the cause of vibration (4) To evaluate the result of countermeasures	1. Vibration due to unbalance 2. Vibration due to oil whirl 3. Vibration due to misalignment 4. Vibration due to loss of a component	・How vibration occurs in rotating equipment ・How to analyze the vibration diagrams ・How to investigate the cause. ・How to take the countermeasures	Md. Ashiqur Rahman & Md. Khairul Bashar	Engineers	PPTC, APSCL	Lecture	Text book, Laptop and projector	Plan	No. of times															1											
													No. of participants													10											
												Result	No. of times																									
													No. of participants																									
		2	Pump Alignment (Centering)	(1) To understand how alignment works done through actual training (2) To be able to properly plan, implement and supervise following alignment procedure - Preparation - Measurement and recording of misalignment - Calculation of centering - Implementation of centering	1. Lecture on actual Pump alignment 2. Measurement of misalignment 3. Centering implementation	・How alignment works ・How to implement and record alignment ・Checkpoints during alignment (centering)	Md. Ashiqur Rahman & Md. Khairul Bashar	Engineers & Technicians	PPTC, APSCL	Lecture & Practice	Text book, Laptop, projector, pump & hand tools	Plan	No. of times							1																			
													No. of participants							10																		
												Result	No. of times																									
													No. of participants																									

■ **Activity**

No.	Activity	Purpose	Important Points	Facilitator	Target Group	Where	How	Tools	Achievements		2019 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	2020 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Remarks
1	Management of tools and jigs (5S)	(1) To understand the 5S methodology (1) To implement 5S to improve the quality of maintenance work.	What is 5S methodology ("Sort", "Set In order", "Shine", "Standardize" and "Sustain") and how it is taken place. How to ensure the quality of maintenance work.	Md. Ashiqur Rahman & Md. Khairul Bashar	Engineers & Technicians	225MW CCPP & 450MW North, APSCL	Practising during actual work and OJT		Plan	No. of times																1	1	1	1	1	1					
										No. of participants																										
									Result	No. of times																										
										No. of participants																										
2	Toolbox meeting	(1) To understand the importance of the Tool Box Meeting (TBM) (2) To be able to facilitate the TBM (3) Facilitat the meeting to make sure all participants express their opinion	・Why do we run the TBM ・Procedure of TBM	Md. Ashiqur Rahman & Md. Khairul Bashar	Engineers & Technicians	225MW CCPP & 450MW North, APSCL	Practising during actual work and OJT		Plan	No. of times				1	1	1	1	1	1																	
										No. of participants																										
									Result	No. of times																										
										No. of participants																										
3	Knowledge sharing platform	(1) To disseminate the root cause of faults/troubles (2) To prevent the repeatation of same faults/ troubles	・What is the lesson learned from the faults/troubles and why it is important. ・How to disseminate the lessons learned	Md. Ashiqur Rahman & Md. Khairul Bashar	Engineers & Technicians	225MW CCPP & 450MW North, APSCL	Practising during actual work and OJT		Plan	No. of times										1	1	1	1	1	1										
										No. of participants																										
									Result	No. of times																										
										No. of participants																										
4	Dissemination the information of Kansai EPCO HRD, H&S and Central Maintenance Data base system	(1) To find out the hints for improving HRD structure in Bangladesh (2) To understand the importance of sharing past failures to prevent same failures (3) To be able to keep record of lessons learned and to disseminate them (4) Central maintenance data base system	・What is the lesson learned and why it is important ・How to store the lessons learned ・How to disseminate the lessons learned ・What is the purpose of induction training ・Why providing training materials with optimal level is essential and what is the best timing ・How job rotation contributes to improve human resources	Md. Ashiqur Rahman & Md. Khairul Bashar	Top management, H&S, HRM & HRD	225MW CCPP & 450MW North, APSCL	Practising during actual work and OJT		Plan	No. of times					1	1	1																			
										No. of participants																										
									Result	No. of times																										
										No. of participants																										

Action Plan

Capacity Building & Strengthening of Thermal Power Generation Operation & Maintenance (Engineer Group 3)

[Feb.24 – Mar.30 2019]

独立行政法人 国際協力機構

Index

1. Framework of the Program

Confirmation of the project framework

- Bilateral co-operation between the government of Bangladesh & the government of Japan.
- Target Type of Power Generation: Gas Turbine Combined Cycle (GTCC)
- Target Sites: BPDB, EGCB, NWPGCL, APSCL、RPCL & CPGCBL .

Overall goal: Capacity of O&M of Thermal Power Plants (TPP) is strengthened.

Project Goal: Training Capacity on O&M of thermal Power stations is strengthened.

Beneficiaries: Engineers & Technicians who will be core instructors and their trainees.

2. Issue Analysis (1/3)

Purpose

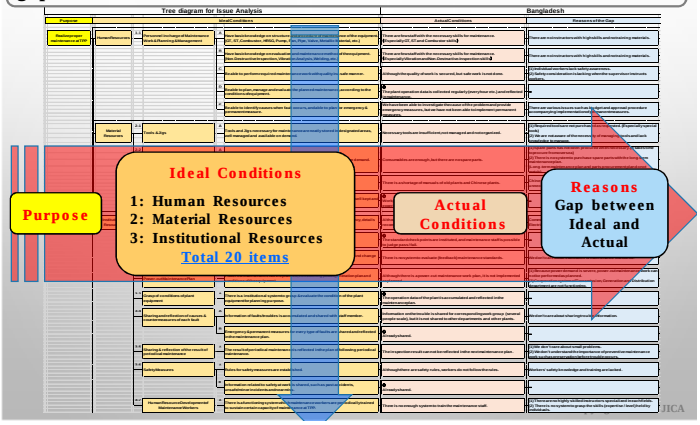
Realization of proper maintenance

Method of Analysis

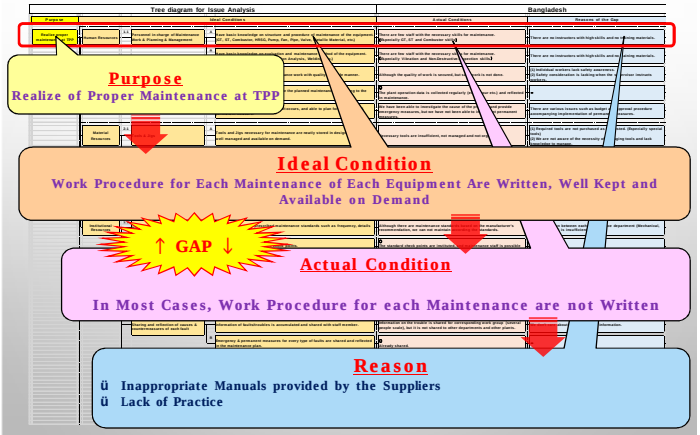
We recognize the current issue referring the ideal situation.
This issue analysis helps us make the Action Plan over what should be enhanced and what should be disseminated by us.

2. Issue Analysis (2/3)

We analyzed the Ideal Conditions, Actual Conditions and Reason of gap between ideal and actual condition.



2. Issue Analysis (3/3)



3. Making the Action Plan (1/1)

Reason for making the Action Plan

In order to identify the root cause of any faults within a shortest period of time, remedies of the faults and for implementation the actual works in field in a safe manner and within a organized way to reduce the probable hazards associated with the activities, the selected phenomenon's are seems to be very effective.

Action Plan

1. Training for Colleagues on TPP
   - Ø Fault Tree Analysis
   - Ø Basics of Vibration
2. Activity on actual work
   - Ø Safety line Marking
   - Ø Tool box Meeting

3-1. Training for Colleagues of TPP (1/2)

Ideal Condition

- Ø Be able to identify causes when fault occurs, and able to plan for emergency & permanent measure.
- Ø Be able to perform required maintenance work with quality in a safe manner.

Actual Condition

- Ø In most cases, personnel are able to plan for emergency & permanent measure.
- Ø In some cases, personnel are not able to perform maintenance in a safe manner.

Reason

- Ø Lack of experience, practice and limited time for working
- Ø In some cases, improper delegation of work.
- Ø Lack of dedication.

Training Item

Fault Tree Analysis

3-1. Training for Colleagues on TPP (2/2)

Ideal Condition

- Ø Have basic knowledge on evaluation and maintenance method of the equipment.(Non-Destructive Inspection, Vibration Analysis, Welding, etc.)
- Ø Be able to plan, manage and evaluate the planned maintenance, according to the conditions of equipment.

Actual Condition

- Ø Most personnel don't have enough knowledge on evaluation method of equipment.
- Ø In most cases, personnel are able to plan, manage and evaluate maintenance according to equipment condition.

Reason

- Ø Inadequate and improper training.
- Ø Insufficient logistic and support and inadequate knowledge for assessing the conditions of equipment.

Training Item

Basics of Vibration

3-2. Activity on Actual Work (1/2)

Ideal Condition

Rules for safety measures are established.

Actual Condition

In many cases, there is no such established safety measure.

Reason

- Ø Infrastructure is not developed yet
- Ø Lack of awareness.

Activity

Safety line Marking

3-2. Activity on Actual Work (2/2)

Ideal Condition

Be able to perform required maintenance work with quality in a safe manner.

Actual Condition

In some cases, personnel are not able to perform maintenance in a safe manner.

Reason

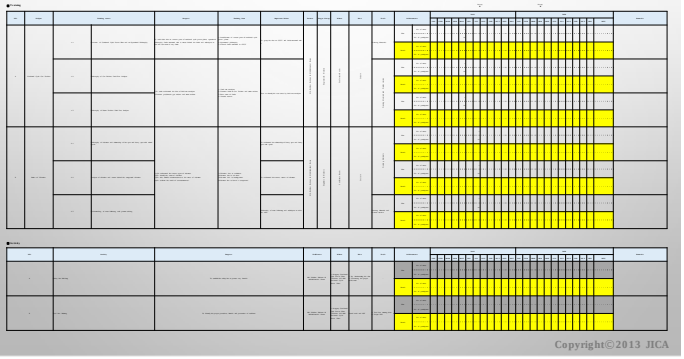
- Ø Philosophy of Tool Box Meeting is not so conventional in our case
- Ø Lack of experience, practice and limited time for working.
- Ø Safety rules are not properly followed due to lack of awareness.

Activity

Tool box Meeting

3-3. Making the Action Plan Format (1/3)

We made the detail Action Plan (including schedule, magnitude, frequency etc.) as below. This format will be utilized to record our activities and report to JICA Expert Team.



3-3. Making the Action Plan Format (2/3)

For instance, we will explain one of the Action Plan regarding Fault Tree Analysis.

■ Training

NO	Subject	Training course		Purpose	Training Item	Important Points	Trainer	Target Group	Where	How	Tools
1	Combined Cycle Gas Turbine	1.1	Overview of Combined Cycle Power Plant and its Operational Philosophy	To make clear idea on various parts of combined cycle power plants, operational philosophy, faults associated with it, causes behind the faults and techniques to find the root cause of any faults	1. Introduction of various parts of combined cycle power plants. 2. Operational philosophy 3. General faults associated in CCGT	To grasp the idea on CCGT and faults associated with it	Md. Habibur Rahman & Md.Mahmudul Hasan	Engineers & Workers	Conference Room	Lecture	Training Materials
		1.2	Philosophy of Gas Turbine Fault Tree Analysis	1.To make understand the idea of fault tree analysis 2.Common problems in gas turbine and steam turbine	1. Fault tree analysis 2. Common faults in Gas Turbine and steam turbine 3. Root cause of faults 4. Practice session	How to identify the root cause by fault tree annalysis					Training Materials and Practice session
		1.3	Philosophy of Steam Turbine Fault Tree Analysis								

3-3. Making the Action Plan Format (3/3)

Regarding Fault Tree Analysis, we make a feasible schedule as below. We will report our activities to JICA Expert Team by filling this format.

■ Training

NO.	Subject	Training course		Achievements		2019 JA	FE	MA	AP	MA	JU	JUL	AU	SE	OC	NO	DE	2020 JA	FE	MA	AP	MA	JU	JUL	AU	SE	OC	NO	DE	Remarks
1	Combined Cycle Gas Turbine	1.1	Overview of Combined Cycle Power Plant and its Operational Philosophy	Plan	No. of times						1																			
					No. of participants						10																			
				Result	No. of times																									
					No. of participants																									
		1.2	Philosophy of Gas Turbine Fault Tree Analysis	Plan	No. of times						1																			
					No. of participants						10																			
				Result	No. of times																									
					No. of participants																									
		1.3	Philosophy of Steam Turbine Fault Tree Analysis	Plan	No. of times						1																			
					No. of participants						10																			
				Result	No. of times																									
					No. of participants																									

4. Impressions Regarding the JICA Training

- Ø **The whole training program was well organized and planned. we are enchanted by the program management.**
- Ø **The program is adorned with relevant contents like, Overview of TPP, Vibration analysis, NDT, 5S, RBM, Alignment, Safety etc.**
- Ø **Chance for discussion on various important matters with trainer and among ourselves were very fruitful.**
- Ø **We got some hands-on experience on vibration analysis, alignment, NDT & safety etc. which are very effective for achieving the objectives of these courses.**
- Ø **Several site visit programs were arranged by JICA which were very much helpful to assess the safety, store management, Human resources, 5S, technical processes and so on.**
- Ø **We are very much impressed by the commitment of Kansai and JICA personnel to identify our laggings and to provide guideline to rectify the issues by arranging such informative and relevant training content.**

Thank you for your attention.

Ohkini!!

Action Plan Engineer Group 3

■ **Basic information**

Country	**Bangladesh**
Target TPP	**1. Sirajganj Combined Cycle Power Plant** **2. Khulna 225 MW Conbined Cycle Power Plant**
Name of the Trainers (JICA-trained participants)	**1. Md. Habibur Rahman** **2. Md. Mahmudul Hasan**
Overall goal	**Capacity of O&M of Thermal Power Plants (TPP) is Strengthened**
Project goal	**Training Capacity on O&M of thermal power stations is strengthened**
Subjects	**[Training]** **1. Fault Tree Analysis** **2. Basics of Vibration** **[Activity]** **1. Safety line Marking** **2. Tool box Meeting**

■ **Training**

NO.	Subject		Training course	Purpose	Training Item	Important Points	Trainer	Target Group	Where	How	Tools	Achievements		2019 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	2020 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Remarks
																				Survey ▼																		Survey ▼		
1	Combined Cycle Gas Turbine	1.1	Overview of Combined Cycle Power Plant and its Operational Philosophy	To make clear idea on various parts of combined cycle power plants, operational philosophy, faults associated with it, causes behind the faults and techniques to find the root cause of any faults	1. Introdduction of various parts of combined cycle power plants. 2. Operational philosophy 3. General faults associated in CCGT	To grasp the idea on CCGT and faults associated with it	Md. Habibur Rahman & Md.Mahmudul Hasan	Engineers & Workers	Conference Room	Lecture	Training Materials	Plan	No. of times					1																					
													No. of participants					10																					
												Result	No. of times																										
													No. of participants																										
		1.2	Philosophy of Gas Turbine Fault Tree Analysis	1. To make understand the idea of fault tree annalysis 2. Common problems in gas turbine and steam turbine	1. Fault tree annalysis 2. Common faults in Gas Turbine and steam turbine 3. Root cause of faults 4. Practise session	How to identify the root cause by fault tree annalysis					Training Materials and Practice session	Plan	No. of times					1																					
													No. of participants					10																					
												Result	No. of times																										
													No. of participants																										
		1.3	Philosophy of Steam Turbine Fault Tree Analysis									Plan	No. of times					1																					
													No. of participants					10																					
												Result	No. of times																										
													No. of participants																										
2	Basics of Vibration	2.1	Philosophy of vibration and relationship of hot spot and heavy spot with critical speed	(1) To understand the various types of vibration (2) To identify the cause of vibration (3) To take suitable countermeasures to the cause of vibration (4) To evaluate the result of countermeasure s'	1. Vibration due to unbalance 2. Vibration due to oil whirl 3. Vibration due to misalignment 4. Vibration due to loss of a component''	To understand the relationship of heavy spot and heavy spot with speed	Md. Habibur Rahman & Md.Mahmudul Hasan	Engineers & Workers	Conference Room	Lecture	Training Materials	Plan	No. of times							1																			
													No. of participants							10																		
												Result	No. of times																										
													No. of participants																										
		2.2	Analysis of vibration and reason behind the catagorised vibration			To understand the various reason of vibration						Plan	No. of times							1																			
													No. of participants							10																		
												Result	No. of times																										
													No. of participants																										
		2.3	Understanding of mass balancing with practise solving			Philosophy of mass balancing and techniques to solve the same					Training Materials and Practice session	Plan	No. of times							1																			
													No. of participants							10																		
												Result	No. of times																										
													No. of participants																										

■ **Activity**

NO.	Activity	Purpose	Facilitator	Where	How	Tools	Achievements		2019 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	2020 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Remarks
1	Safety line Marking	To establish the safety line to prevent any hazards	Md. Habibur Rahman & Md.Mahmudul Hasan	1. Sirajganj Combined Cycle Power Plant 2. Khulna 225 MW Combined Cycle Power Plant	1. By dessiminating the idea 2. Convincing the proper authorities	-	Plan	No. of times																												
								No. of participants																												
							Result	No. of times																												
								No. of participants																												
2	Tool box Meeting	To identify the proper procedure, hazards and prevention of accidents	Md. Habibur Rahman & Md.Mahmudul Hasan	1. Sirajganj Combined Cycle Power Plant 2. Khulna 225 MW Combined Cycle Power Plant	Actual work and OJT	1. Tool box meeting chart 2. Proper PPE	Plan	No. of times																												
								No. of participants																												
							Result	No. of times																												
								No. of participants																												

Action Plan

Capacity Building & Strengthening of Thermal Power Generation Operation & Maintenance (Technician)

[Feb.24 – Mar.16 2019]

独立行政法人 国際協力機構

Index

1. Framework of the Program

Confirmation of the project framework

- Bilateral co-operation between the government of Bangladesh & the government of Japan.
- Target Type of Power Generation: Gas Turbine Combined Cycle (GTCC)
- Target Sites: BPDB, EGCB, NWPGCL, APSCL、RPCL & CPGCBL .

Overall goal: Capacity of O&M of Thermal Power Plants (TPP) is strengthened.

Project Goal: Training Capacity on O&M of thermal Power stations is strengthened.

Beneficiaries: Engineers & Technicians who will be core instructors and their trainees.

2. Issue Analysis (1/3)

Purpose

We recognize the current issue referring the ideal situation.
This issue analysis can help us make the Action Plan over what should be enhanced and what should be disseminated by us.

Method of Analysis

We analyzed the ideal conditions for proper maintenance at power plants, with three categories: Human Resources, Material Resources, Institutional Resources.

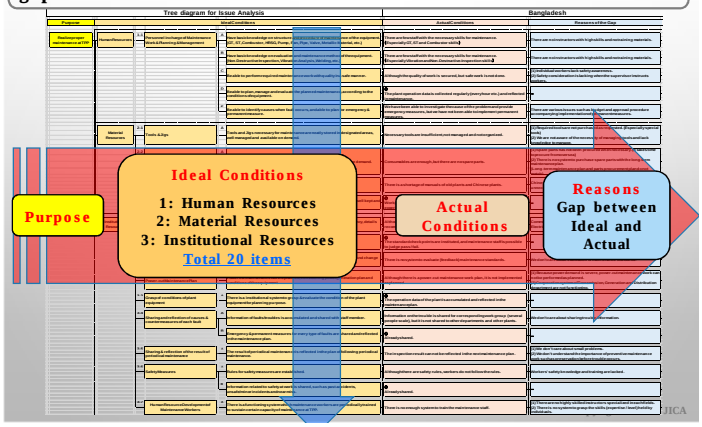
We observed and summarized the reasons of the gap between ideal and actual condition.

Course theme

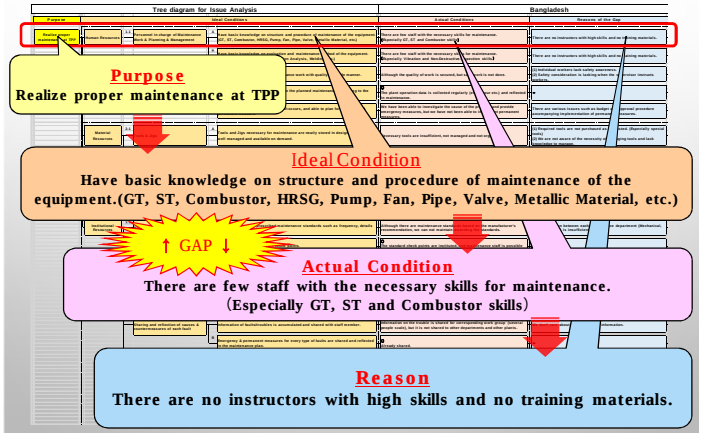
Realization of proper maintenance

2. Issue Analysis (2/3)

We analyzed the Ideal Conditions, Actual Conditions and Reason of gap between ideal and actual condition.



2. Issue Analysis (3/3)



3. Making the Action Plan (1/3)

Action Plan

For the subject (the gap between ideal condition and actual condition)in the issue Analysis, the skill learned through this training or the point noticed through visiting site applied for operating our own power plants

Reason for selecting the Training Subjects

1. We have studied about mechanical equipment including from basic knowledge to trouble and failure.
2. We have realized safety equipment and its proper use help our lives and increase quality of work.

Selected Training Item

1. Overview of the GTCC/ST/HRSG, Pump maintenance, PT/MT
2. Tool Box Meeting(TBM), Industrial and Human Safety, Prevention of Accidents and Disasters

3. Making the Action Plan (2/3)

Ideal Condition

Ø Have basic knowledge on structure and procedure of maintenance of the equipment.
(GT, ST, Combustor, HRSG, Pump, Fan, Pipe, Valve, Metallic Material, etc.)

Actual Condition

Ø There are few staff with the necessary skills for maintenance.
(Especially GT, ST and Combustor skills)

Reason

- There are no instructors with high skills and no training materials.

Training Item

- Pump maintenance
- PT, MT
- Introduction of structural of GTCC, ST, HRSG equipment

3. Making the Action Plan (3/3)

Ideal Condition

Ø Rules for safety measures are established.

Actual Condition

Ø Although there are safety rules, workers do not follow the rules.

Reason

- Workers' safety knowledge and training are lacked.

Training Item

- Tool box meeting (TBM)
- Industrial and human safety
- Prevention of Accidents and Disasters

4. Suggestions and Initiatives

Based on the knowledge gained through JICA training, we propose activities as listed in the following items for realization of proper maintenance of TPP.

ØMaintenance of tools
ØImprovement of maintenance quality
ØTool box meeting (TBM) before actual work

5. Impressions Regarding the JICA Training

Ø All industrial activities in Japan take measures for environmental protection, which is vital for people's health.

Ø Safety zones are set in all plants we visited. Tools are stored in order. We found it is good for safety and quality.

Ø Lectures were conducted in detail, which helped us to understand well.

Ø Lecturers were good at teaching.

Ø It was a precious experience that we saw actual work site of turbine assembly at manufacture's plant.

Ø It was good to know about LNG system in Japan.

Ø Japanese people are careful about time, kind and bright, and full of hospitality.

Ø JICA organizers worked with good team work.

Thank you for your attention.

Ohkini!!

Action Plan Technician Group

■ Basic information

Country	**Bangladesh**
Target TPP	**BPDB, APSCL, NWPGCL, RPCL, EGCB**
Name of the Trainers (JICA-trained participants)	**1. Mr. HOSSAIN Md Alamgir 2. Mr. UDDIN Mohammad Ramiz 3. Mr. RAHMAN Md Bazlur 4. Mr. ISLAM Md Rafiqul 5. Mr. JAHAN Md Sarwar 6. Mr. NOMANY Mohammad Shoaib 7. Mr. KARIM Mohammad Rezaul 8. Mr. FAROQUE Md Omar 9. Mr. SARDAR Md Jakir Hossain 10. Mr. ALI Mohammad Ead**
Overall goal	**Capacity of O&M of Thermal Power Plants (TPP) is Strengthened**
Project goal	**Training Capacity on O&M of thermal power stations is strengthened**
Subjects	**[Training] 1. Maintenance Skill Development 2. Safety training [Activity] 1. Maintenance of tools 2. Improvement of maintenance quality 3. Tool box meeting (TBM) before actual work**

■ Training

NO.	Subject		Training course	Purpose	Training Item	Important Points	Trainer	Where	How	Tools	Achievements		2019 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	2020 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Remarks
1	Maintenance Skill Development	1-1	Pump Maintenance	(1)To understand the basic structure and function of pumps (2)To be able to disassemble and assemble pumps with correct procedure ina safe manner (3)To understand the important checkpoints for pump centering (4)To be able to check and adjust with proper measuring (5)To carry out preventive maintenance	1. Structure of different types of pump 2. Maintenance Contents of pump 3. Maintenance Training of pump	・Basic structure and function of different types of pump ・How to proceed pump maintenance (e.g. isolation, preparation, disassembly , inspection, observation, cleaning) ・How to ensure quality during maintenance work (inspection measures and checkpoints)	JICA trained Participant	TPP	Lacture and OJT	Manufacturer's Manuals and Text books provided by JICA	Plan	No. of times							1			1																	
												No. of participants						10			10																	
											Result	No. of times																										
												No. of participants																										
		1-2	Basics of Non-Destructive Inspection (PT/MT) Skills	(1)To be able to determine which NDI methods to take, depending on the base material and failure condition (2)To be able to properly carry out following NDI procedure while ensuring safety - Preparation - Inspection - Observation - Cleaning	1.PT 2.MT	・Features and mechanism of each NDI methods (e.g. pros and cons, applicable condition) ・How to select suitable NDI methods ・How to proceed pump maintenance (e.g. preparation, inspection, observation, cleaning) ・How to prevent NDI accidents ・How to evaluate the result and record them for ensuring quality	JICA trained Participant	TPP	Lacture and OJT	Manufacturer's Manuals and Text books provided by JICA	Plan	No. of times					1		1																				
												No. of participants					10		10																			
											Result	No. of times																										
												No. of participants																										
		1-3	Abstract and Structure of GTCC, GT, ST, HRSG and GT Hot Parts	(1)To be able to explain the structure and function of GTCC, GT, HRSG and GT Hot Parts (2)To be able to properly implement maintenance of GTCC main equipment	1. Structure of Equipment 2. Maintenance Contents of Equipment 3. Preventive Maintenance Contents of Equipment 4. Equipment Trouble Case Study	・What is the basic structure of GTCC main equipment and how it functions ・Expected failures (weak points) ・How to prevent GTCC main equipment trouble (e.g. creep and fatigue of GT hot parts)	JICA trained Participant	TPP	Lacture and OJT	Manufacturer's Manuals and Text books provided by JICA	Plan	No. of times								1				1															
												No. of participants								10				10													
											Result	No. of times																										
												No. of participants																										
2	Safety training	2-1	Tool box meeting (TBM)	(1) To understand the importance of the Tool Box Meeting (TBM) (2) To be able to facilitate the TBM	1. Theory of TBM 2. Practical training on using TBM board	・Why do we run the TBM ・Procedure of TBM	JICA trained Participant	TPP	Lacture and OJT	Text books provided by JICA	Plan	No. of times				1								1													
												No. of participants				10								10													
											Result	No. of times																										
												No. of participants																										
		2-2	Industrial and human safety	(1) To understand the importance of personnel and equipment safety (2) To be able to properly use safety equipment ready for emergency situations	1.ladder 2.safety belt 3.electric shock 4.be caught by rotation 5.helmet	・How slight dangerous situations cause serious accidents ・How to motivate workers for ensuring safety ・How to check the surrounding safety ・How to prevent accidents at workplace (e.g. putting helmet on always)	JICA trained Participant	TPP	Lacture and OJT	Manufacturer's Manuals and Text books provided by JICA	Plan	No. of times								1				1															
												No. of participants								10				10													
											Result	No. of times																										
												No. of participants																										
		2-3	Prevention of Accidents and Disasters	(1) To understand the importance of personnel and equipment safety (2) To be able to properly use safety equipment ready for emergency situations	1.ladder 2.safety belt 3.electric shock 4.be caught by rotation 5.helmet	・How slight dangerous situations cause serious accidents ・How to motivate workers for ensuring safety ・How to check the surrounding safety ・How to prevent accidents at workplace (e.g. putting helmet on always)	JICA trained Participant	TPP	Lacture and OJT	Manufacturer's Manuals and Text books provided by JICA	Plan	No. of times					1		1																				
												No. of participants					10		10																			
											Result	No. of times																										
												No. of participants																										

■ Activity

NO.	Activity	Purpose	Important Points	Facilitator	Where	How	Tools	Achievements		2019 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	2020 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Remarks
1	Maintenance of tools	Proper management of tools	1. Implementation of 5S 2. To store all kind of tools at dessignened area 3. To put ID number for each tool 4. To record store address (register book)	JICA trained Participant	TPP	Actual work and OJT	-	Plan	No. of times																										
									No. of participants																										
								Result	No. of times																										
									No. of participants																										
2	Improvement of maintenance quality	Improve work quality by evaluate work results	1. To work as per guide manual 2. To use proper maintenance tools 3. To check the quality of actual work and express appreciation	JICA trained Participant	TPP	Actual work and OJT	-	Plan	No. of times																										
									No. of participants																										
								Result	No. of times																										
									No. of participants																										
3	Tool box meeting (TBM) before actual work	All workers reach common ground of the work detail and the hazards associated with the work	1. All workers join TBM 2. Facilitat the meeting to make sure all participants express their opinion	JICA trained Participant	TPP	Actual work and OJT	-	Plan	No. of times																										
									No. of participants																										
								Result	No. of times																										
									No. of participants																										

(3)　第 3 回本邦研修員作成のアクションプラン

Action Plan

Capacity Building & Strengthening of Thermal Power Generation Operation & Maintenance (Engineer Group 1) [Nov.17 – Dec.21 2019]

独立行政法人 国際協力機構

Index

1. Framework of the Program

Confirmation of the project framework

- Bilateral co-operation between the government of Bangladesh & the government of Japan.
- Target Type of Power Generation: Gas Turbine Combined Cycle (GTCC)
- Target Sites: BPDB, EGCB, NWPGCL, APSCL, RPCL & CPGCBL

Overall goal: Capacity of O&M of Thermal Power Plants (TPP) is strengthened.

Project Goal: Training Capacity on O&M of thermal power stations is strengthened.

Beneficiaries: Engineers & Technicians who will be core instructors and their trainees.

2. Issue Analysis (1/3)

Purpose

Realize proper maintenance at TPP

Method of Analysis

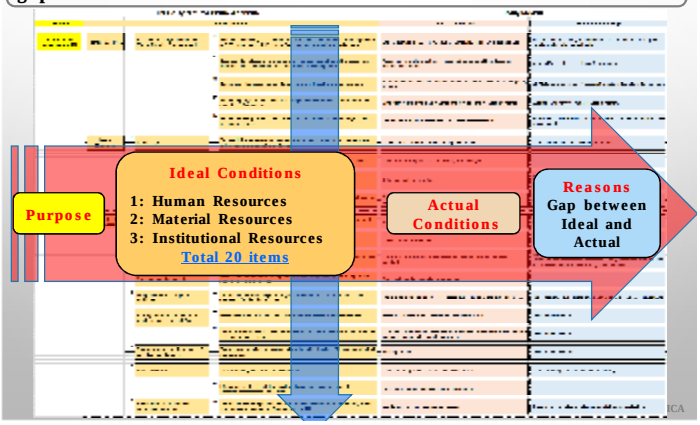
Tree Diagram for Issue Analysis

Course theme

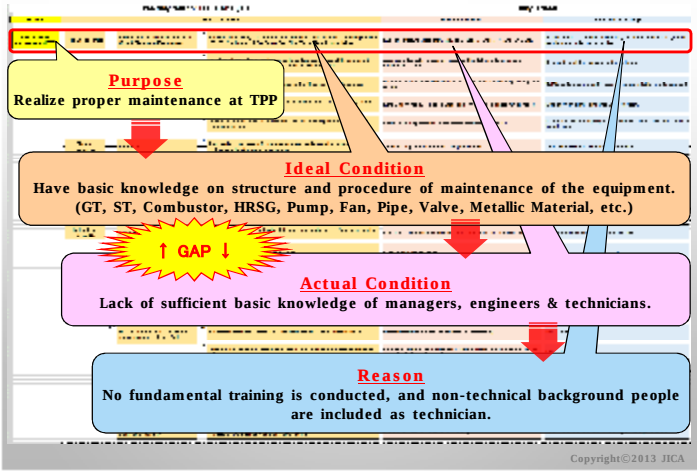
Realization of proper maintenance

2. Issue Analysis (2/3)

We analyzed the Ideal Conditions, Actual Conditions and Reason of gap between ideal and actual condition.



2. Issue Analysis (3/3)



3. Making the Action Plan

Reason for making the Action Plan

Disseminate the useful training lessons to respective TPPs to strengthen the Operation & Maintenance of TPPs.

Action Plan

1. **Training for technical personnel on TPP :**
   - Ø Basic of Vibration
   - Ø Pump Alignment (Centering)
   - Ø Experience-based Safety Training
   - Ø Tool Box Meeting (TBM)
2. **Activity on actual work**
   - Ø Tool Box Meeting (TBM)

3-1. Training for technical personnel on TPP (1/3)

Training Item

1. Basic of Vibration
2. Pump Alignment (Centering)

Ideal Condition

Have basic knowledge on evaluation and maintenance method of the equipment. (Non-Destructive Inspection, Vibration Analysis, Welding etc.)

Actual Condition

Absence of formal evaluation process

Reason

Limitation of knowledge on evaluation process & maintenance method

3-1. Training for technical personnel on TPP (2/3)

Training Item

Experience-based Safety Training

Ideal Condition

Rules for safety measures are established

Actual Condition

Rules for safety measures are partially established

Reason

Lack of training, supervision and monitoring

3-1. Training for technical personnel on TPP (3/3)

Training Item

Tool Box Meeting (TBM)

Ideal Condition

Be able to perform required maintenance work with quality in a safe manner.

Actual Condition

Required maintenance work is done but not in accordance with proper quality & safety.

Reason

Lack of evaluation and absence of TBM.

3-2. Activity on actual work (1/1)

Activity Item

Tool Box Meeting (TBM)

Ideal Condition

Be able to perform required maintenance work with quality in a safe manner.

Actual Condition

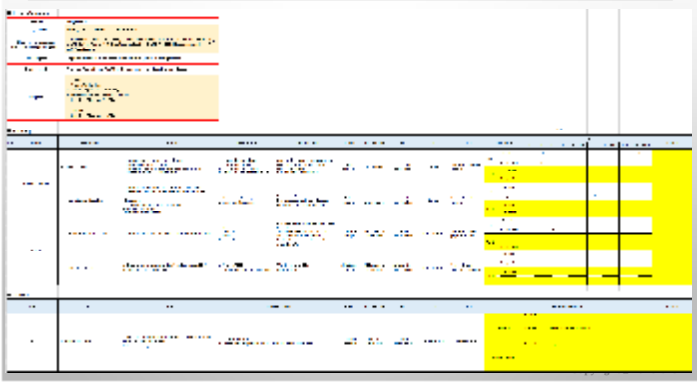
Required maintenance work is done but not in accordance with proper quality & safety.

Reason

Lack of evaluation and absence of TBM.

3-3. Making the Action Plan Format

We made the detail Action Plan (including schedule, magnitude, frequency etc.) as below. This format will be utilized to record our activities and report to JICA Expert Team.



4. Suggestions and Initiatives

A training will be effective if it is conducted in both theoretical & practical means with well equipped facilities. A training comprises only theoretical means is not enough to be effective. Effective training should comprises of theoretical part & applicable practical exercises.

To strengthen the training capacity on O&M & to ensure effective training, well equipped training facilities such as pump alignment facility, vibration analysis facility, exhibition hall for the accidents & dissemination platform among the TPPs' etc. need to be established.

Initiatives are required from the management end to establish well equipped training centers & more emphasis should be given on 'Effective Training'.

5. Impressions Regarding the JICA Training

We are grateful to JICA for giving us the opportunity to take part on training to strengthen the training facility on O&M of TPPs' of Bangladesh. JICA arranged the training very successfully & we are very much cordial to disseminate the lessons learned from the training.

Finally, Big Thanks to JICA for thinking about the Power Sector Capacity Development of Bangladesh. We hope that the program will be continued & JICA will be helping us as they are doing.

5. Individual Impressions Regarding the JICA Training (1/3)

1. Md. Atiqur Rahman (BPDB)

At first, I would like to thanks JICA for selecting me as a participant of this program. This program is absolutely helpful for me as well as for my country. I have learnt many things from this course. I shall try my level best to disseminate my experience gathered from JICA.I hope JICA will continue this program for the engineers of Bangladesh. Live long JICA.

2. Mahbubur Rahman (BPDB)

The training at JICA is very useful to us. I hope that the practical parts of this training will be more helpful to us than theoretical parts. Afterall thanks to JICA for arranging such type of training.

3. Md. Obidul Muktadir Adit (APSCL)

The counterpart Training arranged by JICA on capacity development for maintenance of thermal power stations, Bangladesh is beneficial for us. This is bilateral cooperation between the government of Bangladesh & government of Japan. So i am grateful to Bangladesh government & JICA for selecting me as participant in this training program. After completion of the training i am very optimistic that the overall goal can be achieved entirely. Because it accomplished all the effective training methods.

4. Md. Julhas Uddin (APSCL)

Training arrangement by JICA was very much excellent. From training I have learned how to analysis a problem & how to solve it in a proper way. It will be helpful to teach others. During training period I also learned Discipline, punctuality, time maintain, responsibility & Manner. All of these things make a positive sense to implement training goal. Best of Luck JICA.

5. Individual Impressions Regarding the JICA Training (2/3)

5. Pijush Bhattacharjee (NWPGCL)

I've learned many useful lessons from the training and I'm thankful to JICA for arranging the training and selected me as a participant. Apart from the training, I've learned many things such as Punctuality, Discipline, Cleanliness, Helpful & Cordial behavior of Japanese People etc. from the Japanese culture and Japanese people. These things definitely will play a vital role in my future life. In this sense, I can say that it is a lifetime learning for me and JICA gave me the opportunity to learn. Actually, no worlds will be enough to express my gratitude to JICA and many thanks JICA & all of the facilitators of the training program.

6. Mohammad Kowser (CPGCBL)

I have benefited a lot because JICA gives the opportunities to learn the basic theory with hands on experience of very basics Mechanical Maintenance Works.
I would like to offer my gratitude to JICA and the Personnel of Ibaraki Training Centre for give me a cordial environment and open Hearted Expression so that we can easily share our lagging and confusion and solved that accordingly

7. Md. Shahidul Islam Mazumdar (EGCB)

I had a dream to be a trainee of JICA training and to observe the Japanese techniques of technological development. A lot of thanks to JICA to give me the opportunity to true my dream and I have learnt a lot of things about Japanese techniques of development, especially about upgrade maintenance procedure of TPP. I am very much impressed to the discipline and punctuality everywhere. People are very helpful and respect to each other.

5. Individual Impressions Regarding the JICA Training (3/3)

8. Md. Nurul Islam (RPCL)

I am very pleased to attend the JICA training program of capacity building and strengthening of thermal power generation and operation. Overall training program such as issue analysis training schedule, training material, training system of both lecture and practical session, action plan making were helpful to me. The behavior and etiquette of the JICA training team was very cordial. I think this training program and visit in Japan will be the example in my future life.

Thank you for your attention.

■ Basic information

Country	**Bangladesh**
Target TPP	**BPDB, APSCL, NWPGCL, EGCB & RPCL**
Name of the Trainers (JICA-trained participants)	**1. Mohammad Atiqur Rahman, 2. Mahbubur Rahman, 3. Md. Obidul Muktadir Adit, 4. Md. Julhas Uddin, 5. Pijush Bhattacharjee, 6. Md. Shahidul Islam mazumder & 7. Md. Nurul Islam**
Overall goal	**Capacity of O&M of Thermal Power Plants (TPP) is strengthened.**
Project goal	**Training Capacity on O&M of thermal power stations is strengthened.**
Subjects	**[Training]** **1. Basic of Vibration** **2. Pump Alignment (Centering)** **3. Experience-based Safety Training** **4. Tool Box Meeting (TBM)** **[Activity]** **1. Tool Box Meeting (TBM)**

■ Training

Survey ▼

No.	Subject	Training course		Purpose	Training Item	Important Points	Trainer	Target Group	Where	How	Tools	Achievements		2020 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Remarks
1	Mechanical Maintenance	1-1	Basic of Vibration	1. To understand the various types of vibration 2. To identify the cause of vibration 3. To take suitable countermeasures to the cause of vibration 4. To evaluate the result of countermeasures	1. Vibration due to unbalance 2. Vibration due to oil whirl 3. Vibration due to misalignment 4. Vibration due to loss of a component	・How vibration occurs in rotating equipment ・How to analyze the vibration diagrams ・How to investigate the cause ・How to take the countermeasures	JICA tained Participant	All Engineers	At Respective TPPs / Offices	Lecture	Text book, Laptop and projector	Plan	No. of times			1									1	
													No. of participants		15									15	
												Result	No. of times												
													No. of participants												
		1-2	Pump Alignment (Centering)	1. To understand how alignment works through video training 2. To be able to properly plan, implement and supervise following alignment procedure - Preparation - Measurement and recording of misalignment - Calculation of centering - Implementation of centering	1. Measurement of misalignment 2. Centering implementation	・How alignment works ・How to implement and record alignment ・Checkpoints during alignment (centering)	JICA tained Participant	Mechanical Engineers & Technicians	At Respective TPPs / Offices	Lecture	Text book, Laptop and projector	Plan	No. of times							1						
													No. of participants							15						
												Result	No. of times												
													No. of participants												
2	General	2-1	Experience-based Safety Training	1. To understand the importance of labor safety and equipment safety	1. Ladder 2. Safety belt 3. Helmet 4. Weight lifting	・How slight dangerous situations cause serious accidents ・Why we need to ensure safety and how ・Why we need to put helmet always ・What are the check points to ensure the surrounding safety	JICA tained Participant	All Engineers & Technicians	At Respective TPPs / Offices	Lecture & Practice	Text book, Laptop, projector and PPEs'	Plan	No. of times			1										
													No. of participants			20									
												Result	No. of times												
													No. of participants												
		2-2	Tool Box Meeting (TBM)	1. To understand the importance of the Tool Box Meeting (TBM) 2. To be able to facilitate the TBM	1. Theory of TBM 2. Practical training on using TBM board	・Why do we run the TBM ・Procedure of TBM	JICA tained Participant	All Engineers & Technicians	At Respective TPPs / Offices	Lecture & Practice	Text book, Laptop, projector & TBM Board	Plan	No. of times	1												
													No. of participants	20											
												Result	No. of times												
													No. of participants												

■ Activity

No.	Activity	Purpose	Important Points	Facilitator	Target Group	Where	How	Tools	Implementation status		Remarks
1	Tool Box Meeting (TBM)	1. All workers have common understanding of the work detail and the hazards associated with the work 2. To ensure quality work in a safe manner	1. All workers join TBM 2. Facilitate the meeting to make sure all participants express their opinion	JICA tained Participant	Engineers & Technicians	At Respective TPPs / Offices	Before actual work	TBM Chart / Board	Implemented	(1) Effect implemented (2) Suggestions of measures to continue and improve	
									Not implemented	(1) How to be able to implement	

Action Plan

Capacity Building & Strengthening of Thermal Power Generation Operation & Maintenance (Engineer Group 2 (CPGCBL)) [Nov.17 – Dec.21 2019]

独立行政法人 国際協力機構

Index

1. Framework of the Program

Confirmation of the project framework

- Bilateral co-operation between the government of Bangladesh & the government of Japan.
- Target Type of Power Generation: Gas Turbine Combined Cycle (GTCC)
- Target Sites: BPDB, EGCB, NWPGCL, APSCL, RPCL & CPGCBL

Overall goal: Capacity of O&M of Thermal Power Plants (TPP) is strengthened.

Project Goal: Training Capacity on O&M of thermal power stations is strengthened.

Beneficiaries: Engineers & Technicians who will be core instructors and their trainees.

2. Issue Analysis (1/3)

Purpose

Realize proper maintenance at TPP

Method of Analysis

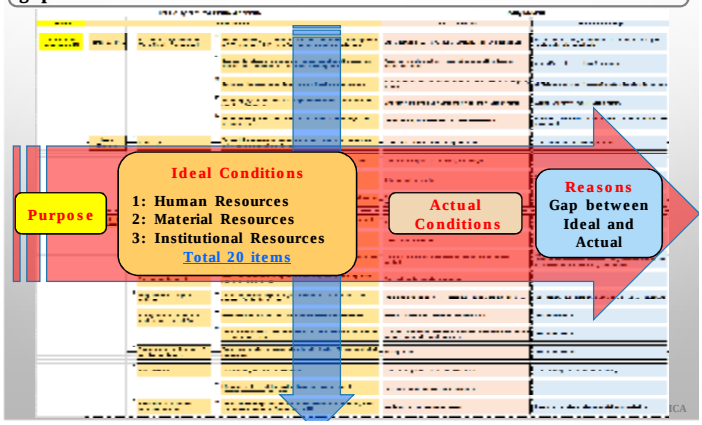
Tree Diagram for Issue Analysis

Course theme

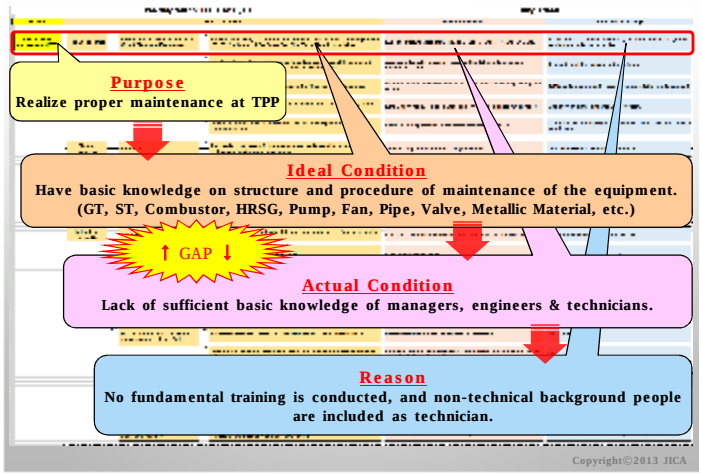
Realization of proper maintenance

2. Issue Analysis (2/3)

We analyzed the Ideal Conditions, Actual Conditions and Reason of gap between ideal and actual condition.



2. Issue Analysis (3/3)



3. Making the Action Plan

Reason for making the Action Plan

Disseminate the useful training lessons to respective TPPs to strengthen the Operation & Maintenance of TPPs.

Action Plan

1. **Training for technical personnel on TPP :**
   - Pump Alignment (Centering)
   - Experience-based Safety Training
   - Tool Box Meeting (TBM)
   - Heat Efficiency Management
   - Overview of Coal Fired Thermal Power Plant
2. **Activity on actual work**
   - Tool Box Meeting (TBM)

3-1. Training for technical personnel on TPP (1/5)

Training Item

1. Pump Alignment (Centering)

Ideal Condition

Have basic knowledge on evaluation and maintenance method of the equipment. (Non-Destructive Inspection, Vibration Analysis, Welding etc.)

Actual Condition

Absence of formal evaluation process

Reason

Limitation of knowledge on evaluation process & maintenance method

3-1. Training for technical personnel on TPP (2/5)

Training Item

Experience-based Safety Training

Ideal Condition

Rules for safety measures are established

Actual Condition

Rules for safety measures are partially established

Reason

Lack of training, supervision and monitoring

3-1. Training for technical personnel on TPP (3/5)

Training Item

Tool Box Meeting (TBM)

Ideal Condition

Be able to perform required maintenance work with quality in a safe manner.

Actual Condition

Required maintenance work is done but not in accordance with proper quality & safety.

Reason

Lack of evaluation and absence of TBM.

3-1. Training for technical personnel on TPP (4/5)

Training Item

Heat Efficiency Management

Ideal Condition

1. **Be able to Monitor, analyze, and search the cause if necessary and take appropriate counter measure against the cause.**

Actual Condition

1. **Analysis is done but No Root Cause Analysis of Heat Efficiency Degradation and counter action Measure.**

Reason

1. **RCA (Root Cause Analysis) is not conducted due to time restrictions like high Demand.**
2. **No Institutional system like RBM (Risk Base Management) to grasp the actual condition of plant equipments.**

3-1. Training for technical personnel on TPP (5/5)

Training Item

Overview of Coal Fired Thermal Power Plant

Ideal Condition

1. **Having Basic knowledge on structure and Latest Technology of Maintenance Operation of Coal Based thermal Power Plant**

Actual Condition

1. **Lack of sufficient basic knowledge of Managers, Engineers and Technicians.**

Reason

1. **There is only one Coal based Thermal Power Plant in Bangladesh. So Coal based Maintenance oriented Knowledge is hardly developed.**
2. **USC Technology is state of the Art Technology in Bangladesh. So not sufficient skill and Knowledge based Manpower on this field developed yet.**

3-2. Activity on actual work (1/1)

Activity Item

Tool Box Meeting (TBM)

Ideal Condition

Be able to perform required maintenance work with quality in a safe manner.

Actual Condition

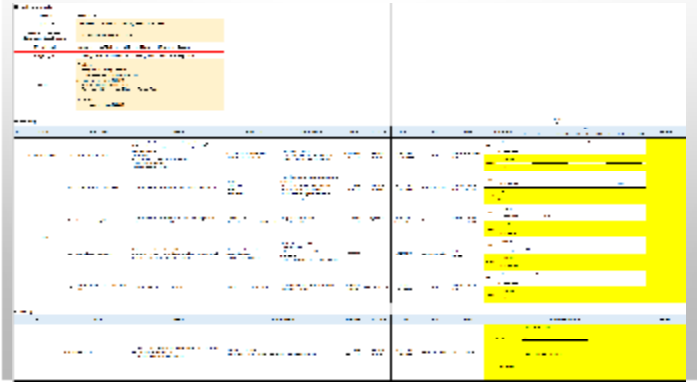
Required maintenance work is done but not in accordance with proper quality & safety.

Reason

Lack of evaluation and absence of TBM.

3-3. Making the Action Plan Format

We made the detail Action Plan (including schedule, magnitude, frequency etc.) as below. This format will be utilized to record our activities and report to JICA Expert Team.



4. Suggestions and Initiatives

Effective training should comprises of theoretical part & applicable practical exercises.

So with a hand on Experience with theoretical learning might be very fruitful and effective as we experienced in Ibaraki Training Centre, Japan.

So we suggest the proper authority for take initiative on these following regards:

- **An Exhibition Hall for every accident recorded in Information and photo format so that others can be conscious about the risk and necessary action measures before Accident.**
- **A Training Facility with proper Theoretical and Hands on Experience basis facility with some basic Mechanical Maintenance facility like Pump Alignment (Centering), Mechanical Vibration, Power Plant Simulator etc.**

5. Impressions Regarding the JICA Training

I have benefited a lot because JICA gives the opportunities to learn the basic theory with hands on experience of very basics Mechanical Maintenance Works.

I would like to offer my gratitude to JICA and the Personnel of Ibaraki Training Centre for give me a cordial environment and wholehearted expression so that we can easily share our laggings and confusion and solved that accordingly.

Thank you for your attention.

■ Basic information

Country	**Bangladesh**
Target TPP	**Coal Power Generation Company Bangladesh Limited**
Name of the Trainers (JICA-trained participants)	**Mohammad Kowser (CPGCBL)**
Overall goal	**Capacity of O&M of Thermal Power Plants (TPP) is strengthened.**
Project goal	**Training Capacity on O&M of thermal power stations is strengthened.**
Subjects	**[Training]** **1. Pump Alignment (Centering)** **2. Experience-based Safety Training** **3. Tool Box Meeting (TBM)** **4. Heat Efficiency Management** **5. Overview of Coal Fired Thermal Power Plant** **[Activity]** **1. Tool Box Meeting (TBM)**

■ Training

Survey ▼

No.	Subject	Training course		Purpose	Training Item	Important Points	Trainer	Target Group	Where	How	Tools	Achievements		2020 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Remarks
1	Mechanical Maintenance	1-1	Pump Alignment (Centering)	1. To understand how alignment works through video training 2. To be able to properly plan, implement and supervise following alignment procedure - Preparation - Measurement and recording of misalignment - Calculation of centering - Implementation of centering	1. Measurement of misalignment 2. Centering implementation	・How alignment works ・How to implement and record alignment ・Checkpoints during alignment (centering)	JICA trained Participant	Engineers & Technicians	At Respective TPPs / Offices	Lecture	Text book, Laptop and projector	Plan	No. of times							1						
													No. of participants							6-10						
												Result	No. of times													
													No. of participants													
2	General	2-1	Experience-based Safety Training	1. To understand the importance of labor safety and equipment safety	1. Ladder 2. Safety belt 3. Helmet 4. Weight lifting	・How slight dangerous situations cause serious accidents ・Why we need to ensure safety and how ・Why we need to put helmet always ・What are the check points to ensure the surrounding safety	JICA trained Participant	Engineers & Technicians	At Respective TPPs / Offices	Lecture & Practice	Text book, Laptop, projector and PPEs'	Plan	No. of times										1				
													No. of participants										6-10			
												Result	No. of times													
													No. of participants													
		2-2	Tool Box Meeting (TBM)	1. To understand the importance of the Tool Box Meeting (TBM) 2. To be able to facilitate the TBM	1. Theory of TBM 2. Practical training on using TBM board	・Why do we run the TBM ・Pincedure of TBM	JICA trained Participant	Engineers & Technicians	At Respective TPPs / Offices	Lecture & Practice	Text book, Laptop, projector & TBM Board	Plan	No. of times			1											
													No. of participants			6-10										
												Result	No. of times													
													No. of participants													
		2-3	Heat Efficiency Management	1. To be able to Monitor the Heat Efficiency. 2. To be able to analyze the monitoring record and search the cause if necessary and take appropriate counter measure	1. Definition of the heat efficiency 2. Monitoring points 3. Analysis and cause means	・What is the Heat Efficiency ・How to measure ・What may cause the heat Efficiency Degradation. ・How to analyze and improve the heat Efficiency.	JICA trained Participant	Engineers & Technicians	At Respective TPPs / Offices	Lecture & Practice	Text book, Laptop, projector.	Plan	No. of times	1													
													No. of participants	6-10												
												Result	No. of times													
													No. of participants													
		2-4	Overview of Coal Fired Thermal Power Plant	1. To Grasp Coal Based Latest Technology	1. Outline of CFPP Overall system	・The latest Structure of CFPP and the latest Environment Equipment	JICA trained Participant	Engineers & Technicians	At Respective TPPs / Offices	Lecture	Text book, Laptop, projector.	Plan	No. of times		1											
													No. of participants		6-10											
												Result	No. of times													
													No. of participants													

■ Activity

No.	Activity	Purpose	Important Points	Facilitator	Target Group	Where	How	Tools	Implementation status		Remarks
1	Tool Box Meeting (TBM)	1. All workers have common understanding of the work detail and the hazards associated with the work 2. To ensure quality work in a safe manner	1. All workers join TBM 2. Facilitate the meeting to make sure all participants express their opinion	JICA trained Participant	Engineers & Technicians	At Respective TPPs / Offices	Before actual work	TBM Chart / Board	Implemented	(1) Effect implemented (2) Suggestions of measures to continue and improve	
									Not implemented	(1) How to be able to implement	

Action Plan

Capacity Building & Strengthening of Thermal Power Generation Operation & Maintenance (Technician)

[Nov.17 – Dec.14 2019]

独立行政法人 国際協力機構

Index

1. Framework of the Program

Confirmation of the project framework

- Bilateral co-operation between the government of Bangladesh & the government of Japan.
- Target Type of Power Generation: Gas Turbine Combined Cycle (GTCC)
- Target Sites: BPDB, EGCB, NWPGCL, APSCL, RPCL & CPGCBL

Overall goal: Capacity of O&M of Thermal Power Plants (TPP) is strengthened.

Project Goal: Training Capacity on O&M of thermal power stations is strengthened.

Beneficiaries: Engineers & Technicians who will be core instructors and their trainees.

2. Issue Analysis (1/3)

Purpose

The purpose of issue analysis is to examine the difference between the ideal condition and the actual condition in order to perform effective maintenance. This will help us find the issue. And think about actions to solve the issue.

Method of Analysis

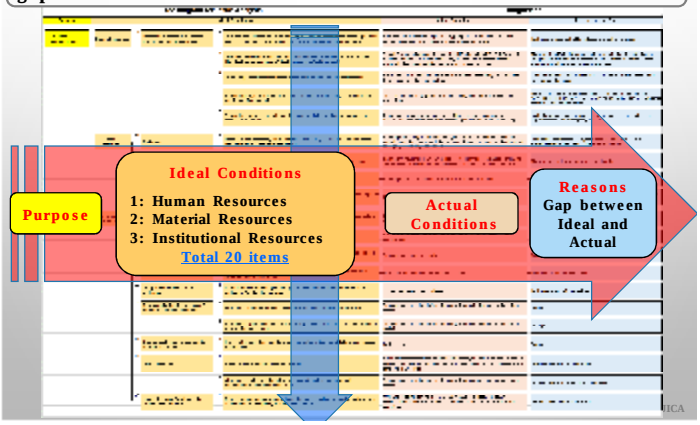
We analyzed the ideal conditions for proper maintenance at power plants, with three categories: Human Resources, Material Resources, Institutional Resources.
We observed and summarized the reasons of the gap between ideal and actual condition.

Course theme

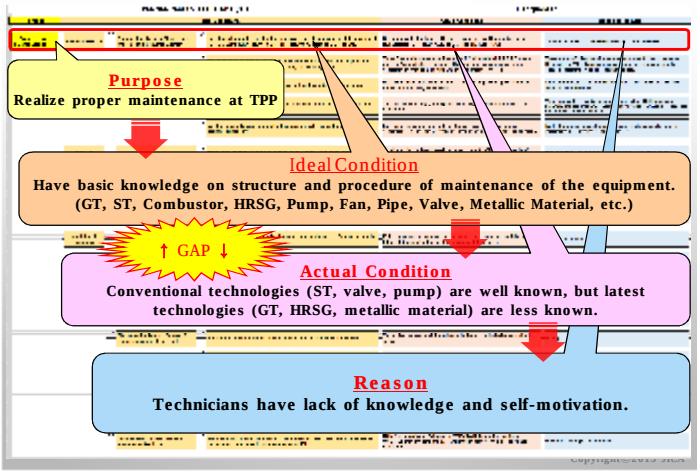
Realization of proper maintenance

2. Issue Analysis (2/3)

We analyzed the Ideal Conditions, Actual Conditions and Reason of gap between ideal and actual condition.



2. Issue Analysis (3/3)



3. Making the Action Plan

Reason for making the Action Plan

Build efficient human resources by sharing what we have learned through training for ideal power plant maintenance. And move the country towards development.

Action Plan

1. Training for workers on TPS
   i. Pump maintenance
   ii. Features of Non Destructive Inspection
   iii. Welding Education
2. Activity on actual work
   i. Tool Box Meeting before actual work.

3-1. Training for workers on TPS (1/2)

Ideal Condition

Have basic knowledge and procedure of maintenance of pump and welding.

Actual Condition

Pump maintenance and welding are less known.

Reason

Technicians have lack of knowledge, practical training and self motivation.

Training Item

1-i. Pump Maintenance and alignment
1-iii. Welding education

3-1. Training for workers on TPS (2/2)

Ideal Condition

Have basic knowledge on evaluation and maintenance method of the equipment (NDI, Vibration).

Actual Condition

Visual testing is implemented but NDI (PT, MT, UT, RT) are not done by plant technicians. They are done by 3rd party experts especially in case of high temperature and pressure system.

Reason

Practical training and tools are insufficient.

Training Item

1-ii. Features of Non destructive inspection

3-2. Activity on actual work

Ideal Condition

Information related to safety at work is shared, such as past accidents, unsafe/minor incidents and near miss.

Actual Condition

Technician get accident & disaster information by verbal.

Reason

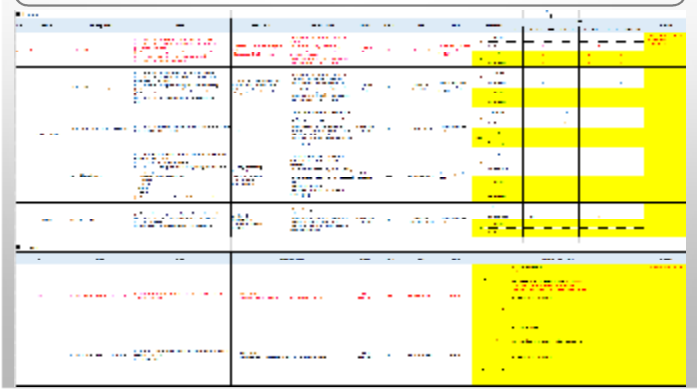
Accident Information sharing with written documents we are not used to.

Activity

2-i. TBM (Tool Box Meeting) before actual work

3-3. Making the Action Plan Format

We made the detail Action Plan (including schedule, magnitude, frequency etc.) as below. This format will be utilized to record our activities and report to JICA Expert Team.



4. Suggestions and Initiatives

(When)
When technicians implement trainings and activities at their power plant

(Who)
Boss (Engineer, Management)

(What)
Collect trainees, provide rooms, provide teaching materials, praise for improvement of motivation (e.g. thanks letter)

5. Impressions Regarding the JICA Training (1/2)

Ø **Akber**

I was impressed by that Japanese is very punctual, and I understood the welding process in Japan. I am eye opened in various meaning. I can do my welding work with welding procedure in Japanese style. That would be help to reduce small accidents and failures. I also understood that time management is important.

Ø **Rabiul**

JICA program is very splendid. I can understand easily trainer give us training after lecture. Thank to trainers that they give us helpful hands to work with machine, so that it make me happy. Japan is island country but was impressed by beautiful scenery and mountains and sea are all beautiful.

Ø **Sazzad**

All about Japan is brilliant, especially Japanese manner and attitude. We have to learn these nature. I will never forget these things in my lifetime.

Ø **Manirul**

I was impressed by that Japanese is very punctual, it could be help doing excellent works. Japanese study about work procedure with manuals in their hands before actual works. There are many newest tools and jigs in the work place in Japan. Unfortunately, we don't have enough tools.

5. Impressions Regarding the JICA Training (2/2)

Ø **Hai**

I was impressed by that Japanese culture and hospitality and punctuality and clearness. It is wonderful how to train and to analyze by Japanese trainers. To study about work procedure with manuals in their hands before actual works. There are many newest tools and jigs in the work place in Japan.

Ø **Taibur**

The Bangladesh government and JICA have made a great training. Thank you from the bottom of my heart. This training brings up good engineers. It is important to implement here in Japan.

Ø **Barman**

The training facility were in place and it was great. It was easy to understand how to teach while showing.

Ø **Syed**

I felt Japanese high technology. Also how to teach the Techno-Center was great. Especially, the teaching of practical skills was great. If quality maintenance like Japan is possible, we can do better work in Bangladesh.

Thank you for your attention.

■ Basic information

Country	**Bangladesh**
Target TPP	**BPDB, APSCL, NWPGCL, RPCL, EGCB**
Name of the Trainers (JICA-trained participants)	**1. Mr. ALI Md Akber　2. Mr. ALAM Md Rabiul 3. Mr. HOSSEN Md Sazzad　4. Mr. ISLAM Md Manirul 5. Mr. HAI Biswas Mohammad Abdul　6. Mr. RAHMAN Md Taibur 7. Mr. BARMAN Bany Madab　8. Mr. SYED Md Abu**
Overall goal	**Capacity of O&M of Thermal Power Plants (TPP) is strengthened.**
Project goal	**Training Capacity on O&M of thermal power stations is strengthened.**
Subjects	**[Training] 1. Pump Maintenance & Alignment 2. Features of Non Destructive Inspection 3. Welding Education 4. Safety Training [Activity] 1. Tool Box Meeting**

■ Training

Survey ▼

NO.	Subject		Training course	Purpose	Training Item	Important Points	Trainer	Where	How	Tools	Achievements		2020 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Remarks
(ex.)	Mechanical Maintenance	ex.	Pump Maintenance	(1) To understand the basic structure and function of pumps (2) To be able to disassemble and assemble pumps with correct procedure in a safe manner (3) To understand the important checkpoints for pump centering (4) To be able to check and adjust with proper measuring (5) To carry out preventive maintenance	1. Structure of different types of pump 2. Maintenance Contents of pump 3. Maintenance Training of pump	・Basic structure and function of different types of pump ・How to proceed pump maintenance (e.g. isolation, preparation, disassembly, inspection, observation, cleaning) ・How to ensure quality during maintenance work (inspection measures and checkpoints)	JICA trained Participant	TPP	Lacture and OJT	Manufacturer's Manuals and Text books provided by JICA	Plan	No. of times			1					1					> Photograph when training > Training report > Attendance list
												No. of participants			10					10					
											Result	No. of times			1				1			1			
												No. of participants			10				5			10			
1	Mechanical Maintenance	1-1	Pump Maintenance & Alignment	(1) To understand the basic structure and function of pumps. (2) To be able to disassemble and assemble pumps with correct procedure in a safe manner. (3) To understand the important checkpoints for pump centering. (4) To be able to check and adjust with proper measuring. (5) To carry out preventive maintenance. (6) To be able to pump alignment with correct procedure in a safe manner.	1. Structure of different types of pump 2. Maintenance Contents of pump 3. Maintenance Training of pump 4. Pump Alignment	・Basic structure and function of different types of pump(e.g. Impeller, casing, Bearing) ・How to proceed pump maintenance (e.g. isolation, preparation, disassembly, inspection, observation, cleaning) ・How to ensure quality during maintenance work (inspection measures and checkpoints)	JICA trained Participant	TPP	Lacture and On the Job Training	Manufacturer's Manuals and Text books provided by JICA	Plan	No. of times			1							1		
												No. of participants			10							10			
											Result	No. of times													
												No. of participants													
		1-2	Features of Non Destructive Inspection	(1) To be able to determine which NDI methods to take, depending on the base material and failure condition	1. PT 2. MT	・Features and mechanism of each NDI methods (e.g. pros and cons, applicable condition) ・How to select suitable NDI methods ・How to proceed pump maintenance (e.g. preparation, inspection, observation, cleaning) ・How to prevent NDI accidents ・How to evaluate the result and record them for ensuring quality	JICA trained Participant	TPP	Lacture & Example	Text books provided by JICA	plan	No. of times						1						
												No. of participants						10							
											Result	No. of times													
												No. of participants													
		1-3	Welding Education	(1) To determine which welding methods to take, depending on the base material and failure condition (2) To identify suitable metal and wire types (3) To be able to properly carry out following welding procedure while ensuring safety - Welding material and tools selection - Preparation - Pre-heating - Welding - Finishing (4) To evaluate the result of welding works for ensuring quality	1. Principles of welding 2. Welding types and features 3. Accident Prevention 4. Welding Defect 5. Welding safety	・Features and mechanism of each welding methods (e.g. pros and cons, applicable condition) ・How to select suitable welding methods, metal, and tools ・How to prepare, pre-heat, carry out welding and finishing ・How to prevent welding accidents ・How to evaluate the result and record them for ensuring quality	JICA trained Participant	TPP	Lacture & Example	Text books provided by JICA	plan	No. of times										1		
												No. of participants										1			
											Result	No. of times													
												No. of participants													
2	General	2-1	Safety Training	(1) To understand the importance of personal and equipment safety (2) To be able to properly use safety equipment equipment ready for emergency situations (3) Help protects employee by providing knowledge of safety.	1. ladder 2. safety belt 3. electric shock 4. be caught by rotation 5. helmet	・How slight dangerous situations cause serious accidents ・How to motivate workers for ensuring safety ・How to check the surrounding safety ・How to prevent accidents at workplace (e.g. putting helmet on always)	JICA trained Participant	TPP	Lacture and On the Job Training	Text books provided by JICA	Plan	No. of times		1						1				
												No. of participants		10						10					
											Result	No. of times													
												No. of participants													

■ Activity

NO.	Activity	Purpose	Important Points	Facilitator	Where	How	Tools	Implementation status		Remarks
(ex.)	Tool box meeting (TBM) before actual work	All workers reach common ground of the work detail and the hazards associated with the work	1. All workers join TBM 2. Facilitate the meeting to make sure all participants express their opinion	JICA trained Participant	TPP	Before actual work	TBM chart	Implemented	(1) Effect implemented > Job accidents have been reduced (2) Suggestions of measures to continue and improve > Perform TBM before all work at the power plant > Provide TBM training for all workers at the power plant	> Photograph when TBM at actual work
								Not implemented	(1) How to be able to implement N/A	
1	Tool box meeting (TBM) before actual work	(1) All workers reach common ground of the work detail and the hazards associated with the work (2) Risk Mitigation	1. All workers join TBM 2. Facilitate the meeting to make sure all participants express their opinion	JICA trained Participant	TPP	Before actual work	TBM chart	Implemented	(1) Effect implemented (2) Suggestions of measures to continue and improve	
								Not implemented	(1) How to be able to implement	

Technical Cooperation Project

Counterpart Training on Capacity Development for Maintenance of Thermal Power Stations

Action Plan
(Management)

13th /Dec./2019

Action Plan- How to achieve countermeasures.

1. Create provisions for future trainers & to get the experts through Training of Trainer (TOT)

How to achieve:

- Those who have adequate technical & managerial know-how (existing trainers) in our organizations, we will try to enrich them through TOT programs conducted nationally by our existing training centers.
- International organizations may come forward to enhance the knowledge of trainers of our country.
- We will request our concern authority to arrange more TOT programs.

Action Plan- How to achieve countermeasures (Cont'd)

2. Purchase modern Training Equipment

How to achieve:

- We need to purchase required training equipment for our training centers, such as-
  - Specific simulators for each power plant
  - Different half cut models of electrical and mechanical equipment.
  - Need to established/develop Instrument & Control (I&C) testing Lab.
- We will request concern/competent authority to purchase above said equipment and to establish a well equipped training centers/labs.

Action Plan- How to achieve countermeasures (Cont'd)

3. Implementing Training Need Assessment (TNA).

How to achieve:

- We will select the trainees as per their field/job requirements by following the TNA procedure.
- We will share our findings on TNA with our office head and request to implement TNA procedure properly.

Action Plan- How to achieve countermeasures (Cont'd)

4. Required top management's initiative on system evolving

How to achieve:

- We will recommend our top management to accelerate establishing the system of individual achievement from training.

Action Plan- How to Support, Promote and Supervise Engineers'/Technicians' action plan.

- Ensure the proper job placement for trainee Engineers/Technicians if necessary.
- Create proper environment for knowledge sharing and training learning.
- Arrange On job training (OJT) where our trainee Engineers/Technicians from JICA will conduct the OJT.

(4)　第 4 回オンライン研修員作成のアクションプラン

Action Plan

Capacity Development for Maintenance of Thermal Power Stations (Engineer)

[May.31 – June.10 2021]

独立行政法人 国際協力機構

Index

1. Framework of the Program

Confirmation of the project framework

- ✓ Bilateral co-operation between the government of Bangladesh & the government of Japan.
- ✓ Target Type of Power Generation: Gas Turbine Combined Cycle (GTCC)
- ✓ Target Sites: BPDB, EGCB, NWPGCL, APSCL, RPCL & CPGCBL

Overall goal: Capacity of O&M of Thermal Power Plants (TPP) is strengthened.

Project Goal: **Training Capacity** on O&M of thermal power stations is strengthened.

Beneficiaries: Engineers & Technicians who will be core instructors and their trainees.


2. Issue Analysis (1/3)

Purpose

Realize proper maintenance at TPP

Method of Analysis

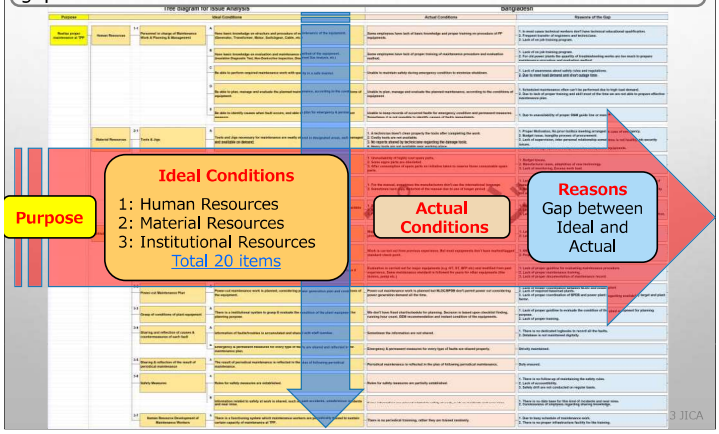
Tree diagram for issue analysis

Course theme

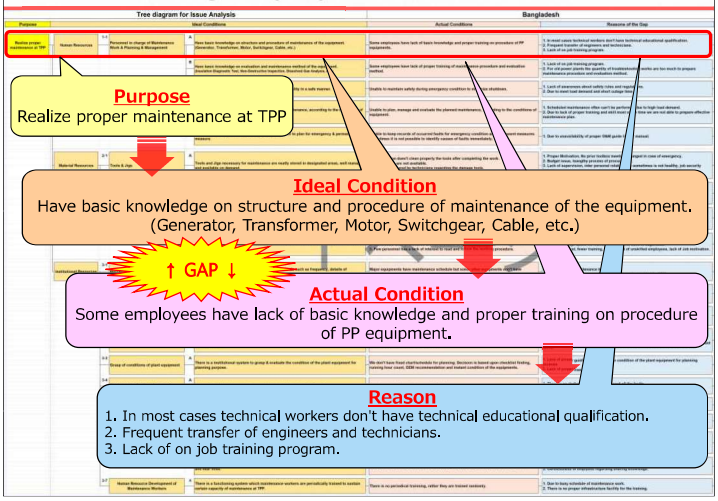
Realization of proper maintenance

2. Issue Analysis (2/3)

We analyzed the Ideal Conditions, Actual Conditions and Reason of gap between ideal and actual condition.



2. Issue Analysis (3/3)



3. Making the Action Plan

Reason for making the Action Plan

Capacity Development for O&M engineers and technicians of Thermal Power Stations through effective training.

Action Plan

1. Training for technical personnel on TPP
   - Proper Maintenance of Generator
   - Proper Maintenance of Transformer
   - Proper Maintenance of Medium Voltage Motor
   - Proper Maintenance of Excitation System (incl. AVR)
   - Optimal Maintenance Planning (incl. RBM)
2. Activity on actual work
   - Pre-maintenance Meeting

3-1. Training for technical personnel on TPP

Training Item

1. Proper Maintenance of Generators
2. Proper Maintenance of medium-voltage Motors
3. Proper Maintenance of Transformers etc

Ideal Condition

1. Have basic knowledge on structure and procedure of maintenance of the equipment.
2. Have basic knowledge on evaluation and maintenance method of the equipment. (Insulation Diagnostic Test, Non-Destructive Inspection, Dissolved Gas Analysis, etc.)

Actual Condition

1. Some employees have lack of basic knowledge and proper training on procedure of PP equipments.
2. Some employees have lack of proper training of maintenance procedure and evaluation method.

Reason

1. Lack of on job training program and basic knowledge training.
2. In most cases technical workers don't have technical educational qualification.

3-2. Activity on actual work

Activity Item

1. Pre-maintenance meeting

Ideal Condition

1. All workers join morning meeting.
2. Meeting is held daily before work.
3. Participants discuss about work with diary and white board.

Actual Condition

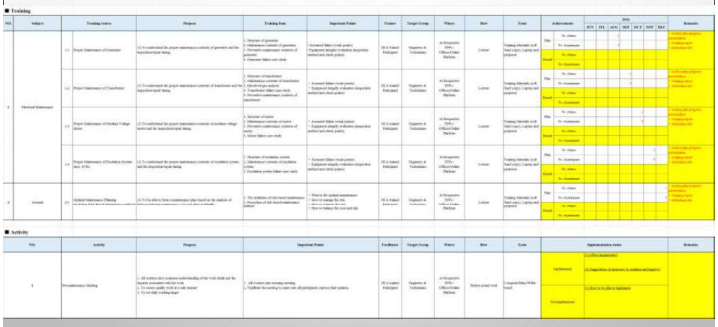
1. Meeting is not held regularly

Reason

1. All workers don't have common understanding of the work detail and the hazards associated with the work.
2. Lack of accountability among workers.

3-3. Making the Action Plan Format

We made the detail Action Plan (including schedule, frequency etc.) as below. This format will be utilized to record our activities and report to JICA Expert Team.



4. Suggestions

1. Course duration can be increased according to course material.
2. Lunch time can be adjusted from 12:30 PM to 2:00 PM BST.
3. During online training participants are to engage themselves in official works too. So, invitation can be made to fully release the training participants from office.
4. Training screen was blurry and difficult to understand. Online training can be held through dedicated cloud hosting.
5. Practical field visit for participants of this training should be included for proper understanding after normalization of pandemic situation.

5. Individual Impressions Regarding the JICA Training (1/7)

1. Md. Kamrul Islam (CPGCBL)

First of all thank you very much for arranging such a wonderful training program during this Covid-19 situation.

Prevention is better than cure.

As you know, all of the participants have a Power Plant except CPGCBL. Other than CPGCBL, the participants already faced some problems in the maintenance life of the Power Plant. In this training course, they learned and they will try to maintain the possible solution for the effective maintenance. And to do this already the cost, time, manpower incurred to find the possible solution by the other participants i.e waste of time, cost other by other organizations except CPGCBL. I mean they are taking the steps i.e. "**CURE**"

But I believe we CPGCBL are very lucky since before operating our Power Plant, we learned effective training on how to make the maintenance of the Power Plant in an effective way. It means, we are taking the steps i.e. "**PREVENTION**"

Finally, CPGCBL expressed our heartiest thanks to all of you including JICA who are trying to conduct this training course.

Thanks for your understanding and cooperation always to Bangladesh.

5. Individual Impressions Regarding the JICA Training (2/7)

2. A.H.M Rokanuzzaman (CPGCBL)

It's been a pleasure to have such kind of training which has arranged by JICA and it was a wonderful experience to get the opportunity to accumulate the knowledge regarding the O&M of the thermal power plant. Very much optimistic that we will be able to share this particular training knowledge among our employees and technicians gradually.

Though we have learned a lot from this training program still we believe that physical appearance has the most impact on the capacity development of anything. So, we expect to go there for a very short period to visually visit the power plant and having the opportunity to learn more.

Eventually, CPGCBL expressed our heartiest thanks to all of you including JICA who are trying to conduct this training course.

Thanks for your understanding and cooperation always to Bangladesh.

3. Shaurav Kumar Saha (EGCB)

I've learned many useful lessons from the training and I'm thankful to JICA for arranging the training and selecting me as a participant. From training I have learned how to analysis a problem and how to make a proper solution of the problem. My cordial thanks and gratitude to JICA & all of the facilitators of the training program.

4. Md. Shariful Islam (EGCB)

The course contents were compiled in a comprehensive yet understandable fashion and the trainers have profound knowledge in their relevant fields. Thanks to JICA & KEPCO for arranging this delightful training program.

5. Individual Impressions Regarding the JICA Training (3/7)

5. A.T.M. Raquibur Rahman (EGCB)

The materials of the training were very carefully developed and the trainers were very enthusiast to clear our any doubt

This training has changed my way of looking into a problem. I will try to implement the learning of the Training in my future life.

Last but not the least, Shiuly Madam has played a fantastic linking role between the trainer and us. Without her the training would not have been such a success.

6. Md. Rasel Mia (APSCL)

The training resources were fruitful and the presentation was also wonderful overall. If there is any scope for practical visiting to your power plant it would be very helpful for us.

7. Md. Jamiul Huque (APSCL)

I am very much grateful to JICA, a bilateral cooperation between the Bangladesh and Japan governments for selecting us for this training Program. Special thanks to the JICA expert team, especially Kansai Electric for arranging such a helpful training program for us. From this training I gathered some effective info about troubleshooting Generator, Transformer, Switchgear, Motor etc. Also mastered how to improve human resources by providing training myself. Though we were very unlucky as we missed practical training & field visits to power plants in Japan due to covid situation, we hope JICA would manage a short visit to Japan for us if Covid situation goes normal. Finally I am very much optimistic about achieving the goals of this training session.

5. Individual Impressions Regarding the JICA Training (4/7)

8. Md. Nasir Uddin (APSCL)

Definitely it was instructive training and I learnt much more information regarding the maintenance of Generator, Transformer, Excitation system etc. I think it would be more fruitful if we could see the equipment physically going to your country that you showed in the slide.

9. Sad Md. Saber (RPCL)

It was a very informative and fruitful training course for electrical maintenance. Thanks to JICA and The Kansai Electric Power Co.,Inc. for arranging such a nice training program.

10. A.S.M. Jabir (RPCL)

First of all, heartiest greetings and thanks to JICA for working in capacity development in Bangladesh. Besides, thanks to Kansai Electric for arranging such an informative and participatory training on electrical maintenance. All the sessions were neatly arranged, highly organized and very informative. The course lecturers, and the coordinator were highly professional, technically skilled and friendly. The workshops were the place for sharing ideas and knowledge among the participants.

I would like to convey my gratitude to JICA and Kansai electric for the great opportunity. The final quote is "Let's not finish it here".

5. Individual Impressions Regarding the JICA Training (5/7)

11. Md. Nurul Islam (RPCL)

The training arranged by JICA and conducted by the Kansai Electric Power Company Ltd was very helpful and beneficiary. This training program broadens my knowledge in electrical maintenance. I have learned about new technology about maintenance. The trainer of program also expert and their dedication was heart touching. The translator was also expert and very much cordial. I think memory of this training program will last long.

12. Shafiqul Islam (NWPGCL)

This training has enhanced my view regarding electrical knowledge. We will be careful about the accident shown in the module. I think, visualizing could be added extra knowledge. Thank you.!

13. Md. Wakilur Rahman (NWPGCL)

It was indeed a nice and compact training program. We wish we could visit Japan and have the chance to see your power plant technologies in real. Thank you!

5. Individual Impressions Regarding the JICA Training (6/7)

14. Md. Mehedi Hossen Limon (NWPGCL)

Before attending this training, I heard a lot about JICA training and other O&M training in Japan from my seniors and I was excited to attend such a program. After participating in this program, I have found the authenticity of what I heard. In these two weeks, I enjoyed both the lively workshop and the technical presentations. I found many new ideas like the Fault Tree Analysis, Human Resource Management. The quality of both the training text and the presentation are on a high level and the presenters were very much friendly and supportive. To express shortly, I loved this program. Thank you all.

15. Md. Abu Rayhan (BPDB)

This training was very useful and effective. Thanks to JICA team.

16. Md. Razaul Karim (BPDB)

This training was really effective. Only lack was to visit kansai electric site or to see things physically what they have shown. We hope you would not disappoint us from visiting Japan to have those experience and develop ourself to full extend when this pandemic Will be normal.

Thank you for your attention.

5. Individual Impressions Regarding the JICA Training (7/7)

17. Md. Daud Shakil (BPDB)

It was a resourceful and case study base training with an effective discussion about individual's past and day to day experience, though due to the current covid situation this training lacks hands-on training, such hands-on training would help us to grasp the training material more easily and would enable us to see the realized model for implementing our learning.

18. Adittya Ranjan Chowdhury (BPDB)

This training was delivered with professionalism, knowledge, expertise, rich materials and interaction. Physical training/observation would have been even more effective to apply our learning in particular fields.

■ Basic information

Country	**Bangladesh**
Target TPP	**BPDB, APSCL, NWPGCL, EGCB, CPGCBL & RPCL**
Name of the Trainers (JICA-trained participants)	**Md. Kamrul Islam, A.H.M Rokanuzzaman, Shaurav Kumar Saha, Md. Shariful Islam, A.T.M. Raquibur Rahman, Md. Rasel Mia, Md. Jamiul Huque, Md. Nasir Uddin, Sad Md. Saber, A.S.M. Jabir, Md. Nurul Islam, Shafiqul Islam, Md. Wakilur Rahman, Md. Mehedi Hossen Limon, Md. Abu Rayhan, Md. Razaul Karim, Md. Daud Shakil & Adittya Ranjan Chowdhury**
Overall goal	**Capacity of O&M of Thermal Power Plants (TPP) is strengthened.**
Project goal	**Training Capacity on O&M of thermal power stations is strengthened.**
Subjects	**[Training]** **1. Proper Maintenance of Generator** **2. Proper Maintenance of Transformer** **3. Proper Maintenance of Medium Voltage Motor** **4. Proper Maintenance of Excitation System (incl. AVR)** **5. Optimal Maintenance Planning** **(including Risk Based Maintenance method)** **[Activity]** **1. Pre-maintenance Meeting**

■ Training

NO.	Subject	Training course		Purpose	Training Item	Important Points	Trainer	Target Group	Where	How	Tools	Achievements		2021 JUN	JUL	AUG	SEP	OCT	NOV	DEC	Remarks
1	Electrical Maintenance	1-1	Proper Maintenance of Generator	(1) To understand the proper maintenance contents of generator and the inspection/repair timing	1. Structure of generator 2. Maintenance contents of generator 3. Preventive maintenance contents of generator 4. Generator failure case study	・Assumed failure (weak points) ・Equipment integrity evaluation (inspection method and check points)	JICA trained Participant	Engineers & Technicians	At Respective TPPs / Offices/Online Platform	Lecture	Training Materials (soft /hard copy), Laptop and projector	Plan	No. of times			1					> Action plan progress presentation > Training report > Attendance list
													No. of participants			5					
												Result	No. of times								
													No. of participants								
		1-2	Proper Maintenance of Transformer	(1) To understand the proper maintenance contents of transformer and the inspection/repair timing	1. Structure of transformer 2. Maintenance contents of transformer 3. Dissolved gas analysis 4. Transformer failure case study 5. Preventive maintenance contents of transformer	・Assumed failure (weak points) ・Equipment integrity evaluation (inspection method and check points)	JICA trained Participant	Engineers & Technicians	At Respective TPPs / Offices/Online Platform	Lecture	Training Materials (soft /hard copy), Laptop and projector	Plan	No. of times				1				> Action plan progress presentation > Training report > Attendance list
													No. of participants				5				
												Result	No. of times								
													No. of participants								
		1-3	Proper Maintenance of Medium Voltage Motor	(1) To understand the proper maintenance contents of medium voltage motor and the inspection/repair timing	1. Structure of motor 2. Maintenance contents of motor 3. Preventive maintenance contents of motor 4. Motor failure case study	・Assumed failure (weak points) ・Equipment integrity evaluation (inspection method and check points)	JICA trained Participant	Engineers & Technicians	At Respective TPPs / Offices/Online Platform	Lecture	Training Materials (soft /hard copy), Laptop and projector	Plan	No. of times					1			> Action plan progress presentation > Training report > Attendance list
													No. of participants					5			
												Result	No. of times								
													No. of participants								
		1-4	Proper Maintenance of Excitation System (incl. AVR)	(1) To understand the proper maintenance contents of excitation system and the inspection/repair timing	1. Structure of excitation system 2. Maintenance contents of excitation system 3. Excitation system failure case study	・Assumed failure (weak points) ・Equipment integrity evaluation (inspection method and check points)	JICA trained Participant	Engineers & Technicians	At Respective TPPs / Offices/Online Platform	Lecture	Training Materials (soft /hard copy), Laptop and projector	Plan	No. of times						1		> Action plan progress presentation > Training report > Attendance list
													No. of participants						5		
												Result	No. of times								
													No. of participants								
2	General	2-1	Optimal Maintenance Planning (including Risk Based Maintenance method)	(1) To be able to form a maintenance plan based on the analysis of balance between maintenance cost and plant availability	1. The definition of risk based maintenance 2. Procedure of risk based maintenance method	・What is the optimal maintenance ・How to manage the risk ・How to estimate the risk ・How to balance the cost and risk	JICA trained Participant	Engineers & Technicians	At Respective TPPs / Offices/Online Platform	Lecture	Training Materials (soft /hard copy), Laptop and projector	Plan	No. of times							1	> Action plan progress presentation > Training report > Attendance list
													No. of participants						5		
												Result	No. of times								
													No. of participants								

■ Activity

NO.	Activity	Purpose	Important Points	Facilitator	Target Group	Where	How	Tools	Implementation status		Remarks
1	Pre-maintenance Meeting	1. All workers have common understanding of the work detail and the hazards associated with the work 2. To ensure quality work in a safe manner 3. To set daily working target	1. All workers join morning meeting. 2. Facilitate the meeting to make sure all participants express their opinion.	JICA trained Participant	Engineers & Technicians	At Respective TPPs / Offices/Online Platform	Before actual work	Computer/Diary/White board	Implemented	(1) Effect implemented (2) Suggestions of measures to continue and improve	
									Not implemented	(1) How to be able to implement	

添付資料 6-2-6

活動実績資料

(1)　活動状況写真

第 1 次現地業務（2017 年 10 月 13 日～10 月 27 日）

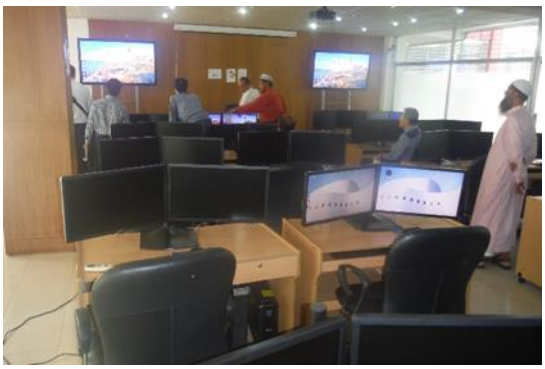
各 C/P との Kick-off ミーティング
（2017.10.15）

BPDB との打合せ（2017.10.16）

EGCB との打合せ（2017.10.17）

NWPGCL との打合せ（2017.10.17）

BPDB Ghorashal TC との打合せ＆研修施設確認（2017.10.18）



BPDB Ghorashal TC 調査（2017.10.18）

第 1 次現地業務（2017 年 10 月 13 日～10 月 27 日）

BPDB Ghorashal TC 調査（2017.10.18）

BPDB Ghorashal 発電所 O&M 状況確認（2017.10.18）

NWPGCL Bheramara CCPP との打合せ＆設備状況調査（2017.10.19）

EGCB Haripur CCPP との打合せ
（2017.10.22）

Pendekar Energy Haripur O&M 状況確認
（2017.10.22）

第 1 次現地業務（2017 年 10 月 13 日～10 月 27 日）	
	
APSCL Site Office との打合せ＆O&M 状況確認（2017.10.23）	
	
APSCL 研修施設調査（2017.10.23）	
	
各 C/P との JCC 前打合せ（2017.10.24）	第 1 回 JCC（2017.10.25）

第 2 次現地業務（2018 年 7 月 28 日～8 月 6 日）

各 C/P との Kick-off ミーティング（2018.7.29）

BPDB 本社マネジメント層への説明
（2018.7.30）

BPDB テクニシャン研修員へのインタビュー
（2018.7.30）

NWPGCL 本社マネジメント層への説明＆研修員へのインタビュー（2018.7.30）

EGCB 本社マネジメント層への説明＆研修員へのインタビュー（2018.7.31）

第 2 次現地業務（2018 年 7 月 28 日～8 月 6 日）

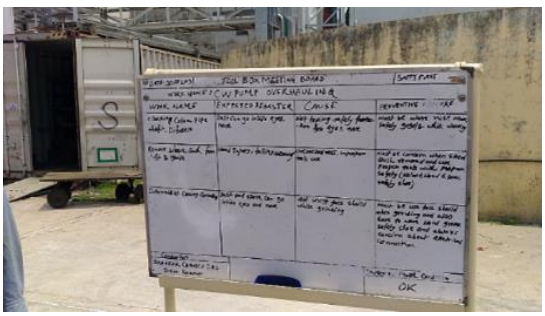
CPGCBL 本社マネジメント層への説明（2018.7.31）

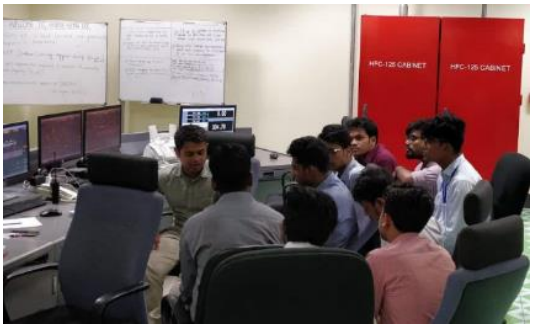
BPDB Ghorashal 発電所マネジメント層への説明（2018.8.1）

BPDB Ghorashal 発電所 O&M 状況調査（2018.8.1）

BPDB Ghorashal CCPP 設備状況調査（2018.8.1）

第 3 次現地業務（2019 年 7 月 24 日～8 月 7 日）	
	
各 C/P との Kick-off ミーティング（2019.7.25）	
	
NWPGCL Sirajganj CCPP マネジメント層への説明（2019.7.28）	NWPGCL エンジニア研修員へのインタビュー（2019.7.28）
	
NWPGCL テクニシャン研修員へのインタビュー（2019.7.28）	NWPGCL 研修員によるアクションプラン実施状況確認（2019.7.28）
	
BPDB 本社マネジメント層への説明（2019.7.29）	BPDB エンジニア研修員へのインタビュー（2019.7.29）

第 3 次現地業務（2019 年 7 月 24 日～8 月 7 日）	
	
BPDB テクニシャン研修員への インタビュー（2019.7.29）	BPDB 研修員によるアクションプラン 実施状況確認（2019.7.29）
	
APSCL マネジメント層への説明 （2019.7.30）	APSCL エンジニア研修員への インタビュー（2019.7.30）
	
APSCL テクニシャン研修員への インタビュー（2019.7.30）	APSCL 関係者との集合写真（2019.7.30）
	
APSCL 研修員によるアクションプラン 実施状況確認（2019.7.30）	NWPGCL テクニシャン研修員への インタビュー（2019.7.31）

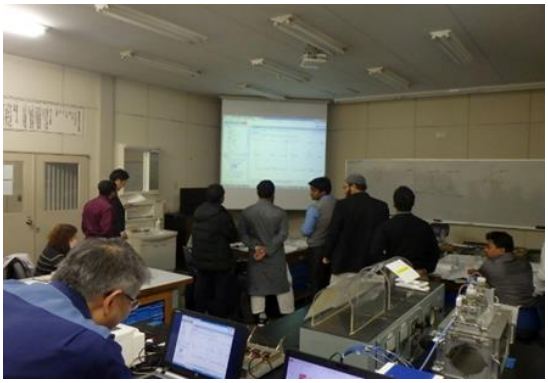
第 3 次現地業務（2019 年 7 月 24 日～8 月 7 日）	
	
NWPGCL 研修員によるアクションプラン 実施状況確認（2019.7.31）	EGCB 本社マネジメント層への説明 （2019.8.1）
	
EGCB エンジニア研修員への インタビュー（2019.8.1）	EGCB テクニシャン研修員への インタビュー（2019.8.1）
	
EGCB 研修員によるアクションプラン 実施状況確認（2019.8.1）	CPGCBL 本社マネジメント層への説明 （2019.8.1）
	
CPGCBL エンジニア研修員への インタビュー（2019.8.1）	CPGCBL 研修員によるアクションプラン 実施状況確認（2019.8.1）

第 3 次現地業務（2019 年 7 月 24 日～8 月 7 日）	
	
CPGCBL 関係者との集合写真（2019.8.1）	RPCL 本社マネジメント層への説明 （2019.8.4）
	
RPCL テクニシャン研修員への インタビュー（2019.8.4）	RPCL 研修員によるアクションプラン 実施状況確認（2019.8.4）
	
RPCL 関係者との集合写真（2019.8.4	第 2 回 JCC（2019.8.6）
	
第 2 回 JCC 出席者との集合写真（2019.8.6）	

第 1 回本邦研修（エンジニア：2018 年 1 月 14 日～2 月 17 日）	
	
三菱電機神戸製作所見学	振動基礎技術研修（実習）
	
安全体感研修	関西電力姫路第二発電所見学
	
品質管理研修	過去教訓研修
	
非破壊検査研修（実習）	人材育成研修

第 1 回本邦研修（エンジニア：2018 年 1 月 14 日～2 月 17 日）	
	
川崎重工明石工場見学	GTCC 研修
	
関西電力舞鶴発電所見学	閉講式

第 1 回本邦研修（テクニシャン：2018 年 1 月 14 日～2 月 3 日）	
	
安全体感研修	品質体感研修
	
ポンプ分解点検研修（実習）	非破壊検査研修（実習）
	
MHPS 高砂工場見学	計器類の保守研修
	
アクションプラン発表会	閉講式

第 2 回本邦研修（エンジニア：2019 年 2 月 24 日～3 月 30 日）	
	
問題分析研修	関西電力概要研修（テクニシャンと合同）
	
関西電力 RMC 見学（テクニシャンと合同）	GTCC 研修
	
振動基礎研修（実習）	人材育成研修
	
給水処理研修	GT 制御研修

第 2 回本邦研修（エンジニア：2019 年 2 月 24 日～3 月 30 日）

安全体感研修

ポンプアライメント研修（実習）

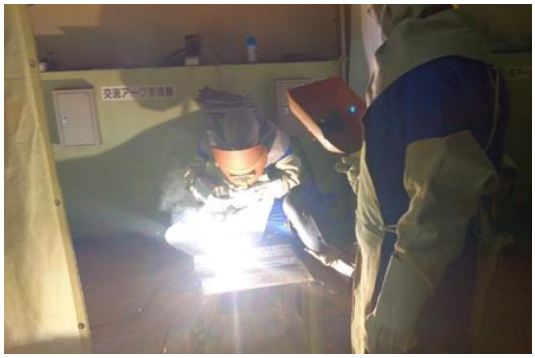
危険予知ミーティング研修

非破壊検査研修（実習）

関西電力姫路第二発電所見学

アクションプラン発表会

閉講式

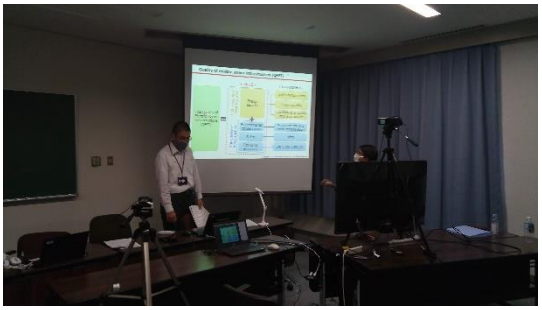
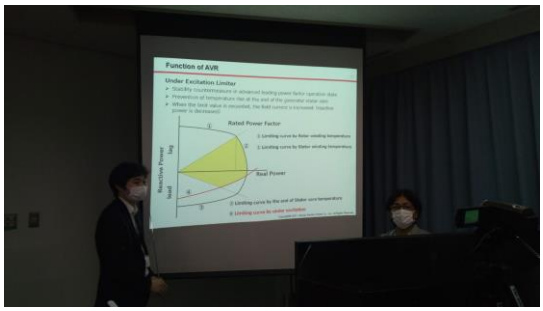
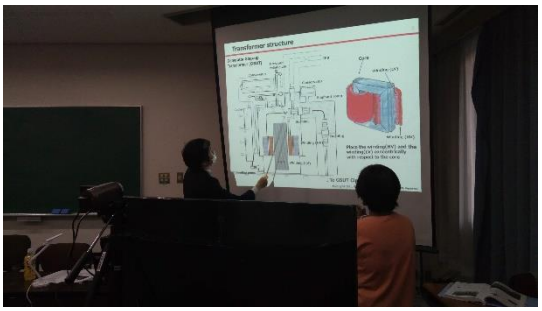
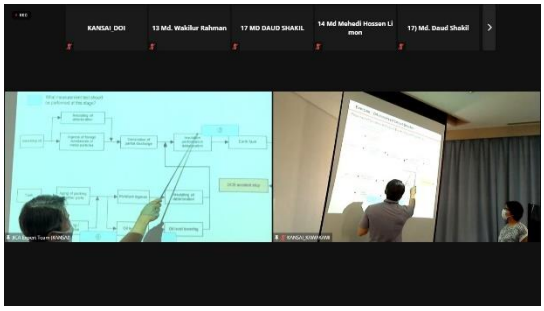
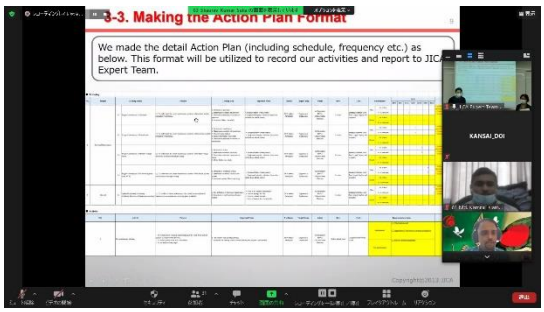
第 2 回本邦研修（テクニシャン：2019 年 2 月 24 日～3 月 16 日）	
	
問題分析研修	GT・ST・HRSG の概要･構造研修
	
品質体感研修	金属材料取扱い研修
	
安全体感研修	溶接施工研修（実習）
	
週間レビュー	事故災害未然防止研修

第 2 回本邦研修（テクニシャン：2019 年 2 月 24 日～3 月 16 日）	
	
高温高圧配管の保守研修	関西電力姫路第二発電所見学
	
アクションプラン作成	閉講式

第 3 回本邦研修（エンジニア：2019 年 11 月 17 日～12 月 21 日）	
	
問題分析研修	ポンプアライメント研修（講義）
	
安全体感研修	関西電力舞鶴発電所見学
	
アクションプラン作成	アクションプラン発表会

第 3 回本邦研修（テクニシャン：2019 年 11 月 17 日～12 月 14 日）	
	
問題分析研修	振動基礎技術研修（実習）
	
安全体感研修	ポンプ分解点検研修（実習）
	
アクションプラン作成	

第 3 回本邦研修（マネジメント：2019 年 12 月 8 日～12 月 14 日）	
	
エンジニア向け研修状況見学	テクニシャン向け研修状況見学
	
関西電力姫路第二発電所見学	アクションプラン作成
	
アクションプラン発表会	テクニシャン研修員との合同写真

第 4 回オンライン研修（エンジニア：2021 年 5 月 31 日～6 月 10 日）	
	
Job Report 発表	質の高いインフラ研修
	
励磁装置の最適保全研修	変圧器の最適保全研修
	
開閉装置の最適保全研修	アクションプラン作成指導
	
アクションプラン発表会	閉講式

(2)　現地活動記録

バングラデシュ第１回現地業務　調査メモ（10/15）

日時：2017 年 10 月 15 日（日）16:45～17:30

目的：本プログラム実施の必要性と今回の調査実施についてバングラデシュ国（以下、「バ国」と表記）関係機関からの理解を得る。

場所：Meeting room of Power Division, MoPEMR

出席：(Bangladesh カウンターパート)　Rahamat 氏他、Attendance List 参照（計 13 名）
(JICA Bangladesh 事務所)　Mukammeluddin 氏（計 1 名）
(JICA 本部)　田所氏（計 1 名）
(関西電力)　平畑、河合、吉竹、一岡、藤井（計 5 名）

【打合せ結果】

1. 本プロジェクトのワークプラン案を説明して、大綱了解を得た。なお、先方に時間的制約（プレゼン説明 15 分）があったため、プロジェクトアクティビティやモニタリング指標等に関する説明を一部割愛するとともに、先方から要望のあったワークフローチャートや実施体制、今回の調査行程が主な議題となり、今回の調査実施について了承を得た。
2. 渡航前に JICA 東京本部と共有した質問状がバングラ事務所 Mukammeluddin 氏およびバ国関係機関に共有されていないことが判明。また、今回行程の対応可否についても当該関係機関との調整が不十分であったことから、Mukammeluddin 氏が速やかに質問状の共有および関係機関との行程調整を実施済。なお、調整後の今回調査行程および関係機関の各フォーカルポイントについては 10/16 早々に Mukammeluddin 氏より関係者に周知される見込み。

（今後の予定）

✓ 10/16（月）打合せは BPDB（09:30～）、MoPEMR（14:30～）を実施予定（JICA バングラ事務所からの同行はなし）。

以　上

15-Oct-2017 Kick off meeting

Name	Title	E-mail
Rahamat Ullah Mohd. Dastagir ndc	Additional Secretary, Power Division, MoPEMR	[redacted]
Shah Md.Helal Uddin	Deputy Chief, Power Division, MoPEMR	
SK Md Abdul Ahud	Joint Chief, Power Division, MoPEMR	
Muhammad Chishty Asheque	Assistant Chief, Power Division, MoPEMR	
Kazi Absar Uddin Ahmed	Director, Directorate of System Plannig, BPDB	
Md Abu Yousuf	Chief Engineer, Planing&Development, BPDB	
Jorifa Khatun	Executive Engineer, System plan, BPDB	
Sazzaduz Rahmu	Managing Director, APSCL	
Kshitish Chandra Biswas	Chief Engineer, APSCL	
M.A. Hasrat	Executive Director (Engineering), EGCB	
Ibrahim Ahmad Shafi	Superintending Engineer (Focal point), EGCB	
Md. Saiful Islam	Executive Engineer, NWPGCL	
Md. Abdur Rouf	Executive Director (Project), CPGCBL	
Hiroshi Tadokoro	Senior Advisor, JICA	
Ahmad Mukammeluddin	Senior Program Manager, JICA Bangladesh Office	
Hiroki Hirahata	General Manager, Kansai Electric	
Toru Kawai	Manager, Kansai Electric	
Shigeru Yoshitake	Manager, Kansai Electric	
Hidenobu Ichioka	Chief Engineer, Kansai Electric	
Takeo Fujii	Manager, Kansai Electric	

バングラデシュ第１回現地業務　調査メモ（10/16）

日時：2017 年 10 月 16 日（月）9:30～12:00

目的：事前に作成した質問票を基に、火力発電所の運営・維持管理に関する現状の聞き取り調査を実施する。

場所：Meeting room of BPDB

出席：(BPDB)　Kazi Absar Uddin Ahmed, Director, Directorate of System Plannig
Md Abu Yousut, Chief Engineer, Planing&Development
Jorifa Khatun, Executive Engineer, System plan
Engr. M. Mahmudur Rahman Mahmud, Deputy Director, Design & Inspection

(JICA 本部)　田所氏（計 1 名）

(関西電力)　平畑、河合、吉竹、一岡、藤井（計 5 名）

【打合せ結果】

1. BPDB との面談を通じて受領した下記資料の調査分析を行う。
   - POWER PLANT WISE YEARLY SUMMARY STATISTICS (PROVISIONAL) FY2015-2016
   - POWER PLANT STATISTICS Sep-2017
   - Annual Training Program 2017-2018
   - Annual Procurement Plan (GOODS) 2017-2018

   また、本日の確認内容は添付（質問状）のとおり。そのうち一部項目については BPDB より別途回答予定（10/23 期日）。
2. 本打合せにて、BPDB 代表との面談を行い、本プロジェクトに対する全面的なバックアップを確約して頂いた。

バングラデシュ第１回現地業務　調査メモ（10/16）

日時：2017 年 10 月 16 日（月）14:30～15:15

目的：事前に作成した質問票を基に、火力発電所の運営・維持管理に関する現状の聞き取り調査を実施する。

場所：Meeting room of Power Division, MoPEMR

出席：(MoPEMR)　Shah MD. Helal Uddin, Deputy Chief, Power Division　他 1 名
(JICA 本部)　田所氏（計 1 名）
(関西電力)　平畑、河合、吉竹、一岡、藤井（計 5 名）

【打合せ結果】

1. MoPEMR との面談を行い、現在の組織体制と各セクションの役割を中心に情報収集した。その中で、現在把握の組織図には一部修正が必要なコメントがあったので、最新の組織図 and/or リンクを別途回答頂く予定。
2. 発電所 OM に係る人材育成方針・計画は各発電所で実施とのコメントがあったため、本件については今後の発電所・訓練センターへのサイトビジットにて確認予定。
   さらに、技術基準等の法規制等に関する現状について質問したところ先方から反応（BERC が担当）があった。しかし、打合せ後に HP で確認した結果、設備基準等に関する法規制は確認されなかった。

（今後の予定）

✓ 10/17（火）の打合せは、EGCB（9:30～）、NWPGCL（11:30～）、APSCL（16:00～）を実施予定（JICA バングラ事務所からの同行はなし）。

以　上

バングラデシュ第１回現地業務　調査メモ（10/17）

日時：2017 年 10 月 17 日（火）9:20～10:20

目的：事前に作成した質問票を基に、火力発電所の運営・維持管理に関する現状の聞き取り調査を実施する。

場所：Meeting room of EGCB

出席：(EGCB)　Ibrahim Ahmad Shafi Al Mohtab, Superintending Engineer (P&D)
他 2 名
(JICA 本部)　田所氏（計 1 名）
(関西電力)　平畑、河合、吉竹、一岡、藤井（計 5 名）

【打合せ結果】

1. EGCB から受領する予定の下記資料の調査分析を行う。
   ・Job Description
   ・Organization Chart
   ・Training schedule

   本日の確認内容は添付（質問状）のとおり。そのうち一部項目については EGCB より別途回答予定（10/22 期日）で、メンテナンスに関する項目については、発電所に確認することとした。

   なお、新規電源に関する EPC との設備仕様協議、契約交渉時の関与について、サポートして欲しいという話があった。

バングラデシュ第１回現地業務　調査メモ（10/17）

日時：2017 年 10 月 17 日（火）11:30～13:00

目的：事前に作成した質問票を基に、火力発電所の運営・維持管理に関する現状の聞き取り調査を実施する。

場所：Meeting room of NWPGCL

出席：(NWPGCL)　Md. Nuruzzaman, Executive Director (Finance)
Md. Anamul Haque, Deputy General Manager (HR)
Md. Mamunur Rahman Mondal, General Manager (HR & Admin)
Md. Saiful Islam, Executive Engineer　他 2 名

(JICA 本部)　田所氏（計 1 名）

(関西電力)　平畑、河合、吉竹、一岡、藤井（計 5 名）

【打合せ結果】

1. NWPGCL との面談を通じて受領した下記資料の調査分析を行う。
   ・Training Calendar 2016-2017
   ・Training Calendar 2017-2018
   ・Organization Chart of NWPGCL
   また、本日の確認内容は添付（質問状）のとおり。そのうち一部項目については NWPGCL より別途回答予定（10/22 期日）。
2. NWPGCL は新しい発電所しか所有していないので、研修者選定のクライテリアが経験年数 5 年というのは厳しく、2～3 年への緩和要求あり（現状のままでは OM ニーズの高い発電所要員の選定がままならない懸念を抱いている）。また、英語能力についての基準（TOEFL iBT 100 以上）についても、要求水準が厳しく削除してほしいとの要望があった。研修者選定のクライテリアについては JICA と協議要。
   また、JICA の過去 FS で推奨した Bheramara への訓練センター設置は不採用になった模様。一方で ADB のサポートにより、Khulna 発電所にシミュレータを備えた訓練施設が設置されたとの言及あり。

バングラデシュ第１回現地業務　調査メモ（10/17）

日時：2017 年 10 月 17 日（火）15:50～17:20

目的：事前に作成した質問票を基に、火力発電所の運営・維持管理に関する現状の聞き取り調査を実施する。

場所：JICA Office

出席：(APSCL)　Md. Shah Alam Khan, Superintending Engineer　他 1 名
(JICA 本部)　田所氏（計 1 名）
(関西電力)　平畑、河合、吉竹、一岡、藤井（計 5 名）

【打合せ結果】

1. APSCL から受領する予定の下記資料の調査分析を行う。
   - Training Calendar 2016-2017
   - Training Calendar 2017-2018
   - Oraganization Chart of NWPGCL
   - Trouble shooting guideline
   - Annual Procurement Plan

   また、本日の確認内容は添付（質問状）のとおり。そのうち一部項目については APSCL より別途回答予定（10/22 期日）。

（今後の予定）

✓ 10/18（水）は BPDB の Ghorashal Training Center を訪問し、打合せ及び設備確認を実施予定（JICA 現地事務所の平田氏が同行）。

以　上

バングラデシュ第１回現地業務　調査メモ（10/18）

日時：2017 年 10 月 18 日（水）9:45～16:40

目的：BPDB Ghorashal 訓練センター、発電所の現地調査の実施および事前に作成した質問票を基に、火力発電所の運営・維持管理に関する現状の聞き取り調査を実施する。

場所：Meeting room of Ghorashal Training Center (BPDB)

出席：(BPDB)　Md.Omar Faruque, Director, Ghorashal Training Center
Md.Belayet Hossain, CEO & Chief Engineer, Ghorashal Power station SBU
Engr. M. Mahmudur Rahman Mahmud, Deputy Director, Design & Inspection
(JICA Bangladesh 事務所)　平田氏（計 1 名）
(JICA 本部)　田所氏（計 1 名）
(関西電力)　平畑、河合、吉竹、一岡、藤井（計 5 名）

【調査結果】

1. 研修施設について、BPDB 以外からの研修生の受け入れはなし。
2. 研修施設の構成人数は 58 名で、宿泊は 90 名まで可能。
3. BPDB の配下でトレーニングセンターが 6 箇所あり。
4. シミュレータのメーカーは WSC 社である。プラントメーカーではない。設置費用は 10mUS$。通常運転および起動停止の訓練用であり、不具合対応の機能はない。対象設備は GT/ST/CCGT で、保有する発電設備に全て対応可能とのこと。
5. 電気の研修機器として、絶縁抵抗測定、接地抵抗測定、油中ガス分析装置、絶縁油耐電圧試験装置、ケーブルフォルトロケーター、リレーテスタ等があった。
6. 機械の研修機器として、引張試験機と圧縮試験機があった。
7. 発電設備は合計 7 ユニットあるが、6 号機は 2010 年から停止（実質廃止状態）。その原因は、系統側と発電機側の解列ができず、誘導電動機化に至り、最終的にはタービン設備が炎に包まれたとのコメントあり。
8. 3 号機が GTCC リパワリング中で、2 年後に COD 予定。GT1 台は Siemens、ST は既設を流用（ただし 3 号機は振動大および軸受温度高の不具合が発生）、EPC は中国系。さらに 7 号機が CCGT 新設機で運転中。
9. 当直員はオペレータ 6 人とエンジニア 3 人で構成され、4 班 3 交替制。
10. 1～6 号機の合計出力は設計ベースで 210MW であるが、現在出力は 170～180MW 程度しかない。
11. 1 時間、8 時間、12 時間毎に手取りでデータ採取しており、12 時間毎のデータで発電プラント性能計算をして、本社が管理している。

12. ちなみに 1～5 号機は旧ソ連製。5 号機が定検中で、競札でロシア企業が落札（18 ヶ月保証あり）。ロシア人約 10 名が Superviser で対応中。
13. 作業は現地所員で実施し、その点検結果を SV がレビューする形態。
14. 現場所員は作業着が半袖でヘルメットを被っていない。また、整理整頓が不徹底である点が散見された。

（今後の予定）

✓ 10/19（木）は Bheramara 発電所を訪問して、打合せ及び設備確認を実施予定。

以　上

バングラデシュ第１回現地業務　調査メモ（10/19）

日時：2017 年 10 月 19 日（木）14:30～17:00

目的：Bheramara 発電所（NWPGCL）の現地調査の実施および事前に作成した質問票を基に、火力発電所の運営・維持管理に関する現状の聞き取り調査を実施する。

場所：Meeting room of Bheramara power plant (NWPGCL)

出席：(NWPGCL)　Mohammad Mosharraf Hossain, Superintending Engineer
Md. Rablul Isram, Executive Engineer (Mech.)
Md. Asad Halim, Executive Engineer (Elec.)　他５名
(JICA 本部)　田所氏（計１名）
(関西電力)　平畑、河合、吉竹、一岡、藤井（計 5 名）

【調査結果】

1. EPC：丸紅、GT：MHPS 701F4 288MW、ST：MHPS 140MW、発電機：MELCO 変圧器：CGL（インドメーカー）、DCS：Emerson、GT 制御装置：DIASYS
2. 現在、GT 単機で運転中（2017/5/9 運開）だが、供給ガス不足のため 110MW しか出力がでていない。また、コンバインドサイクルとしての運開は遅延している模様。
3. EPC 保証期間 2 年＋LTSA 契約期間 6 年のセットで当面は対応。
4. プラント全体の運転情報監視ソフト：MAXIMO
5. 当直員は 3 交替。
6. MHPS 高砂・長崎工場およぶ MELCO 神戸工場にて GT/ST を対象にした O&M 研修を受講済（26 人）。

【面談結果】

1. 本日の確認内容は添付（質問状）のとおり。そのうち一部項目については NWPGCL（Bheramara 発電所）より別途回答予定（10/22 期日）。
2. NWPGCL 本社面談時と同様に、本発電所からの研修者選定に関する強い要望あり。研修者選定方法については JICA と協議要。

（今後の予定）

✓ 10/20（金）は Bheramara から Dhaka への移動及び報告資料作成を実施予定。

以　上

バングラデシュ第１回現地業務　調査メモ（10/22）

日時：2017 年 10 月 22 日（日）10:00～12:00

目的：Haripur-CCPP 発電所（EGCB）の現地調査の実施および事前に作成した質問票を基に、火力発電所の運営・維持管理に関する現状の聞き取り調査を実施する。

場所：Meeting room of Haripur-CCPP power plant（EGCB）

出席：(EGCB)　A.K.M Mostafizur Rahaman, Superintending Engineer, Haripur CCPP
Engr. Md. Kamruzzaman, Superintending Engineer, Haripur CCPP
Mohammad Anwar Hossain, Executive Engineer, Haripur CCPP
Engr. Md. Siddiqur Rahman, Executive Engineer, Haripur CCPP
Engr Md Rokonuzzaman, PEng, Executive Engineer, Haripur CCPP
(JICA 本部)　森氏（計 1 名）
(関西電力)　平畑、河合、吉竹、一岡、藤井（計 5 名）

【調査結果】

1. EPC：丸紅、GT：MHPS（701F4：279MW @35℃）、GT 発電機：MELCO
   ST（発電機含む）：富士電機（149MW）、HRSG：Doosan（韓国）、変圧器：ABB
   運転開始：2014 年 4 月 6 日、プラント効率：56%（HHV）

【面談結果】

1. EPC 保証期間は 2 年。LTSA は GT のみ対象で 3 年契約（満了後も契約延長予定）。発電所からの補修予算要求に対して、EGCB 本社からの予算削減は基本的になし。
2. 研修については EGCB 配下の発電所にクラスルームがあり、エンジニアが講師を担当。研修前後で確認試験を行い、その研修の効果を確認。新任の職員は、BPDB が保有する Ghorashal の研修センターで研修を受けた後、本発電所に着任する。
3. 本プロジェクトの研修ニーズを質問したところ、OEM から提供された内容だけしか有していないため、それ以外の全般的な知識に対する研修ニーズあり。
4. 本発電所が他所に比べて運用実績が優れている理由を質問したところ、JICA 円借款（EPC）プロジェクトであり JICA による定期的なモニタリングがよい結果につながっているとの回答があった。また、外部コンサルタントとして E&Y を採用。
5. 発電所向けガス供給不足が頻発している。また、発電所の所要人数に対して、実働人数が各課で不足している。職員の採用は発電所単位ではなく EGCB が行っており、EGCB が採用手続きに時間を要している間に、他の発電所で人員が必要になるなど事情の変更が生じることが原因。EGCB の採用ポストに対する応募自体は十分にある。

バングラデシュ第１回現地業務　調査メモ（10/22）

日時：2017 年 10 月 22 日（日）13:00～15:30

目的：Haripur-CCPP 発電所（Pendekar）の現地調査の実施および事前に作成した質問票を基に、火力発電所の運営・維持管理に関する現状の聞き取り調査を実施する。

場所：Meeting room of Haripur-CCPP power plant（Pendekar）

出席：(Pendekar)　Kazi Shamsul Aiam, Plant Manager
Ahmad Syahrani Bin Sulaiman, Regional Country Manager　他 3 名
(JICA 本部)　森氏（計 1 名）
(関西電力)　平畑、河合、吉竹、一岡、藤井（計 5 名）

【調査結果】

1. EPC：HHI、GT：MHPS（701F3)、ST：富士電機、HRSG：HHI
   運転開始：2001 年 10 月 1 日
   Availability Factor は総じて 90%以上（大型補修工事がない場合)。
   利用率は昨年度実績で 77%。

【面談結果】

1. 雨季/乾季関係なく近隣の川から取水するも不純物が多いのが難点。
2. 発電所向けガス供給不足が頻発し、供給ガスには不純物が含有（訪問当日もガスフィルター交換のため運転停止させていた)。
3. 優れた発電運用実績および発電所運開以降の無災害実績から、2014 年にベストコンバインドサイクルアワードを受賞。なお、発電所運用性能についてはモニタリングシステムにて常時監視。
4. BPDB に対して少人数体制で運用。運転員 4 人/直で 2 交替制。
5. 新任者への研修は自前で行っており、BPDB 等の施設を利用することはない。採用は新卒者及び他の発電所等で経験を積んだ人材どちらも行っている。
6. Questionnaire で本日確認した内容は添付資料のとおり（本日送付した Questionnaire に基づき別途回答予定)。また、本日のプレゼン資料も別途送付予定。

（今後の予定）

✓ 10/23（月）は Ashganj 発電所を訪問して、打合せ及びサイトビジットを実施予定。

以　上

バングラデシュ第１回現地業務　調査メモ（10/23）

日時：2017 年 10 月 23 日（月）10:00～15:30

目的：Ashuganj 発電所（APSCL）の現地調査および事前に作成した質問票を基に、火力発電所の運営・維持管理に関する現状の聞き取り調査を実施する。

場所：Meeting room of Ashuganj power station Company Ltd.（APSCL）

出席：(APSCL)　Md. Shah Alam Khan, Superintending Engineer　他約 20 名
(JICA 本部)　森氏（計 1 名）
(関西電力)　平畑、河合、吉竹、一岡、藤井（計 5 名）

【調査結果】

1. 1970 年 7 月に 1 号機が運転開始し、現在はユニット 11 機の構成。ただし 1 号機および 5 号機（GT-2）は休止状態（現状のネット出力はゼロのためリタイア予定)。また、発電所全体の設備容量 1,876MW に対して現状のネット出力は 1,627MW が見込まれるとのこと。
2. 本日、現地調査した 10 号機 (450MW-CCPP : South), 11 号機 (450MW-CCPP : North) については以下のとおり。
   - 10 号機　GT : Siemens AG (250MW)、ST : Siemens (125MW)、HRSG : CMI(USA)、発電機：Siemens、一軸式
   - 11 号機　GT：Siemens AG(254.756MW)、ST：Siemens（128MW)、HRSG：Nooter Eriksen (韓国)、発電機：Siemens、一軸式

【面談結果】

1. 10 号機（2016 年運開）および 11 号機（2017 年運開）は、OEM マニュアルに基づき対応中だが、今後は自社マニュアルに改善させて整備する予定。
2. 2017 年 8 月に人身災害あり。(変圧器付近で死亡事故発生)
3. 予算は APSCL が承認する。予算承認が遅れることはない。
4. 作業停止計画は、7 月前に BPDB に提出して、BPDB が最終承認する。承認が遅れることはないが、需給が厳しい場合は調整が入ることがある。
5. 教育した成果は、インタビューと試験で確認している。
6. トレーニングメニューとして、LTSA、最新設備、及び石炭火力に関する内容ついて教えて頂きたいとの要望あり。
7. 事業開発に関する研修資料を受領した（Advanced Project Management Batch1：Ricardo 社)。教育は BPDB の本社で実施している。
8. RMC（遠隔監視）は LTSA が入ってから導入予定。
9. その他、確認結果は、Questionnaire の回答のとおり。

（今後の予定）

- ✓ 10/24（火）14 時より、MoPEMR Power Division にて各関係機関とラップアップミーティングを実施予定。

以　上

バングラデシュ第１回現地業務　調査メモ（10/24）

日時：2017 年 10 月 24 日（火）14:00～15:30

目的：**現地調査結果及び今後の進め方等に関して、MoPEMR 他、関係箇所と打合せを実施する。**

場所：Conference room of MoPEMR Power Division

出席：(Bangladesh カウンターパート)

Shah Md. Helal Uddin, PhD, Deputy Chief, Power Division, MoPEMR

Mr. Muhammad Chishty Asheque, Assistant Chief, Power Division, MoPEMR

Engr. M. Mahmudur Rahman Mahmud, Deputy Director, Design & Inspection, BPDB

Md. Shah Alam Khan, Superintending Engineer (Mechanical Maintenance), APSCL

Md. Anamul Haque, Deputy General Manager, NWPGCL

Ibrahim Ahmad Shafi Al Mohtad, Superintending Enjineer, EGCBL

Engr. Md. Abdur Rouf, Executive Director, CPGCBL

(JICA 本部)　森氏（計 1 名）

(関西電力)　平畑、河合、吉竹、一岡、藤井（計 5 名）

【打合せ結果】

1. パワーポイント説明資料 P10　テクニシャンのクライテリアについて、「mechanical engineering」を「mechanical work」に修正する。（修正済）
2. クライテリアの経験年数については、各社間で認識の違いがあり、議論されたが、原案通りとなった。(5 年以上)
3. 研修プログラムの HSE は Engineer に必要な知識かとの質問があったが、安全環境(Safty Environment)の意味であると説明し、納得していただいた。
4. パワーポイント資料と MM 資料を本日中に送付するよう依頼があったため、別途関係箇所に送付するとした。

（今後の予定）

✓ 10/25（水）13 時より JICA バングラデシュ事務所で事前打合せ、15 時より JCC を実施予定。

以　上

Meeting: **A meeting with JICA's Mission on "Project for Capacity Development for Operation and Maintenance of Thermal Power Station "**

Venue: Conference Room of Power Division
(Room # 1116, Level # 11, Bidyut Bhaban, Ramna, Dhaka)

Date: 24/10/2017

Time: 02:00 pm.

Participant List

Sl No.	Name of the Participant	Designation & Organization	Mobile/Phone E-mail	Signature
1				
2	Ibrahim Ahmad Shafi Al Mortad	SE, EGCB	[redacted]	
3	Md. Abdur Rouf	Executive Director(Project) CPGCBL		
4	Md. Shah Alam Khan	Chief Engineer (O&M) APSCL		
5	Md. Anamul Haque	DGM (HR) NWPGCL		
6	Junki Mori	JICA HQ		
7	Shigeru Yoshitake	Kansai		
8	Takeo Fujii	〃		
9	Toru Kawai	〃		
10	Hidenobu Ichioka	〃		
11	Hiroki Hirahata	〃		
12				
13	Engr. M. Mahmudur Rahman Mahmud	BPDB		
14				
15				
16				

バングラデシュ第 2 回現地業務　調査メモ（7/29）

日時：2018 年 7 月 29 日（日）15:00～16:00

目的：プロジェクト中間報告、第 2 回本邦研修内容共有、第 2 回現地業務スケジュール共有

場所：MoPEMR Power Division Office

出席：(Bangladesh カウンターパート)　Rahamat 氏他、Attendance List 参照（計 13 名）
(JICA Bangladesh 事務所)　Mukammeluddin 氏（計 1 名）
(関西電力)　平畑、吉竹、土井、一岡、大部（計 5 名）

【打合せ結果】

プレゼン資料で提示した第 2 回本邦研修に向けた Selection Criteria に関して、様々な意見提起があった。まずは JICA Expert からの提案として持ち帰っていただき、今後の現地調査結果を踏まえながら Wrap-up meeting（8/9）にて纏めることとした。

【主なトピックス】

○Overview of Interim Report (Bangladesh)

✓ オペレータへのトレーニング有無について言及があった（APSCL)。
→オペレーション研修は、シミュレータと実際の発電プラントの仕様（メーカ、燃料、発電方式等）が大きく異なり、バングラデシュでの運用に特化した研修ではないこと、基本的には OEM からそれぞれの発電プラントに沿ったメニューに基づき行う方が効果的であること等を説明した。また、我々ユーティリティとして効果的な技術貢献はメンテナンスを中心に研修を行うことが効果的であることを説明して理解頂いた。

✓ 第 2 回本邦研修メニューで、電気・C&I 分野を行う考えはあるか質問があった(APSCL)。
→今後の設備経年化等の影響を考慮すると、電気や C&I よりも機械分野に重点を置いた方が火力 O&M の品質およびコストへの影響から効果的なことを説明して理解頂いた。

✓ 本邦研修中は、今回提案の研修科目とともに休日の過ごし方（例えば日本の歴史、観光、食事等）を充実させることで相乗効果を期待したいという意見があった（Power Division)。

✓ Selection Criteria については「経験年数 5～10 年」に関する意見提起が各カウンターパートからあった（NWPGCL 他)。Power Division からも本要件の緩和に関するコメントがあった。
→本件については各カウンターパートとの意見交換（先方事情やニーズ把握等）を進め、Wrap-up meeting 時に改めて提示予定。

✓ Power Division には、今回の JICA 能力開発プロジェクトをバングラ側で独自に計画したいという意向がある模様。ついては本プロジェクトに必要な予算規模を確認したいとの意見があった（⇒JICA 側フォロー事項と認識）

【特記事項】

➢ 第 2 回現地業務に関して、いくつかのカウンターパートより、訪問・打合せ時間が Focal Person より共有されていないことが判明。本日参加メンバーに対して Agenda と共に送付する。

（明日 7/30 の予定）

✓ BPDP とのミーティング

✓ NWPGCL とのミーティング

以　上

A kick-off meeting with JICA Expert Team regarding "Project for Capacity Development for Operation and Maintenance of Theramal Power Stations"

Venue: Conference Room of Power Division (Room # 1116, Level # 11) Bidyut Bhaban, Ramna, Dhaka)

Date: **29/07/2018**
Time: **3:00 pm.**

Participant List

Sl No.	Name of the Participant	Designation & Organization	Mobile/Phone E-mail	Signature
1	[illegible]	[illegible]	[redacted]	
2	Toshiharu Doi	Mechanical Eng Mgr		Yoshi Doi
3	Shigeru Yoshitake	Mech Eng		
4	Hidenobu Ichioka	Elec. engineer		
5	Yuki Obe	C&I Engineer		
6	Zahed ur Rashed	Executive [illegible] Director (Engineering) NWPGCL		
7	[illegible]	[illegible] NWPGCL		
8	[illegible]	[illegible]		
9	[illegible]	Assistant Engineer. D&I-1, BPDB		
10	M. Mahmudur Rahman Mahmud	XEN, BPDB		
11	[illegible]	Chief Engineer		

Participant List

Sl No.	Name of the Participant	Designation & Organization	Mobile/Phone E-mail	Signature
12	[illegible]	Assistant Chief [illegible] Power Division	[redacted]	
13	Md. Atabur Rouf	Executive Director (Project) CPGCBL		
14	Ali Kauser M. Firoz	MD, EGCB		
15	[illegible]	MD, EGCB APSCL		
16	[illegible]	[illegible]		29.07.20
17	Md. Ashraf Hossain	RECOM) RPCL		29/7/2018
18	Kamal Hossain	Manager-HR RPCL		29/07/2018
19	Hiroki Hirahata	Kansai		
20				
21				
22				
23				
24				

バングラデシュ第 2 回現地業務　調査メモ（7/30）

日時：2018 年 7 月 30 日（月）10:00～12:00

目的：プロジェクト中間報告、第 2 回本邦研修内容共有、関西電力の人材育成体系紹介、研修員へのインタビュー

場所：BPDB Head Office

出席：(BPDB)　Belayet 氏他、Attendance List 参照（計 4 名）

(関西電力)　平畑、吉竹、土井、一岡、大部（計 5 名）

【打合せ結果】

1. BPDB として、プレゼン資料で提示した第 2 回本邦研修メニューおよび選考基準について改めて議論して、ご理解いただいた。
2. HRD に関するアンケートに関して、本現地調査業務中に Mahmudur 氏に作成の上で、提出依頼済（8/1Ghorashal 現地調査同行時に回収予定）。また、育成計画・評価システム・テキストのサンプルを 8 月末までにメールで回答いただくようを依頼済。
3. 現地での BPDB 研修員によるトレーニングレポートは、関電要求に基づき Mahmudur 氏が取り纏め、2018-20 年度（3 年間）の間、半年単位で提出いただくよう依頼済。

【主なトピックス】

○Overview of Interim Report (Bangladesh)

✓ Belayat 氏向けにプレゼン資料を個別説明して、大綱了解が得られた。

○研修員へのインタビュー（エンジニア 1 名、テクニシャン 2 名）

✓ 未回答であった研修員に対するアンケートに回答いただいた。
✓ テクニシャン 1 名（Ataur 氏）は現在別の発電所で勤務しており、AP の実施は元の発電所に戻ってからになるとのこと。（約 1 ヵ月後から開始する予定）
✓ 自国に帰ってから教育を実施する際、年齢は関係ない模様。
✓ 現地での研修対象者は本邦研修員が所属する部門（メンテナンス）内から参加しており、OJT の形式で教えている。
✓ 現地での研修員からの改善意見等は特に挙がっておらず、積極的に日本で学んだ知識を教えて欲しいとの意見があった。

○関西電力の人材育成体系紹介

✓ GT 部門における育成計画・評価システム・育成段階に応じたテキストのサンプルを 8 月末までに提出いただくよう依頼済（→BPDB：Mahmudur 氏）。

【その他】

- 8/1 Ghorashal PS 訪問時は、BPDB の Mahmudur 氏も同行（車同乗）する。

日時：2018 年 7 月 30 日（月）14:30～16:00
目的：プロジェクト中間報告、第 2 回本邦研修内容共有、関西電力の人材育成体系紹介
場所：NWPGCL Corporate Office
出席：(NWPGCL)　Muruzzaman 氏他、Attendance List 参照（計 6 名）
　　(関西電力)　平畑、吉竹、土井、一岡、大部（計 5 名）

【打合せ結果】

プレゼン資料で提示した第 2 回本邦研修の選考基準のうち、選考基準の一つである経験年数（GTCC の OM 経験 5 年以上 10 年まで）の条件緩和について要請あり。理由は、所管する 3 発電所（Bheramara/Sirajganj/Khulna）はいずれも比較的新しいため、エンジニア・テクニシャンの選考対象から外れやすくなることを懸念したもの。
→本項目については「Ideally」であることを明記した上で、人員選考の最終判断はあくまでバングラ側であることを説明して、ご理解いただいた。

【主なトピックス】

○Overview of Interim Report (Bangladesh)

- ✓ Selection Criteria について、NWPGCL の発電所は運開間もないプラントが多くあり、経験年数が 5 年に満たない要員が多数いるため、柔軟な表記にしてもらいたいとの意見提起があった。
  →本項目については「Ideally」であることを明記することでご理解いただいた。なお、エンジニアおよびテクニシャンの人員選考はあくまでバングラ側であることを今回改めて説明済み。
- ✓ 発電プラントメーカによって選考基準に影響はあるかとの質問があった。
  →本邦研修では MHPS を代表プラントとして研修を実施するが、GT/ST/HRSG に関連する部門であればどのメーカーのプラントから参加して問題ないと説明し、理解いただいた。

○関西電力の人材育成体系紹介

- ✓ NWPGCL においては社員共通の人材育成システムはあるものの、あくまで General な内容。関電とは異なり、技術要員（特にメンテナンス）に特化したものや、能力・スキル水準に応じたカテゴライズはなされていない。また、研修教材はあくまで OEM マニュアルを使用したものであり、NWPGCL オリジナルのものは存在しないとのこと。

→関電での人材育成に関する取り組み内容に関心があった模様。

【特記事項】

- 「Annual Report 2017/18」「Training Program 2017/18」を受領。

（明日 7/31 の予定）

- ✓ EGCB とのミーティング
- ✓ CPGCBL とのミーティング
- ✓ RPCL とのミーティング

以　上

meeting title: _____

Capacity Building for Operation & Maintenance of Thermal Power Plant
in People's Republic of Bangladesh

Meeting with BPDB Attendance List

Date: 30th / July / 2018

Time: 10 : 00 - 12 : 00

Place: BPDB Head Office

Name	Position	Company	Signature
M. Mahmudur Rahman Mahmud	Executive Engr.	BPDB	
Uddin md jalal	Foreman	BPDB	
RAHMAN MD ATAUR	FITTER – 'D'	BPDB	
Yuki Obe	C&I Eng.	KEPCO	
Hidenobu Ichioka	Elec. Eng	Kansai Electric	
Yoshihiro Doi	Mech Eng Mgr.	Kansai	
Shigeru Yoshitake	Mech Eng	Kansai	
Nirohi Hirohata	General Manager	Kansai	
md. Belayet Hossai	C.E. P&D.	BPDB.	

JICA

Kansai Electric Power
power with heart

meeting title: _____

Capacity Building for Operation & Maintenance of Thermal Power Plant
in People's Republic of Bangladesh

Meeting with NWPGCL Attendance List

Date: 30th / July / 2018

Time: 14 : 30 - 15 : 50

Place: NWPGCL Corporate Office

Name	Position	Company	Signature
Md. Muruzzaman	ED(Fin)	NWPGCL	30/7/18
Abdullah Al Quraishi	Project Director Sirajganj 3rd Unit	NWPGCL	30.07.18
Md. Mainuddin Sarker	Executive Engr.	NWPGCL	30/07/18
MOHAMMAD MONIR HOSSAIN	EXECUTIVE ENGINEER (P&D)	NWPGCL	30.07.18
Md. MDTIUL ISLAM	Superintending Engineer (Procurement)	NWPGCL	30-07-18
Quazum uddin Ahmed	Deputy Manager (HR/Training)	NWPGCL	30.07.18
Masud	Guide	Jaba	
Yoshihiro Doi	Mech. Eng Mgr.	Kansai	
Hiroki Hinata	General Manager	Kansai	平田 弘樹
Hidenobu Ichioka	Elec. Engineer	Kansai	一岡栄喜
Yuki Obe	C&I Eng.	Kansai	大江 祐貴
Shigeru Yoshitake	Mech eng	Kansai	吉竹 茂

JICA

Kansai Electric Power
power with heart

バングラデシュ第 2 回現地業務　調査メモ（7/31）

日時：2018 年 7 月 31 日（火）9:30～11:00
目的：プロジェクト中間報告、第 2 回本邦研修内容共有、関西電力の人材育成体系紹介
場所：EGCB Corporate Office
出席：(EGCB)　Kausar 氏他、Attendance List 参照（計 9 名）
　　(関西電力)　平畑、吉竹、土井、一岡、大部（計 5 名）

【打合せ結果】

1. EGCB として、プレゼン資料で提示した第 2 回本邦研修メニューおよび選考基準について改めて議論し、ご理解いただいた。
2. Kansai の HRD に関するプレゼン資料を EGCB の Focal Person に送付する。(本調査メモ作成時点で送付済み)

【主なトピックス】

○Overview of Interim Report (Bangladesh)

- ✓ 本邦研修員の人数に関して 10 人ずつではなく、もっと増員できないかとの意見あり。
  →コメント内容は JICA に伝えるものの、予算的にも増員は難しいだろうと返答。
- ✓ 選考基準（経験年数や機械系）に対しては、特に意見無し。
- ✓ その他プレゼン資料を説明し、大綱了解が得られた。

○Questionnaire

- ✓ 特になし

○関西電力の人材育成体系紹介

- ✓ EGCB の技術員の人材育成階層はビギナー・ミドル・シニアの 3 つに分かれている。
- ✓ ビギナーはまず 1 ヶ月ほど講義形式で基礎的な知識を得ることからはじめ、5 年ほど経験を積むとミドルの扱いになる（正式には決まっていない模様)。
- ✓ EGCB の雇用方法としては、本社で勤務する人は初めから本社勤務として雇用される。
- ✓ EGCB として研修プログラムはあるが、specific な研修については、外部のメーカや研修機関を利用する。
- ✓ Kansai の HRD に関するプレゼン資料提供の要望あり（別途メールで送付済)。
- ✓ EGCB には研修テキストにあたる教材は無い模様で、Kansai の研修テキストに関する提供要望もあり。本件については、本邦研修で使用した教材が参考になると回答して納得頂いた。

日時：2018 年 7 月 31 日（月）11:50～13:10

目的：プロジェクト中間報告、第 2 回本邦研修内容共有、関西電力の人材育成体系紹介、研修員へのインタビュー

場所：CPGCBL Corporate Office

出席：(CPGCBL)　Abdur 氏他、Attendance List 参照（計 3 名）
(関西電力)　平畑、吉竹、土井、一岡、大部（計 5 名）

【打合せ結果】

✓ CPGCBL として、プレゼン資料で提示した第 2 回本邦研修メニューおよび選考基準について改めて議論し、ご理解いただいた。

【主なトピックス】

○Overview of Interim Report (Bangladesh)

✓ 本邦研修対象部門に関して質問があり、機械系メンテナンス部門を対象とすることを説明。2 年目以降は電気・計装系を対象にしてもらいたい模様。
→機械のトラブルにはコストインパクトが大きいものが多く、機械系に特化した方が大きな研修効果が期待できること等を説明して、2 年目は機械系とすることを理解頂いた。3 年目については継続して議論することとした。

✓ オペレーション部門の研修有無に関して言及があった。
→運転シミュレータと実際の発電設備の間に仕様の違いがあれば、その研修効果に疑問があること、実際に設備を納入したメーカによるサポートが有効との説明により、理解頂いた。

✓ 選考基準（経験年数）に対してはその厳密性について質問あり。
→関西としてはミドルレベルを想定。最終的にはバングラ側の判断である旨を説明。

○関西電力の人材育成体系紹介

✓ CPGCBL は現時点で石炭火力建設期間中の組織のため、アウトラインのみ説明。

✓ バングラでの人材育成は、Power Division よりトレーニングセンターへの応募依頼があった際に応募する形式とのこと。

✓ バングラとしては、初の USC(超々臨界圧)ボイラを採用しており、それ特有の知識や技能がないことが悩み事。
→オーナーズエンジや EPC 事業者等を最大限活用し、CPGCBL の USC ユニットに密接に関係する最新技術の提供を積極的に要求し、速やかに習得すべきと提案。また、本邦研修では関西でのトラブル事例も含めて概要説明時に説明する旨を説明。（ただし、あくまで GTCC がメインターゲット）

〇研修員へのインタビュー（エンジニア 1 名）

- ✓ エンジニア研修員の Yamin 氏は発電所で勤務中とのことで不参加であった。
- ✓ CPGCBL のエンジニア研修員 2 名（Yamin 氏、Mannaf 氏）は共同で振動に関する研修を実施したとのこと。その際の教育資料は本邦研修時の研修資料を使用。
- ✓ 自国で研修を行うのに年齢の上下は関係ない模様。
- ✓ 自国での研修時の問題点として、本邦研修時のモデルロータや非破壊検査等の資機材がないため、プラクティカルな研修ができないとの意見があった。研修に参加された方々からの意見でも挙がっている模様。
- ✓ 現状、研修施設はないが、マタバリ発電所運開（2024 年頃）を目処に、メーカーサポート（資金は JICA サポート）によりシミュレータ等を備えた研修施設が設置される予定。

【特記事項】

- ➢ 「Annual Report 2016/17」を受領。

RPCL への調査に関しては、学生デモによる道路封鎖の影響により、急遽中止とした。

（明日 8/1 の予定）

- ✓ BPDB Ghorashal 発電所訪問

以　上

meeting title: _____

Capacity Building for Operation & Maintenance of Thermal Power Plant
in People's Republic of Bangladesh

Meeting with EGCB Attendance List

Date: 31th / July / 2018

Time: 9 : 30 - 11 : 00

Place: EGCB Corporate Office

Name	Position	Company	Signature
Ali Kausar M. Firoz	Managing Director	EGCB	
M. A. HASNAT	~~Executive Director~~ Executive Director (Engg)	EGCB	31.07.18
Ibrahim Ahmad Shafi Al Mohtad	Superintending Engineer (Planning & Development)	EGCB	
Al obyed Bin Ahmed	SDE	siddhirganj 335 mw CCPP EGCB Ltd.	
MOHAMMAD NOORE ALAM SIDDIKI	Executive Engineer	EGCB Ltd.	31/07/18
MAH. Faizul Haque	Manager (HR)	EGCB Ltd	31/07/18
Touhidur Rahman	Assistant Engineer (P&D)	EGCB Ltd.	Touhid
Masud	Guide	JICA	
Hirahata Hiroki		Kansai Electric	
Hidenobu Ichioka	Elec. Engineer	Kansai Electric	一岡宇喜
Yoshihiro Doi	Mech. Eng. Mgr.	Kansai	
Shigeru. Yoshitake	Mech Eng	Kansai	吉竹 茂

JICA

Kansai Electric Power
power with heart

meeting title: _____

Name	Position	Company	Signature
Yuki Obe	C&I Eng	Kansai	大部祐貴
Md. Nazmul Alam	PD 335MW CCPP Project	EGCB Ltd	
Md. Siful Islam	SE	EGCB Ltd.	

Kansai Electric Power
power with heart

meeting title: _____

Capacity Building for Operation & Maintenance of Thermal Power Plant
in People's Republic of Bangladesh

Meeting with CPGCBL **Attendance List**

Date: 31th / July / 2018

Time: 11 : 50 - 13 : 10

Place: CPGCBL Corporate Office

Name	Position	Company	Signature
Md. Abdur Rouf	Executive Director (Project)	CPGCBL	
MUHAMMAD MATIUR RAHMAN	Manager (HRM)	CPGCBL	MRahman 31/7/18
SM Abdul Mannaf	Executive Engineer (Mech)	CPGCBL	
Yuki Obe	C&I Eng	Kansai	
Hidenobu Ichioka	Elec. Engineer	Kansai Electric	一岡栄喜
Shigeru Yoshitake	Mech eng	Kansai	吉竹茂
Hiroki Hirakata	General Manager	Kansai	平田弘樹
Yoshihiro Doi	Mech Eng/Mgr	Kansai	Yoshi Doi

バングラデシュ第 2 回現地業務　調査メモ（8/1）

日時：2018 年 8 月 1 日（水）10:30～13:00
目的：プロジェクト中間報告、第 2 回本邦研修内容共有、研修員へのインタビュー
場所：BPDB Ghorashal Power Station
出席：(BPDB)　Rahwu 氏他、Attendance List 参照（計 4 名）
　　(関西電力)　平畑、吉竹、土井、一岡、大部（計 5 名）

【打合せ結果】

1. BPDB Ghorashal 発電所幹部に対し、プロジェクト中間報告、第 2 回本邦研修メニューおよび選考基準について説明し、大綱了解が得られた。

【主なトピックス】

○　Ghorashal 発電所視察

✓ 1～6 号機（ガス焚きコンベンショナル、旧ソ連製プラント）については、前回現地調査時（2017/10）に視察済み。

✓ 視察当日は 1･2 号機については、定格出力 55MW のところ、30～36MW で運転中、3 号機については、定格出力 210MW のところ、95MW で運転中であり、DSS 運用している模様。4･5 号機は停止中。6 号機は 2010 年のタービン発電機モータリング化による損傷トラブルにより廃止状態。(運転操作盤の電源も切っている状況)

✓ 3･4 号機は、GT 追設「GT（GE 製：スペックは不明）+HRSG を新設し、ST は既存活用」によるリパワリング中。6 号機についても将来的にはリパワリングを計画中だが、ファイナンス組成が問題とのこと。

✓ 今回新設した 7 号機を中心に視察。7 号機は 1 on 1 の出力 365MW の GTCC。現在は EPC である中国系企業によって運転されていた。
　GT：Siemens SGT5-4000F、ST：DONGFANG（中国)、HRSG：韓国メーカー
　GT 発電機：Siemens、ST 発電機：DONGFANG（中国)、主変圧器：China XD

✓ COD～保証期間(18 ヶ月)終了までの間の運転は EPC である中国系企業によって O&M を行う模様。この 18 ヶ月間の運転期間中に Ghorashal 発電所要員を OJT で教育し、引継ぎを行うとのこと。現在は現場設備を中心に OJT を実施中。その後、中央制御室にてオペレーション方法について伝達予定とのこと。

✓ GT 圧縮機翼の化学洗浄装置が設置されており、1 回／10 日の周期で負荷運転中に出力を下げて実施している。GT 吸気フィルタは高性能 3 段式を採用しているが HEPA は未使用。高性能フィルタよりも安上がりであると判断したとの説明があった。

○Questionnaire

✓ 特になし

○研修員へのインタビュー（テクニシャン 2 名）

✓ Ghorashal 発電所所属のテクニシャン 2 名（Mr. Shafiqul, Mr. Shah Alam）のインタビューを予定していたが、別の発電所（Chandpur 発電所）で発生したトラブルへの応援のため不在（インタビューは実施不可）。研修員未提出の研修実施レポートおよびアンケートの回答については、メールで後日送るよう BPDB の Mahmudur 氏に依頼済。

✓ Mahmudur 氏に依頼していた BPDB 本社向けアンケートと質問状の回答は回収済。

（明日 8/2 の予定）

✓ APSCL Site Office および発電所訪問→学生デモによる道路封鎖のため、調査中止。

以　上

meeting title: _____

Capacity Building for Operation & Maintenance of Thermal Power Plant
in People's Republic of Bangladesh

Meeting with Ghorashal Attendance List

Date: 1st / Aug / 2018

Time: 10 : 40 - 11 : 10

Place: Ghorashal Power Station

Name	Position	Company	Signature
Mohammad Ali Faraz	XEN	BPDB	
Jewel Hossain Senazi	Assistant Chief Engineer	BPDB	
H. Mahmuder Rahma	XEN (Design-1)	BPDB	
Md. Zahurul Islam	Manager	BPDB	
Nioki Kinkata	General Manager	Kansai	
Masud	Guide	Jica	
Yoshihiro Doi	Mech. Eng / Mgr	Kansai	
Hidenobu Ichioka	Elec. Engineer	Kansai	
Shigeru Yoshizake	Mech. Eng	KANSAI	
Yuki Obe	C&I Eng.	Kansai	

Kansai Electric Power
power with heart

Minutes of Meeting

Project	The Project for Capacity Development for Operation & Maintenance of Thermal Power Stations in Bangladesh (the 3rd survey by JICA Expert Team)
Title	Kick-off Meeting
Date	25th July 2019
Time	15:00 - 16:00
Place	Conference Room of Power Division
Attendees	See Attachment “attendance list”

Record of Discussions

NO	ITEM DETAILS
1.	**Introduction**
1.1	This meeting was convened with the objective to discuss the below agenda point: 1) Presentation of JICA Capacity building O&M “OVERVIEW of INTERIM REPORT(Drafted)” ü Project Summary ü O&M Training in Japan (2nd Batch in 2019) ü Monitoring Indicators (2nd Year Completed: 2019) ü Summary on the Mission: 2nd Follow-up Survey Reviewing O&M training activity at TPPs implemented by JICA-trained engineers & technicians. Grasping the current situation of O&M at TPPs and identifying the O&M training needs, through discussion on the issue analysis. Suggesting next O&M training in Japan and the selection criteria for engineers & technicians: 3rd Batch, NOV/DEC in 2019. Suggesting brand-new HRD (Human Resource Development) training in Japan and the selection criteria for management: DEC in 2019.

NO	ITEM DETAILS
2.	**OVERVIEW of INTERIM REPORT(Drafted)**
2.1	JICA expert (KANSAI) made the presentation on "OVERVIEW of INTERIM REPORT(Drafted)", containing "Project Summary", "O&M Training in Japan (2nd Batch in 2019)", "Monitoring Indicators (2nd Year Completed: 2019)" and "Summary on the Mission: 2nd Follow-up Survey" 1) MoPEMR requested to increase the number of HRD participants from 4-5 members to power division plus each generation company (1+6 members). 2) MoPEMR also told that there were only few feedback of action plan implemented by JICA-trained technicians. 3) EGCB told that it was also preferable to focus on chief engineer of TPPs for next training in Japan. 4) APSCL asked to increase the number of engineers & technicians for next training in Japan. 5) MoPEMR requested to increase the number of participants by shortening current training term for engineers & technicians. 6) CPGCBL told that other training course aside from mechanical maintenance (electrical, C&I, etc.) would be also preferable as next training in Japan. 7) NWPGCL told that the diploma as the selection criteria for technician should be removed. JICA expert replied that the diploma is not mandatory but preferable. As a conclusion of today's meeting, both sides agreed that the above-mentioned issues should be decided at JCC through this follow-up survey and internal discussion of Japan side.

বিদ্যুৎ, জ্বালানি ও খনিজ সম্পদ মন্ত্রণালয়
বিদ্যুৎ বিভাগ, পরিকল্পনা-২ শাখা

A kick-off meeting with JICA Expert Team regarding "Project for Capacity Development for Operation and Maintenance of Theramal Power Stations"

Venue: Conference Room of Power Division (Room # 1116, Level # 11) Bidyut Bhaban, Ramna, Dhaka)

Date: 25/07/2019
Time: 2.30 pm.

Participant List

Sl No.	Name of the Participant	Designation & Organization	Mobile/Phone E-mail	Signature
1	Shaon Md. Hejaul Haque	Dy. Chief Power Di	[redacted]	
2				
3				
4	Md. Abdur Rouf	Executive Director (Project) CPGCBL		
5	Engr. Md. Shah Alam Khan	Chief Engr. APSCL		
6	Engr. Papon Das	Superintending Engineer. B-R Powergen Ltd		
7	Abdullah Al Mahmood	SE B R Powergen Ltd.		
8	Ibrahim Ahmed Shafi Al Mahtad	SE EGCB Ltd.		
9	Sushanta Kumar Saha	Chief Engr (Plg) RPCL		
10	md. Rezaul Kabir	S.E (RPCL)		.com

Participant List

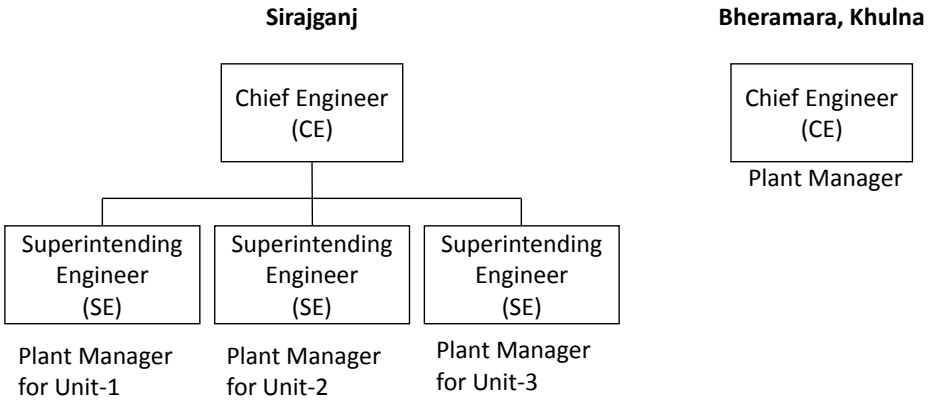
Sl No.	Name of the Participant	Designation & Organization	Mobile/Phone E-mail	Signature
11	Kamal Hossain	Manager-HR RPCL	[redacted]	
12	Mohammad Ashikur Rahman	Deputy Manager (T&I) RPCL		
13	M. Mahmudur Rahman Mahmud	Dy. Director (XEN) BPDB		
14	Hidenobu Ichioka	Kansai Electric		
15	Yoshikuni Doi	Kansai Electric		
16	Akira Kozakai	Kansai Electric		
17	Ahmad MuKammaluddin	Principal Program Manager		
18	Md. Anamul Haque	DGM(HA) NWPGCL		
19	Hiroki Hirakata	General Manager		
20				

Minutes of Meeting

Project	The Project for Capacity Development for Operation & Maintenance of Thermal Power Stations in Bangladesh (the 3rd survey by JICA Expert Team)
Title	3rd survey in Sirajganj
Date	28th July 2019
Time	09:30-13:00
Place	Conference Rooms and Unit-2 (Site Visit)
Attendees	See Attachment "attendance list"

Record of Discussions

NO	ITEM DETAILS
1.	**Introduction**
1.1	This meeting was convened with the objective to discuss the below agenda point: 1) Presentation of JICA Capacity building O&M "OVERVIEW of INTERIM REPORT(Drafted)" ✓ Project Summary ✓ O&M Training in Japan (2nd Batch in 2019) ✓ Monitoring Indicators (2nd Year Completed: 2019) ✓ Summary on the Mission: 2nd Follow-up Survey ・ Reviewing O&M training activity at TPPs implemented by JICA-trained engineers & technicians. ・ Grasping the current situation of O&M at TPPs and identifying the O&M training needs, through discussion on the issue analysis. ・ Suggesting next O&M training in Japan and the selection criteria for engineers & technicians: 3rd Batch, NOV/DEC in 2019. ・ Suggesting brand-new HRD (Human Resource Development) training in Japan and the selection criteria for management: DEC in 2019.

NO	ITEM DETAILS
2.	**OVERVIEW of INTERIM REPORT(Drafted)**
2.1	JICA expert (KANSAI) made the presentation on "OVERVIEW of INTERIM REPORT(Drafted)", containing "Project Summary", "O&M Training in Japan (2nd Batch in 2019)", "Monitoring Indicators (2nd Year Completed: 2019)" and "Summary on the Mission: 2nd Follow-up Survey" 1) Management asked JICA expert which level of personnel would be suitable to participate in the HRD training. JICA expert replied that senior management level is suitable. 2) Management explained the difference in job responsibility and promotion system between Sirajganj and usual TPPs as follows: ➢ In Sirajganj, there are three superintending managers (SE), each of which has role and responsibility of plant manager for TPP unit individually while chief engineer (CE) is usually plant manager at other TPPs. The aim is that each SE can grasp the condition of their own unit.  ➢ In order to simplify the promotion system for technician, there are only two stages for foreman (A and B) as technician stage level in Sirajganj while there are usually four stages at other generation companies including BPDB. It depends on the policy of power generation companies, and it is suitable that NWPGCL has smaller workforce than BPDB. 3) Management explained that there are evaluation criteria format for engineers and technicians such as achievement of KPI, specified competences etc. 4) Management recommended JICA expert to increase the number of O&M training participants rather than to increase that of HRD training

NO	ITEM DETAILS
3.	**Interview and discussion with JICA-trained engineers and technicians**
	1) Hearing the answers of Kansai's questionnaire, JICA's questionnaire and APs activities (E/T) JICA expert received their activity report and pictures. (E) They disseminated their knowledge to their colleagues by utilizing JICA experts' materials even though they are busy to establish O&M organization for new unit-3 which is under construction. (T) Technicians implement their APs with their supervisors' and colleagues' fruitful corporation. But it is difficult to report their activities with electrical documents because of their unfamiliarity with computer. JICA expert advised that the priority is implementation of APs and report is the secondary. (T) Technicians lecture some trainings to their new employees. (T) TBM (Tool Box Meeting) is held sometime before actual works. That helps to improve safety awareness, but their status is on the way to ensure the safety mind. (T) Technicians have transferred their skill and knowledge obtained in Japan to other colleagues. JICA expert confirmed they made full use of JICA-provided textbooks for their disseminations. 2) Discussion about the Issue Analysis of O&M at TPPs. (E) O&M manuals are almost available. (E) The quality of main equipment especially gas turbine manufactured by Siemens is high quality, on the other hand that of BOP is relatively not so high quality. (E) Operation procedures are written, well organized and available on demand. (E) There are some information sharing system such as sharing trouble condition via messaging chat application and sharing safety information via verbal communication before work, but not formalized way. (T) Technicians would repair after considering causes of the troubles. (E/T) Scheduled maintenance is done after negotiation with BPDB. The schedule is sometime changed. (T) Tools and Jigs are set in order after training in Japan. This activity can help technicians to save the time and lead to efficient work.

NO	ITEM DETAILS
4.	**Site Survey of Unit-2**
	1) Shirajganj TPP has 3 units. One is operated independently but other two are under EPC warranty. 2) JICA expert observed as follows; · In the ware house and workshop, they keep their tools and jigs set in order. · In the turbine house, there is a safety line marking JICA-trained engineer implemented through action plan. And they stock filters on floor except for safety area. · In operation room, some Chinese EPC supervisors are supervising Bangladeshi operation. · This unit was installed in 2018, the overall unit is clean and well operated. · Safety information and ISO policies etc. are on board in entrance. · The unit can run with dual type of fuel (gas and High Speed Diesel oil). Last year they suffered from shortage of gas and operate only with HSD for 4 months, but this year imported LNG helped continuous gas firing operation.

Minutes of Meeting

Project	The Project for Capacity Development for Operation & Maintenance of Thermal Power Stations in Bangladesh (the 3rd survey by JICA Expert Team)
Title	3rd survey in Bangladesh Power Development Board (BPDB)
Date	29th July 2019
Time	10:00-13:00
Place	Conference Rooms in BPDB
Attendees	See Attachment "attendance list"

Record of Discussions

NO	ITEM DETAILS
1.	**Introduction**
1.1	This meeting was convened with the objective to discuss the below agenda point: 1) Presentation of JICA Capacity building O&M "OVERVIEW of INTERIM REPORT(Drafted)" ü Project Summary ü O&M Training in Japan (2nd Batch in 2019) ü Monitoring Indicators (2nd Year Completed: 2019) ü Summary on the Mission: 2nd Follow-up Survey Reviewing O&M training activity at TPPs implemented by JICA-trained engineers & technicians. Grasping the current situation of O&M at TPPs and identifying the O&M training needs, through discussion on the issue analysis. Suggesting next O&M training in Japan and the selection criteria for engineers & technicians: 3rd Batch, NOV/DEC in 2019. Suggesting brand-new HRD (Human Resource Development) training in Japan and the selection criteria for management: DEC in 2019. 2) General discussion on further technical contribution from JICA Expert Team "DROMM program".

NO	ITEM DETAILS
2.	**OVERVIEW of INTERIM REPORT(Drafted)**
2.1	JICA expert (KANSAI) made the presentation on "OVERVIEW of INTERIM REPORT(Drafted)", containing "Project Summary", "O&M Training in Japan (2nd Batch in 2019)", "Monitoring Indicators (2nd Year Completed: 2019)" and "Summary on the Mission: 2nd Follow-up Survey" 1) Management fully agreed to JICA expert's suggestion that next O&M training program would focus on mainly mechanical maintenance, and that the selection criteria for technicians would be regarded as not mandatory but preferable. 2) Management asked JICA expert which level of personnel would be suitable to participate in the HRD training. JICA expert replied that senior management level would be suitable. 3) With regard to HRD training, management told JICA expert that it would be the best scenario to increase the numbers of participants from 4-5 persons to 7 as kick-off meeting, and that it would be suitable to limit participants to power generation companies which are now implementing O&M unless JICA is completely able to accept Bangladeshi request. JICA expert replied that it is under discussion with JICA HQ and finally depends on JICA's decision.
3.	**General Discussion on KANSAI's technical proposal**
	KANSAI made the discussion with BPDB management based the discussion paper "DROMM program". 1) Management showed KANSAI more interest in this basic concept: especially in terms of having more advantage over major manufacturers at the expiration of existing LTSA. 2) However management asked KANSAI whether it is possible to adapt not only Japanese GT/GTCC but also other manufacturers (for example GE). KANSAI replied that it is necessary to make the further internal discussion of Japan side. 3) Management informed KANSAI that the counterpart is Engr. M. Mahmudur Rahman Mahmud.

NO	ITEM DETAILS
3.	**Interview and discussion with JICA-trained engineers and technicians**
	1) Hearing the answers of Kansai's questionnaire, JICA's questionnaire and APs activities (E/T) JICA expert received their activity report and pictures. (E/T) Engineers disseminated their knowledge to their colleagues even though they have some difficulties as follows: Ø Busy to prepare for overhaul work. Ø Limited workforce for their duties. Ø Limited numbers of training room and equipment. (E) Engineers told that the subject "pump alignment" was especially useful among the training course in Japan because they can utilize the knowledge and skills directly to their work, and that it would be much better to include the contents of vertical type pump if possible. (E) Engineers suggest that it would be more effective for JICA-trained participants to disseminate their knowledge and skills not only to colleagues in their own TPP, but also to those in other TPPs. (T) Technicians hope more support to implement their APs especially from their boss, engineers and managers. Some engineers except for JICA trained, do NOT realize the importance of implementing of APs and ensuring safety. (T) Technicians are eager to discuss some matter with other colleagues but some engineer give us some another task so that they cannot. (T) It is difficult to report their activities with electrical documents because of their unfamiliarity with computer. But one of technicians has enough literacy and can assist them to be a representative of them. (T) Some engineers except for JICA trained, value Tool Box Meeting (TBM) as useless. Technicians guess that is because they do not know how important safety is and in Bangladesh there is no culture the senior follows the younger. (E/T) TBM (Tool Box Meeting) is held sometime before actual works. That helps to improve safety awareness, but their status is on the way to ensure the safety mind. (T) In BPDB, technicians have a training centre but just only class room trainings are held. They have no practical training courses due to lack of equipment. If they have, they could utilize the equipment to implement APs as well. In fact, they usually receive only theoretical knowledge from textbooks so they are obliged to implement actual work by their original methods. (T) Technicians do not have enough safety equipment (helmet, safety shoes and so on) due to lack of budget.

(T) Technicians activities are not well recognized by management level including BPDB HQ. That is why technicians could not receive enough support to implement their APs in the site. They hope their activities are recognized by official.

2) Discussion about the Issue Analysis of O&M at TPPs.

(E) In old TPP units, O&M manuals are good and available. On the other hand, in new TPP units, especially constructed by Chinese company, they are not completed and comprehensive.

(E) There are no formalized information sharing system for trouble, measures and safety information. They only share such kind of information personally.

(E) Current training program of BPDB is not effective because most of them are only theoretical and not practical.

(T) Technicians would repair after considering causes of the troubles.

(T) Because of long delivery time, it tends to lack spare parts.

(T) Tools and Jigs are set in order after training in Japan. This activity can help technicians to save the time and lead to efficient work.

(T) Maintenance manuals have been created by JICA-trained technicians based on obtained knowledge and skill from training in Japan.

Capacity Building for Operation & Maintenance of Thermal Power Plant
in the People's Republic of Bangladesh

BPDB Attendance List

Date: 29 / 07 / 2019

Time: 10 : 00 - 13 : 00

Place: BPDB HQ conference room

No.	Name	Position	Company	Signature
1	Md. Ziaur Rahman	SDE (Sub-Divisional Engr)	BPDB	29.07.19
2	Md. Hassan Mahamud	(Executive Engr.) XEN	BPDB	29.07.19
3	Mohammad Asaduzzaman,	(XEN) Executive Engineer	BPDB	29.07.2019
4	M. Mahmudur Rahman	Deputy Director (Executive Engr.)	BPDB	
5	Md, Bazlur Rahman	Foreman	BPDB	
6	Md. Jalal Uddin	Foreman	BPDB	
7	MD. RAMIZ UDDIN	FOREMAN	BPDB	
8	MD. Ataur Rahman	Fitter-D	B.P.D.B	
9	Hidenobu Ichioka	Electrical Engineer ~~Kansai Electric~~	Kansai Electric	一岡栄喜
10	Hiroki Hirahata	General Manager	Kansai Electric	平畠裕樹

JICA

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BPDB

Attendance List

No.	Name	Position	Company	Signature
11	Yoshihiro Doi	Mech. Eng.	Kansai Electric	Yoshi Doi
12	Akira Kozakai	Mech & Ope Eng	Kansai Electric	小堺 昇

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Minutes of Meeting

Project	The Project for Capacity Development for Operation & Maintenance of Thermal Power Stations in Bangladesh (the 3rd survey by JICA Expert Team)
Title	3rd survey in Ashuganj CCPP (APSCL)
Date	30th July 2019
Time	10:00-13:00
Place	Conference Rooms in Ashuganj CCPP
Attendees	See Attachment “attendance list”

Record of Discussions

NO	ITEM DETAILS
1.	**Introduction**
1.1	This meeting was convened with the objective to discuss the below agenda point: 1) Presentation of JICA Capacity building O&M “OVERVIEW of INTERIM REPORT(Drafted)” ü Project Summary ü O&M Training in Japan (2nd Batch in 2019) ü Monitoring Indicators (2nd Year Completed: 2019) ü Summary on the Mission: 2nd Follow-up Survey Reviewing O&M training activity at TPPs implemented by JICA-trained engineers & technicians. Grasping the current situation of O&M at TPPs and identifying the O&M training needs, through discussion on the issue analysis. Suggesting next O&M training in Japan and the selection criteria for engineers & technicians: 3rd Batch, NOV/DEC in 2019. Suggesting brand-new HRD (Human Resource Development) training in Japan and the selection criteria for management: DEC in 2019. 2) General discussion on further technical contribution from JICA Expert Team “DROMM program”.

NO	ITEM DETAILS
2.	**OVERVIEW of INTERIM REPORT(Drafted)**
2.1	JICA expert (KANSAI) made the presentation on "OVERVIEW of INTERIM REPORT(Drafted)", containing "Project Summary", "O&M Training in Japan (2nd Batch in 2019)", "Monitoring Indicators (2nd Year Completed: 2019)" and "Summary on the Mission: 2nd Follow-up Survey" 1) Management agreed to JICA expert 's proposal about next O&M/HRD training program in Japan and the selection criteria, but also told that it would be the best scenario to increase the numbers of HRD participants from 4-5 members to 7 as kick-off meeting. JICA expert replied that it is under discussion with JICA HQ and finally depends on JICA's decision. 2) Management don't have any comments in particular about candidate for HRD training, provided that the participants can understand HRD training course in Japan and implement HRD action plan in Bangladesh. After that, through discussion with some JICA-trained engineers, they suggest that the participants should have technical background for improving the HRD. JICA expert is well noted. 3) Management requested JICA expert to install brand-new training facility. JICA expert replied that we would like Bangladesh side to make further discussion through HRD training in Japan.
3.	**General Discussion on KANSAI's technical proposal**
	1) Management showed KANSAI more interest in this basic concept: especially in terms of having the alternative option instead of LTSA. 2) However management asked KANSAI whether it is possible to expand not only Japanese GT/GTCC but also Siemens GT. KANSAI replied that it is necessary to make the further internal discussion of Japan side. 3) Management informed KANSAI that the counterpart is Engr. Md. Shah Alam Khan.

NO	ITEM DETAILS
4.	**Interview and discussion with JICA-trained engineers and technicians**
	1) Hearing the answers of Kansai's questionnaire, JICA's questionnaire and APs activities (E/T) JICA expert received their activity report and pictures. (E) Engineers disseminated their knowledge to their colleagues with the active support from management even though they are relatively busy with their duties including not only technical work, but also administrative and procurement work etc. (E) Engineers told that the subject "pump alignment" was especially useful among the training course in Japan because they can utilize the knowledge and skills directly to their work. (E) Through the discussion with engineers, JICA expert suggest that the personnel with the technical background should be included in the next HRD training in Japan. (T) Technicians implement their APs with their supervisors' and colleagues' fruitful cooperation. Their supervisors support and accelerate their activities. (T) Technicians briefed not only their trained activities in Japan but also Japanese cultures (punctuality and ethical manner*) to their supervisors by verbal after returning to Bangladesh. Their supervisors could understand the importance of their activities (APs). * Technicians saw the scene on the way to home that the bus driver helped the mother who took a small child and a baby carriage when getting on the bus, and they were impressed. (T) Technicians mentioned that their APs can help to improve their whole technical level. (T) It is difficult to report their activities with electrical documents because of their unfamiliarity with computer. But one of technicians has enough literacy and can assist them to be a representative of them. (T) TBM (Tool Box Meeting) is held sometime before actual works. That helps to improve safety awareness, but their status is on the way to ensure the safety mind. (T) First batched JICA trained technician hoped more information about Steam Turbine. JICA expert advised that Second batched JICA trained technicians have already been lectured and have the textbooks. That textbook can help their hope and JICA expert asked them to share the textbooks each other.

2) Discussion about the Issue Analysis of O&M at TPPs.

(E) Safety culture is now being improved through implementation of APs such as 5S activities and TBM (Tool Box Meeting).

(E) In old TPP units, there were enough O&M manuals, consumables and spare parts. On the other hand, in new TPP units, they are not enough. Engineers manage the issue by procuring local parts and implementing repair work at their own workshop.

(E) There are no formalized information sharing system for trouble, measures and safety information. They only share such kind of information personally. But making archive room for lesson learned is now in process.

(E) Through the discussion with engineers, JICA expert identified the current problem of T/C (training centre) in APSCL as follows:

- Ø T/C is relatively old because it is established based on the TPP unit started in 1985.
- Ø Insufficient management of T/C due to lack of manpower such as the loss of manuals
- Ø Training program focusing on mainly theoretical subject and not practical one

(T) Technicians have enough safety equipment and utilize them necessarily. Their supervisors order them to do so and monitor their utilization.

(T) Scheduled maintenance is done after negotiation with BPDB. The schedule is sometime changed.

(T) Technicians would repair after considering causes of the troubles. But in case of vibration, it would be difficult and take much time to investigate the causes.

(T) Technicians would make tools, jigs and consumables lists when repairing. These lists can help to save the time in the next same repairing. And now they are storing these lists.

(T) Technicians have enough O&M manuals, tools, jigs and spare parts in usual repairing work. But in some rare repairing work, they would face lack of necessary materials.

(T) Technicians are eager to have training equipment (half cut model etc.) in training centre to understand the structure further.

NO	ITEM DETAILS
5.	**Site Survey of Ashuganj TPP**
	1) Ashuganj TPP has 3 CCGT units. 2) JICA expert observed as follows; In the ware house and workshop, they keep their tools and jigs set in order. In the turbine house, there is a safety line marking JICA-trained engineer implemented through action plan. These units were installed in recent year, the overall unit is clean and well operated. They do not face critical troubles. Safety information and ISO policies etc. are on board in entrance. HSE department is responsible for such kind of activities.

Capacity Building for Operation & Maintenance of Thermal Power Plant
in the People's Republic of Bangladesh

APSCL Attendance List

Date: 30 / 07 / 2019

Time: 10 : 00 - ___ : ___

Place: APSCL Conference room.

No.	Name	Position	Company	Signature
1	Md. Shah Alam Khan	C.E	APSCL	
2	MD. ASHIQUR RAHMAN	EXECUTIVE ENGINEER	APSCL	
3	MD. ABDUL HALIM SULTANI	EXECUTIVE ENGINEER	APSCL	
4	MAHMUDUR RAHMAN	EXECUTIVE ENGINEER	APSCL	M. Rahman
5	Md. Khairul Bashar	Sub-Divisional Engineer	APSCL	
6	MD. JAHANGIR ALAM	SENIOR FOREMAN	APSCL	
7	Md. Omar Faroque	"	"	
8	MD. REZAUL KARIM	JONIOR Foreman	APSCL	
9	Md. SHOAIB NOMANY	SR. Foreman	APSCL	
10	Shankar Chandra Das	SR. Foreman	APSCL	

APSCL Attendance List

No.	Name	Position	Company	Signature
11	Hidenobu Ichioka	Elec. Engineer JICA Expert team	Kansai Electric	一岡栄喜
12	Hiroki Hirakata	General Manager	Kansai Electric	平畑弘樹
13	Akira Kozakai	Mech & Operation Engineer, JICA Expert	Kansai Electric	小堺 瑛
14	Yoshihiro Doi	Mech. Eng. JICA Expert	Kansai Electric	Yoshi Doi

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Minutes of Meeting

Project	The Project for Capacity Development for Operation & Maintenance of Thermal Power Stations in Bangladesh (the 3rd survey by JICA Expert Team)
Title	3rd survey in North West Power Generation Company Limited (NWPGCL)
Date	31st July 2019
Time	10:30-13:00
Place	Conference Rooms in NWPGCL
Attendees	See Attachment “attendance list”

Record of Discussions

NO	ITEM DETAILS
1.	**Introduction**
1.1	This meeting was convened with the objective to discuss the below agenda point: 1) Presentation of JICA Capacity building O&M “OVERVIEW of INTERIM REPORT(Drafted)” ü Project Summary ü O&M Training in Japan (2nd Batch in 2019) ü Monitoring Indicators (2nd Year Completed: 2019) ü Summary on the Mission: 2nd Follow-up Survey Reviewing O&M training activity at TPPs implemented by JICA-trained engineers & technicians. Grasping the current situation of O&M at TPPs and identifying the O&M training needs, through discussion on the issue analysis. Suggesting next O&M training in Japan and the selection criteria for engineers & technicians: 3rd Batch, NOV/DEC in 2019. Suggesting brand-new HRD (Human Resource Development) training in Japan and the selection criteria for management: DEC in 2019. 2) General discussion on further technical contribution from JICA Expert Team “DROMM program”.

NO	ITEM DETAILS
2.	**OVERVIEW of INTERIM REPORT(Drafted)**
2.1	JICA expert (KANSAI) made the presentation on "OVERVIEW of INTERIM REPORT(Drafted)", containing "Project Summary", "O&M Training in Japan (2nd Batch in 2019)", "Monitoring Indicators (2nd Year Completed: 2019)" and "Summary on the Mission: 2nd Follow-up Survey" 1) Management agreed to JICA expert 's proposal about next O&M/HRD training program in Japan and the selection criteria, but also told that it would be the best scenario to increase the numbers of HRD participants to around 10 candidates. JICA expert rejected NWPGCL's comment quickly and replied that it is under discussion with JICA HQ and finally depends on JICA's decision.
3.	**General Discussion on KANSAI's technical proposal**
	1) Management showed KANSAI more interest in this basic concept: especially in terms of having the alternative option instead of LTSA. Moreover management also suggested that the scope of work should expand not only GT but also ST/HRSG because existing LTSA focus on only GT. 2) However management asked KANSAI whether it is possible to expand not only Japanese GT/GTCC but also Alstom/Siemens. KANSAI replied that it is necessary to make the further internal discussion of Japan side. 3) Management informed KANSAI that the counterpart is Md. Anamul Haque.

NO	ITEM DETAILS
4.	**Interview and discussion with JICA-trained engineers and technicians**
	1) Hearing the answers of Kansai's questionnaire, JICA's questionnaire and APs activities (E/T) JICA expert received their activity report and pictures. (E) Engineers disseminated their knowledge to their colleagues with the support from management even though they are relatively busy with their duties. (E) Engineers started TBM (Tool Box Meeting) activities mainly for difficult repairing work like HRSG repair and pump alignment. (T) One of the technicians was transferred to Madhumati 100MW HFO fired engine Power Station from Bheramara CCPP last year. (T) Technician implements his APs with his supervisors' fruitful cooperation. (T) Technician mentioned that his APs can help to improve whole technical level of his workplace. (T) It is difficult to report his activities with electrical documents because of his unfamiliarity with computer. But other participants have enough literacy and can assist them to be a representative of him. (T) Risk prediction activity is held before actual works. That helps to improve safety awareness, but their status is on the way to ensure the safety mind. (T) Technician seems to hope that AP can be disseminated to not only his mechanical maintenance section but also other sections (such as operation and electrical maintenance) subject to internal approval.

2) Discussion about the Issue Analysis of O&M at TPPs.

(E) Safety culture is now being improved through implementation of APs such as 5S activities and TBM (Tool Box Meeting).

(E) The quantity and quality of O&M manuals, consumables and spare parts are depending on the manufacturer of the equipment. For example, those items were not enough for the equipment manufactured by the Indian and Chinese companies. Engineers manage the issue by procuring local parts and implementing repair work by themselves.

(E) There are no formalized information sharing system for trouble, measures and safety information. They only share such kind of information personally.

(T) Technician has enough safety equipment and utilize them necessarily. Their supervisors order them to do so and monitor their utilization.

(T) Scheduled maintenance can be carried out as planned except when there are no parts.

(T) Technician would repair after considering causes of the troubles.

(T) Technician has enough tools, jigs and spare parts in usual repairing work.

(T) There are few special tools. If special tools are needed, they would borrow them from other power plants.

(T) Maintenance quality and safety awareness are gradually improving by the execution of technician's AP.

(T) Maintenance manuals are always available on demand.

(T) JICA expert advised technician to utilize the conference room for training.

Capacity Building for Operation & Maintenance of Thermal Power Plant
in the People's Republic of Bangladesh

NWPGCL HQ Attendance List

Date: 31 / 07 / 2019

Time: 10 : 30 - 13 : 00

Place: NWPGCL HQ

No.	Name	Position	Company	Signature
1	MD MAMUNUR RAHMAN MONDAL	General Manager (HR & Admin)	North-West Power Generation Co. Ltd.	31.7.19
2	MD. ANAMUL HAQUE	Deputy General Manager (HR)	North-West power Generation Co. Ltd.	
3	A.J.M. MOSTAFIZUR RAHAMAN TALUKDER	Assistant Manager (HR)	North-West Power Generation Co. Ltd	31.07.19
4	Md. Abu Zafar Siddique	Executive Engineer.	North-West Power Generation Co Ltd	31.07.19
5	Md. Mahmudul Hasan.	Executive Engineer	NWPGCL	31-07-19
6	Md Jahirul Islam	Foreman	NWPGCL	31.07.19
7	Hidenobu Ichioka	Elec. Engineer JICA Expert	Kansai Electric	一岡栄喜
8	Hiroki Hirahata	General Manager	Kansai Electric	平畑弘樹
9	Akira Kozakai	Mech & Operation Engineer, JICA Expert	Kansai Electric	小堺 瑛
10	Yoshihiro Doi	Mech. Eng JICA Expert	Kansai Electric	Yoshi Doi

Minutes of Meeting

Project	The Project for Capacity Development for Operation & Maintenance of Thermal Power Stations in Bangladesh (the 3rd survey by JICA Expert Team)
Title	3rd survey in Electricity Generation Company of Bangladesh (EGCB)
Date	1st August 2019
Time	9:00-11:30
Place	Conference Rooms in EGCB
Attendees	See Attachment "attendance list"

Record of Discussions

NO	ITEM DETAILS
1.	**Introduction**
1.1	This meeting was convened with the objective to discuss the below agenda point: 1) Presentation of JICA Capacity building O&M "OVERVIEW of INTERIM REPORT(Drafted)" ü Project Summary ü O&M Training in Japan (2nd Batch in 2019) ü Monitoring Indicators (2nd Year Completed: 2019) ü Summary on the Mission: 2nd Follow-up Survey Reviewing O&M training activity at TPPs implemented by JICA-trained engineers & technicians. Grasping the current situation of O&M at TPPs and identifying the O&M training needs, through discussion on the issue analysis. Suggesting next O&M training in Japan and the selection criteria for engineers & technicians: 3rd Batch, NOV/DEC in 2019. Suggesting brand-new HRD (Human Resource Development) training in Japan and the selection criteria for management: DEC in 2019. 2) General discussion on further technical contribution from JICA Expert Team "DROMM program".

NO	ITEM DETAILS
2.	**OVERVIEW of INTERIM REPORT(Drafted)**
2.1	JICA expert (KANSAI) made the presentation on "OVERVIEW of INTERIM REPORT(Drafted)", containing "Project Summary", "O&M Training in Japan (2nd Batch in 2019)", "Monitoring Indicators (2nd Year Completed: 2019)" and "Summary on the Mission: 2nd Follow-up Survey" 1) Management agreed to JICA expert 's proposal about next O&M/HRD training program in Japan and the selection criteria, but also told that it would be the best scenario to increase the numbers of HRD participants from 4-5 members to 7 as kick-off meeting. JICA expert replied that it is under discussion with JICA HQ and finally depends on JICA's decision. 2) Management suggested that at least one engineer and one technician should participate from each entity for next O&M training course in Japan. 3) Management don't have any comments in particular about candidate for HRD training, provided that the participants can understand HRD training course in Japan and implement HRD action plan in Bangladesh. 4) Management asked JICA expert whether the diploma as the selection criteria for technician is mandatory or not. JICA expert replied that the diploma is not mandatory but preferable.
3.	**General Discussion on KANSAI's technical proposal**
	1) Management showed KANSAI more interest in this basic concept: especially in terms of having the alternative option instead of LTSA. 2) Management gave KANSAI current status about 3 GTCC line up and informed KANSAI that the counterpart is Mr. Ibrahim Ahmad Shafi Al Montad.

NO	ITEM DETAILS
4.	**Interview and discussion with JICA-trained engineers and technicians**
	1) Hearing the answers of Kansai's questionnaire, JICA's questionnaire and APs activities (E/T) JICA expert received their activity report and pictures. (E) Engineers disseminated their knowledge to their colleagues with the active support like coordinating the schedule of the members, conference room etc. from management. (E) One of the JICA-trained engineers started to keep the record of accidents and incidents with the approval of the management. (T) Technicians implement their APs with their supervisors' and colleagues' fruitful cooperation. Their supervisors support and accelerate their activities. (T) Technicians carry out the trainings including other sections in case of common subjects like safety, plant overview, "5S" and punctuality. (T) Technicians mentioned that their APs can help to improve whole technical level of their workplace. (T) Technicians are eager to have training equipment in training centre like Kanden Plant Techno Centre to understand the structure further. (T) By carrying out 5S activities, they help to save time and work efficiently. 2) Discussion about the Issue Analysis of O&M at TPPs. (E) Engineers started giving instruction about safety to the team members, and safety culture is now being improved. (E) There are no formalized information sharing system for trouble, measures and safety information. They only share such kind of information personally. However, Enterprise Resources Planning (ERP) is being installed for all TPPs of EGCB to comprehensively share and manage the necessary information, and the system is going to operate within this year. (T) Safety culture is now being improved through implementation of APs such as 5S activities and TBM (Tool Box Meeting). (T) Technicians have enough safety equipment and utilize them necessarily. Their supervisors order them to do so and monitor their utilization. (T) Technicians would repair after considering causes of the troubles and engineer's permission. (T) Technicians have enough tools, jigs and spare parts in usual repairing work. (T) O&M manuals are always available on demand.

Capacity Building for Operation & Maintenance of Thermal Power Plant
in the People's Republic of Bangladesh

EGCB Attendance List

Date: 1st / 8 / 2019

Time: ~~10~~ 9 : 00 - 11 : 30

Place: EGCB HQ

No.	Name	Position	Company	Signature
1	Arun Kumar Saha	Managing Director	EGCB	
2	Ibrahim Ahmad Shafi Al Mokhtad	Superintending Engg.	EGCB Ltd	
3	Al obyed Bin Ahmed	SDE (OPN)	siddirganj 335 MW CCPP	
4	Md. pias Hossain	SDE (OPN)	Haripur 412 MW CCPP.	
5	Md. Mamun Hosen	SAE (OPN)	Haripur 412	
6	MD. JAKIR HOSSAIN ~~SARDAR~~ SARDAR	FOREMAN	Haripur 412 MW CCPP	
7	Hidenobu Ichioka	Elec. Engineer JICA Expert	Kansai Electric	一岡栄喜
8	Hiroki Hirakata	General Manager	Kansai Electric	平畑弘樹
9	Akira Kozakai	Mech & Operation Engineer, JICA Expert	Kansai Electric	小堺 瑛
10	Yoshihiro Doi	Mech Eng JICA Expert	Kansai Elec	

Minutes of Meeting

Project	The Project for Capacity Development for Operation & Maintenance of Thermal Power Stations in Bangladesh (the 3rd survey by JICA Expert Team)
Title	3rd survey in Coal Power Generation Company Bangladesh Limited (CPGCBL)
Date	1st August 2019
Time	13:30-16:00
Place	Conference Rooms in CPGCBL
Attendees	See Attachment "attendance list"

Record of Discussions

NO	ITEM DETAILS
1.	**Introduction**
1.1	This meeting was convened with the objective to discuss the below agenda point: 1) Presentation of JICA Capacity building O&M "OVERVIEW of INTERIM REPORT(Drafted)" ü Project Summary ü O&M Training in Japan (2nd Batch in 2019) ü Monitoring Indicators (2nd Year Completed: 2019) ü Summary on the Mission: 2nd Follow-up Survey Reviewing O&M training activity at TPPs implemented by JICA-trained engineers & technicians. Grasping the current situation of O&M at TPPs and identifying the O&M training needs, through discussion on the issue analysis. Suggesting next O&M training in Japan and the selection criteria for engineers & technicians: 3rd Batch, NOV/DEC in 2019. Suggesting brand-new HRD (Human Resource Development) training in Japan and the selection criteria for management: DEC in 2019. 2) General discussion on further technical contribution from JICA Expert Team "DROMM program".

NO	ITEM DETAILS
2.	**OVERVIEW of INTERIM REPORT(Drafted)**
2.1	JICA expert (KANSAI) made the presentation on "OVERVIEW of INTERIM REPORT(Drafted)", containing "Project Summary", "O&M Training in Japan (2nd Batch in 2019)", "Monitoring Indicators (2nd Year Completed: 2019)" and "Summary on the Mission: 2nd Follow-up Survey" 1) Management agreed to JICA expert 's proposal about next O&M/HRD training program in Japan and the selection criteria, but also told that it would be the best scenario to increase the numbers of HRD participants from 4-5 members to Max 7 persons who are dispatched from each power generation entity respectively. JICA expert replied that it is under discussion with JICA HQ and finally depends on JICA's decision. 2) Management requested JICA expert to include the specific contents about coal-fired TPP like coal handling, environmental challenges, in next O&M training program in Japan. JICA expert replied that the targeted type of power generation on this JICA program is GTCC and you should have discussion with JICA Bangladesh office.
3.	**General Discussion on KANSAI's technical proposal**
	1) Management showed KANSAI more interest in this basic concept: especially in terms of having the alternative option instead of LTSA. CPGCBL has no existing plant at this time. 2) Management informed KANSAI that the counterpart is Engr. Md. Abdur Rouf.

NO	ITEM DETAILS
4.	**Interview and discussion with JICA-trained engineers and technicians**
	1) Hearing the answers of Kansai's questionnaire, JICA's questionnaire and APs activities (E) JICA expert received their activity report and pictures. (E) Engineers disseminated their knowledge to their colleagues with the support from management even though they are relatively busy with their duties. (E) Matarbari TPP is now under construction, so they are going to implement some items of APs like preventive maintenance at the proper phase of the Matarbari TPP project. (E) Engineers told that the mandatory job rotation of KANSAI for new engineers is very effective to establish the fundamental knowledge and skills of O&M at TPPs. (E) In Matabari TPP project, installation of training centre including simulator and manufacturer's training for 3-6 months are covered in EPC's scope of work. 2) Discussion about the Issue Analysis of O&M at TPPs. (E) There are two types of problems regarding the O&M manuals. One is the shortage of manuals, and the other is that O&M manuals are not well managed (loss of manuals especially in old units, limited access to the manuals etc.). (E) There are initially enough spare parts, but procurement of the parts seems to become insufficient gradually. (E) Safety is not regarded as first priority, but recently the situation is being improved. (E) There are no formalized information sharing system for trouble, measures and safety information. They only share such kind of information personally. (E) Because of installing Computerized Maintenance Management System (CMMS) to their TPP and having capability to identify the causes of the troubles and take proper measures, it seems that O&M situation of certain IPP in Bangladesh is similar to the ideal condition.

Capacity Building for Operation & Maintenance of Thermal Power Plant
in the People's Republic of Bangladesh

CPGCBL Attendance List

Date: 1st / Aug / 2019

Time: 13 : 30 - 16 : 00

Place: CPGCBL conference room

No.	Name	Position	Company	Signature
1	Golam Kibria	Managing Director	CPGCBL	
2	Md. Nazrul Islam	Executive Director (P&D)	CPGCBL	
3	Md. Abdur Rouf	Executive Director (Project)	CPGCBL	
4	Muhammad Saifur Rahman	Superintendent Engineer (Mechanical)	CPGCBL	
5	Muhammad Matiur Rahman	Manager (HRM)	CPGCBL	
6	Md. Abdul Mannaf	Executive Enginener (Mechanical)	CPGCBL	
7	Md. Yamin Ali	Executive Enginener (Mechanical)	CPGCBL	
8	Md. Adnan Ibrahim	Executive Enginener (Mechanical)	CPGCBL	
9	Md. Yeakub Hossan	Assistant Engineer (Mechanical)	CPGCBL	

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CPGCBL

Attendance List

No.	Name	Position	Company	Signature
10	Hidenobu Ichioka	Elec. Engineer JICA expert	Kansai Electric	一岡栄喜
11	Hiroki Hirahata	General Manager	Kansai Electric	平畑弘樹
12	Akira Kozakai	Mech & Operation Engineer, JICA Expert	Kansai Electric	小堺 瑛
13	Yoshihiro Doi	Mech. Eng. JICA Expert	Kansai Electric	土井祥宏

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Minutes of Meeting

Project	The Project for Capacity Development for Operation & Maintenance of Thermal Power Stations in Bangladesh (the 3rd survey by JICA Expert Team)
Title	3rd survey in Rural Power Company Limited (RPCL)
Date	4th August 2019
Time	10:00-11:30
Place	Conference Rooms in RPCL
Attendees	See Attachment "attendance list"

Record of Discussions

NO	ITEM DETAILS
1.	**Introduction**
1.1	This meeting was convened with the objective to discuss the below agenda point: 1) Presentation of JICA Capacity building O&M "OVERVIEW of INTERIM REPORT(Drafted)" ü Project Summary ü O&M Training in Japan (2nd Batch in 2019) ü Monitoring Indicators (2nd Year Completed: 2019) ü Summary on the Mission: 2nd Follow-up Survey Reviewing O&M training activity at TPPs implemented by JICA-trained engineers & technicians. Grasping the current situation of O&M at TPPs and identifying the O&M training needs, through discussion on the issue analysis. Suggesting next O&M training in Japan and the selection criteria for engineers & technicians: 3rd Batch, NOV/DEC in 2019. Suggesting brand-new HRD (Human Resource Development) training in Japan and the selection criteria for management: DEC in 2019. 2) General discussion on further technical contribution from JICA Expert Team "DROMM program".

NO	ITEM DETAILS
2.	**OVERVIEW of INTERIM REPORT(Drafted)**
2.1	JICA expert (KANSAI) made the presentation on "OVERVIEW of INTERIM REPORT(Drafted)", containing "Project Summary", "O&M Training in Japan (2nd Batch in 2019)", "Monitoring Indicators (2nd Year Completed: 2019)" and "Summary on the Mission: 2nd Follow-up Survey" 1) Management told that each JICA-trained participant had been individually interviewed, and that this Project was very effective. 2) Management agreed to JICA expert 's proposal about next O&M/HRD training program in Japan and the selection criteria, but also told that it would be the best scenario to increase the numbers of HRD participants from 4-5 members to 7 as kick-off meeting. JICA expert replied that it is under discussion with JICA HQ and finally depends on JICA's decision. 3) Management asked JICA expert whether there are prior assessment in Bangladesh by JICA expert and age limit about candidate for HRD training. JICA expert replied that there are no such assessment and limit, provided that the participants can understand HRD training course in Japan and implement HRD action plan in Bangladesh. 4) Management asked JICA expert whether the diploma as the selection criteria for technician is mandatory or not. JICA expert replied that the diploma is not mandatory but preferable. 5) Management told that capacity building for existing TPPs was so helpful that other subjects like electrical and I&C aside from mechanical maintenance would help to improve O&M after this Project.
3.	**General Discussion on KANSAI's technical proposal**
	1) Management showed KANSAI more interest in this basic concept: especially in terms of having the alternative option instead of LTSA from major manufacturers and procurement from Indian manufacturer, BHEL. 2) At this time RPCL procures GT spare parts from BHEL but has some concern about the quality management, especially late delivery of technical service. 3) Management informed KANSAI that the counterpart is Mr. Kamal Hossain at the general information.

NO	ITEM DETAILS
4.	**Interview and discussion with JICA-trained engineers and technicians**
	1) Hearing the answers of Kansai's questionnaire, JICA's questionnaire and APs activities (E/T) JICA expert received their activity report and pictures. (E/T) Engineers and technicians disseminated their knowledge to their colleagues with the active support from management even though they are relatively busy with their duties. (E) Engineers told that the training program in RPCL was now improving through their APs implementation. (E/T) JICA expert confirmed they made full use of JICA-provided textbooks for their disseminations. (T) Technicians mentioned that their APs can help to improve whole technical level of their workplace (T) One of the technicians is going to carry out 4S activities as soon as new workshop is completed. 2) Discussion about the Issue Analysis of O&M at TPPs. (E) Safety rules and cultures are already established, and furthermore they are now being improved through implementation of APs such as 4S activities and safety line marking. (E/T) Information related to trouble, measures and safety are shared with other TPPs, and are accumulated via webpage. (T) Technicians mentioned that their workplaces have very experienced people. (T) Technicians have enough safety equipment and utilize them necessarily. Their supervisors order them to do so and monitor their utilization. (T) Technicians would repair after considering causes of the troubles. (E/T) Engineers and technicians have enough tools, jigs and spare parts in usual repairing work, and they are kept well. Engineers told that necessary consumables and spare parts can be procured as planned. (E/T) O&M manuals and procedures are always available on demand. (E/T) Considering the above, JICA expert thought that O&M situation of RPCL is almost similar to the ideal condition.

Capacity Building for Operation & Maintenance of Thermal Power Plant
in the People's Republic of Bangladesh

RPCL Attendance List

Date: 4th / Aug / 2019

Time: 9 : 30 - 12 : 00

Place: RPCL conference room

No.	Name	Position	Company	Signature
1	Md. Abdus Sabur	Managing Director	RPCL	
2	Md Salim Bhuiyan	ED (Engg)	RPCL	
3	PRALOY KUMAR SAHA	ED(A2F) Addl. & GM(A2F)	RPCL	
4	Md. Mahbubur Rahman	GM(HR & Admin)	RPCL	
5	K.B.M. Amin Ullah patwary	Company Secretary	RPCL	
6	Md Shahjahan Faqir.	DGM (CA/F)	RPCL	
7	Kamal Hossain	Manager-HR	RPCL	
8	Quazi AFM Mohiuddin	SDE, RPCL-GPP	RPCL	
9	Shaukat Ali Chowdhury	AE, MPS	RPCL	
10	Md. Ead Ali	AE, GPP RPCL	RPCL	

RPCL Attendance List

No.	Name	Position	Company	Signature
11	Md. Mizanur Rahman Hazaladar	Work asst.	Rural power co. Ltd.	
12	Md. Masud Al Mamun	Interpreter	JICA	
13	Hidenobu Ichioka	Elec. Engineer JICA expert	Kansai Electric	一岡栄喜
14	Hiroki Hirahata	General Manager	Kansai Electric	平畑弘樹
15	Akira Kozakai	Mech&Operation Engineer, JICA Expert	Kansai Electric	小堺暁
16	Yoshihiro Doi	Mech Eng. JICA Expert	Kansai Electric	Yoshihiro Doi

Kansai Electric Power
power with heart

添付資料 6-2-7

成果品一覧

成果品一覧

(1) 報告書

No.	報　告　書　名	提出時期
1	ワークプラン	2018 年 6 月
2	ベースライン調査報告書	2018 年 8 月
3	業務進捗報告書（第 1 回）	2018 年 9 月
4	業務進捗報告書（第 2 回）	2019 年 10 月
5	業務進捗報告書（第 3 回）	2021 年 2 月
6	事業モニタリングシート Ver.1	2018 年 11 月
7	事業モニタリングシート Ver.2	2019 年 5 月
8	事業モニタリングシート Ver.3	2019 年 9 月
9	事業モニタリングシート Ver.4	2020 年 3 月
10	事業モニタリングシート Ver.5	2020 年 12 月
11	事業モニタリングシート Ver.6	2021 年 9 月
12	事業モニタリングシート Ver.7	2022 年 1 月
13	業務完了報告書	2022 年 2 月（予定）

(2) その他成果品

No.	成　果　品　名	提出時期
1	第 1 回本邦研修（エンジニア・テクニシャン）のカリキュラム、研修テキスト	2018 年 1 月
2	第 2 回本邦研修（エンジニア・テクニシャン）のシラバス、カリキュラム、研修テキスト	2019 年 2 月
3	第 3 回本邦研修（エンジニア・テクニシャン・マネジメント）のシラバス、カリキュラム、研修テキスト	2019 年 11 月
4	第 4 回オンライン研修のシラバス、カリキュラム、研修テキスト	2021 年 6 月

添付資料 6-2-8

事業モニタリングシート Ver.7 更新版

TO Chief Representative of JICA Bangladesh Office

Project Monitoring Sheet

Project Title: The Project for Capacity Development for Operation and Maintenance of Thermal Power Stations in Bangladesh

Version of the Sheet: Updated version of Ver.7（Term: August 2021 – February 2022）

Name: Dr. Shah Md. Helal Uddin

Title: Representative of Counterpart / Joint Secretary of MoPEMR Power Division

Name: Okuda Hidenobu

Title: Chief Advisor / Thermal Power Generation O&M

Submission Date: 25th February, 2022

I. Summary

1 Progress

1-1 Progress of Inputs

- *The Japanese side provided the following items from August 2021 to February 2022.*
  - Although the Japanese side was planning to dispatch the Japanese experts for the final survey (the 4th follow-up survey) during this reporting period (from August 2021 to November 2021), the dispatch of the Japanese experts was not conducted as planned due to the spread of the COVID-19.
- *The Bangladesh side provided the following items from August 2021 to February 2022.*
  - Assignment of counterpart personnel
  - Other operational cost

1-2 Progress of Activities (during this reporting period)

The progress of activities set for each output is as follows.

- *Output 1: Current situation of O&M of thermal power plants (TPPs) is analyzed and training needs are identified.*
  - Sub-Activities 1.1: To analyze the current situation of O&M at TPP and grasp the need of trainings.
    - ✓ Already completed.
  - Sub-Activities 1.2: To review the training system of TPP staff, and analyze the current situation and issues of each technical level of O&M staff.
    - ✓ Already completed.
  - Sub-Activities 1.3: To confirm and propose the training needs of each technical level.
    - ✓ Already completed.

- *Output 2: Instructors of TPPs are trained and secured.*
  - Sub-Activities 2.1: To prepare the program of training in Japan for instructors and O&M staff by identifying issues and training needs.
    - ✓ Already completed.
  - Sub-Activities 2.2: To conduct trainings in Japan and develop capacity of instructors and O&M staff of TPP.
    - ✓ Already completed.
  - Sub-Activities 2.3: To prepare Action Plans of trainings for O&M of TPP.
    - ✓ Already completed.
- *Output 3: Training curricula and materials of O&M are improved.*
  - Sub-Activities 3.1: To propose of human resource development plan and staff development plan, and accreditation system in the target TPP.
    - ✓ Implementation of the Human Resource Development (HRD) Action Plan by management to improve HRD plan at TPPs was almost completed, however, some action plans are still in progress as shown in Table 1-1. (For the detailed contents, please refer to the Attachment 1.)

Table 1-1: Progress of HRD Action Plan (as of the end of November 2021)

Action Plan Item	APSCL	BPDB	CPGCBL	EGCB	RPCL	NWPGCL
1. Create provisions for future trainers & to get the experts through Training of Trainer (TOT)	Completed, but one item is being further enhanced.	Completed	Completed, but one item is not possible now.	Completed		
2. Purchase modern Training Equipment	Completed, but one item is still in progress.	Completed, but one item is still in progress.	It's still impossible now.	Completed, but one item is still in progress.		
3. Implementing Training Need Assessment (TNA)	Completed					
4. Required top management's initiative on system evolving	Completed					
5. Support, Promote and Supervise Engineers' /Technicians' action plan	Completed		Completed, but one item is not possible now.	Completed		

  - Sub-Activities 3.2: To improve training curricula and materials for O&M training at TPP (OJT's) and training centers.
    - ✓ JICA Expert Team (JET) confirmed that improved situation of the curricula and teaching materials for O&M training at TPPs through the training report from the JICA training participants and the questionnaire surveys for management and participants as the alternative to dispatching experts to Bangladesh.
    - ✓ At the final Joint Coordination Committee (JCC) online meeting on 19th November

2021, JET explained that the implementation of the HRD Action Plan is essential to continuously improve training curricula and materials for O&M training at TPPs. Bangladesh side agreed on this point and will continue to improve the training curricula and materials by themselves even after the Project completion.

- *Output 4: O&M Training at TPPs is improved.*
  - Sub-Activities 4.1: To conduct trainings at each TPP by instructors.
    - ✓ According to the training reports from JICA training participants (46 engineers & 28 technicians), they conducted 37 improved/new trainings for 336 O&M personnel at TPPs (in total) after October 2020 when the 3rd JCC online meeting was held.
    - ✓ Despite this situation where it is difficult to implement their Action Plan, some JICA-trained engineers conducted online lecture training and voluntary dissemination activities for their colleagues.
    - ✓ Implementation of the HRD Action Plan by management to continuously improve O&M training at TPPs was almost completed, however, some action plans are still in progress as shown in Table 1-1.
    - ✓ At the final JCC online meeting on 19th November 2021, JET explained that the implementation of the HRD Action Plan is essential to continuously improve O&M training at TPPs. Bangladesh side agreed on this point and will continue to improve the O&M training by themselves even after the Project completion.
  - Sub-Activities 4.2: To modify the training contents, curricula and materials as necessary based on feedback of trainings in Bangladesh.

    N/A

1-3 Achievement of Output (during this reporting period)

- *Output 1: Current situation of O&M of thermal power plants (TPPs) is analyzed and training needs are identified.*
  - ✓ Output 1 has already been achieved.
- *Output 2: Instructors of TPPs are trained and secured.*
  - ✓ Output 2 has already been achieved.
- *Output 3: Training curricula and materials of O&M are improved.*
  - The achievements of Output 3 in this reporting period are as follows.
    - ✓ The curricula and teaching materials for O&M training at TPPs have been improved as follows. Most of the O&M staff who received the training by the participants said that they helped enhance their basic technical knowledge, so it is considered that above improvements have helped to improve the training capacity on O&M of TPPs.
      - The trainings to be implemented by the participants were incorporated into the annual training program in some public utilities.

- The training courses that had never been included in the training curriculum at each public utility were provided, such as Non-destructive Inspection, Pump Alignment and Fault Tree Analysis.
- Most of the trainings were performed with utilizing the training materials provided by JET.
- Some of the trainings were performed using training materials created by the participants based on training materials provided by JET.

✓ Implementation of the HRD Action Plan by management to continuously improve training curricula and materials for O&M training at TPPs was almost completed, however, some action plans are still in progress as shown in Table 1-1.

One of the incomplete Action Plan items is the purchase of training equipment in item 2. Each electricity generation utility has already requested the relevant authorities who have the authority to purchase the training equipment or establish the training center, but only BPDB and APSCL, which have training centers, actually purchased training equipment. Even in BPDB and APSCL, which actually purchased training equipment, due to budgetary concerns, they are limited to purchasing some equipment, and it will take time to prepare all training equipment that are considered to contribute to the improvement of training capacity.

In addition, at other electricity generation utilities that do not have a training center (NWPGCL, EGCB, RPCL) or electricity generation utilities that do not have a power plant in operation (CPGCBL), it is necessary to first establish a training center in order to implement this action plan item. Therefore, they are not going to start immediately, and they are planning to establish a training center in line with the planned construction of the TPP in the future, so this will also take time.

In the progress of the HRD Action Plan at CPGCBL, the reason why there are many items that cannot be implemented at present is that CPGCBL is a newly established electricity generation utility and does not yet own a power plant in operation.

➢ *Output 4: O&M Training at TPPs is improved.*

- The achievements of Output 4 in this reporting period are as follows.

✓ According to the training reports from JICA training participants (46 engineers & 28 technicians), they conducted 37 improved/new trainings for 336 O&M personnel at TPPs (in total) after October 2020 when the 3rd JCC online meeting was held. As a result of evaluating the quality of the training conducted by the participants as an instructor, the training received a high evaluation of 4 or higher (highest evaluation = 5, lowest evaluation = 1) as shown in Chart 1-1. From this, it is considered that the training capacity on O&M of TPPs has been improved.

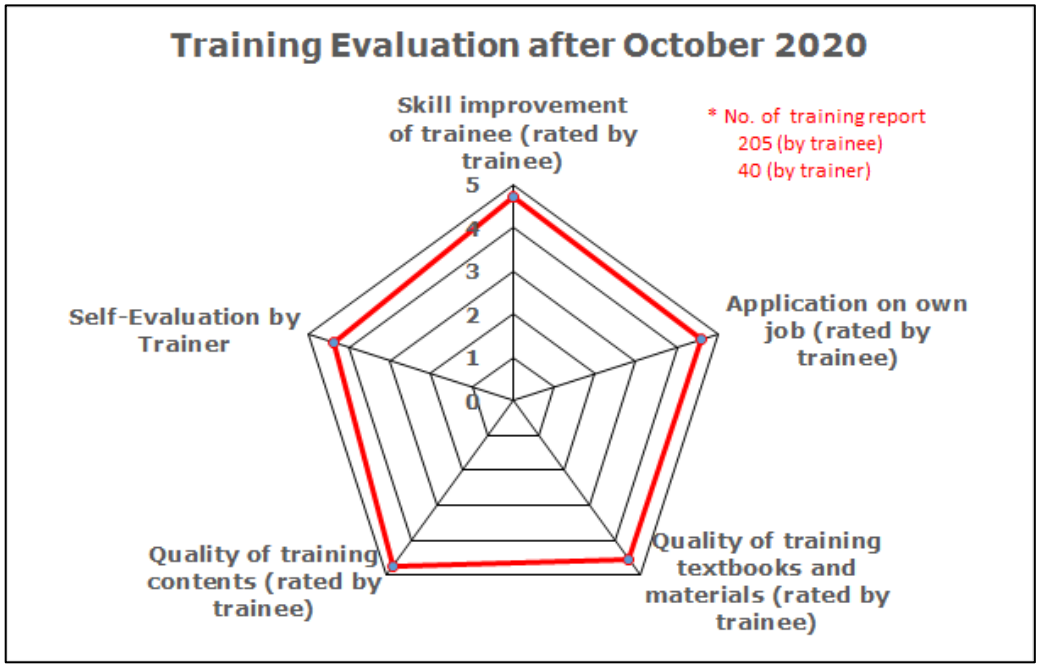


Chart 1-1: Evaluation of On-site Trainings after October 2020 (based on training reports)

- ✓ Implementation of the HRD Action Plan by management to continuously improve O&M training at TPPs was almost completed, however, some action plans are still in progress as shown in Table 1-1.
- ✓ About 52% of the trained instructors were able to implement the Action Plan as planned. The remaining about 48% of instructors were able to implement only partial Action Plans due to the spread of the Covid-19.

1-4 Achievement of the Project Purpose

➢ *Project Purpose: Training capacity on O&M of thermal power stations is strengthened.*
(The parts that contributed during the reporting period are underlined.)

- The Project Purpose has been achieved considering evaluation indicators such as number of improved new training courses and number of trainers.
  - ✓ As of the end of November 2021, the participants of engineers who participated in JICA trainings conducted 127 trainings as instructors and trained 1,590 O&M personnel at TPPs. On the other hand, the participants of technicians who participated in JICA trainings conducted 146 trainings as instructors and trained 1,407 O&M personnel at TPPs. In addition, regarding workplace improvement activities, activities such as Pre-maintenance meeting and 4S were implemented at each workplace. (Table 1-2)

Table 1-2: Action Plan implementation status (as of the end of November 2021)

		Number of Participants in JICA training	Number of Training Activity at each TPP	Number of Trainees at each TPP	Reference
BPDB	Engineers	10	19	283	TBM, 4S & Safety line marking
	Technicians	10	41	421	TBM, 4S & Safety line marking
NWPGCL	Engineers	8	27	446	TBM, Safety line marking, Pre-maintenance meeting
	Technicians	5	42	455	TBM, 4S
APSCL	Engineers	9	24	239	TBM, 4S, Knowledge sharing, Pre-maintenance meeting
	Technicians	7	25	227	TBM, 4S
CPGCBL	Engineers	7	19	187	1 retired person
EGCB	Engineers	6	13	169	
	Technicians	3	14	157	TBM, Keeping record, Pre-maintenance meeting
RPCL	Engineers	6	25	256	TBM, 4S (Safety line), Pre-maintenance meeting
	Technicians	3	24	147	TBM, Fire drill
Cumulative Total	Engineers	46	127	1,590	
	Technicians	28	146	1,407	
	Total	74	273	2,997	

✓ As to the beneficiaries of the Project, each participant as the trainer was able to disseminate the knowledge and skills learned during JICA trainings to 626 colleagues, which was more than the target figure (600) set in the PDM. (Table 1-3)

Table 1-3: Beneficiaries of the Project

	Direct Beneficiaries		Final Beneficiaries	Remarks
	Number of Trained Instructors		Number of Trainees	
	Engineer	Technician		
BPDB	10	10	215	6 unreported people
NWPGCL	8	5	126	
APSCL	9	7	104 * incl. external trainees	
CPGCBL	7	-	46	1 unreported people
EGCB	6	3	77	
RPCL	6	3	58	
Total	46	28	**626 [people]**	
	74 [people]			
Target	**60 [people]**		**600 [people]**	

✓ Forty-six (46) engineers and twenty-eight (28) technicians were trained as expected instructors in the trainings in Japan and the online training. The

participants in respective trainings answered that they had almost achieved the training objective ("Training capacity of the participants for O&M of TPPs will be strengthened."), and that the knowledge and experience they acquired can be directly applied or adaptable to their work as shown in Table 1-4 and 1-5. On the other hand, two participants answered "not achieves" due to the online training without any practical training and site visit though JET endeavored to provide practical knowledge in the online training.

Table 1-4: Achievement level of the training objective in JICA trainings

	← Fully Achieved			Not Achieved →
	4	3	2	1
Engineer training (46 people)	12 (26%)	32 (70%)	2 (4%)	-
Technician training (28 people)	24 (86%)	4 (14%)	-	-

Table 1-5: Usefulness level of the training results in JICA trainings

	It can be directly applied to work	It cannot be directly applied, but it can be adaptable to work	It cannot be directly applied or adapted, but it can be of reference to me	It was not useful at all
Engineer training (46 people)	26 (57%)	19 (42%)	1 (1%)	-
Technician training (28 people)	23 (82%)	4 (14%)	1 (4%)	-

✓ In the trainings in Japan and the online training, engineers and technicians made the Action Plans for improvement of the O&M capacity of TPPs. Due to the dissemination of knowledge through implementation of the Action Plans, basic technical and safety knowledge of the O&M staff of TPPs were enhanced (Chart 1-2), which lead to reduction in accidents at TPPs, and improvement of O&M quality of the staff of TPPs. (Chart 1-3).

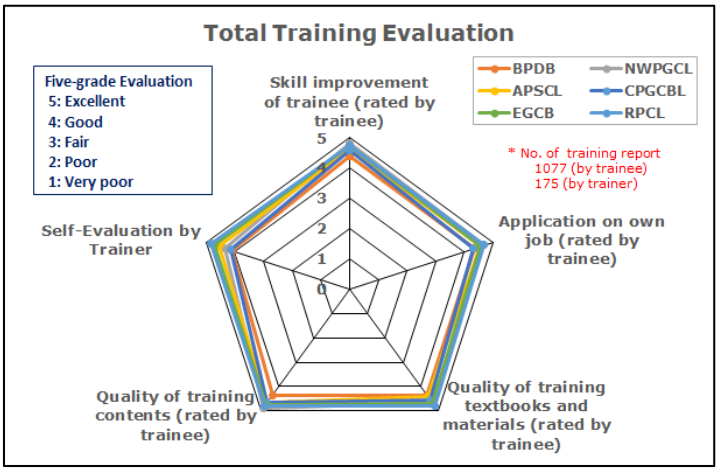


Chart 1-2: Evaluation of On-site Trainings (based on training reports)

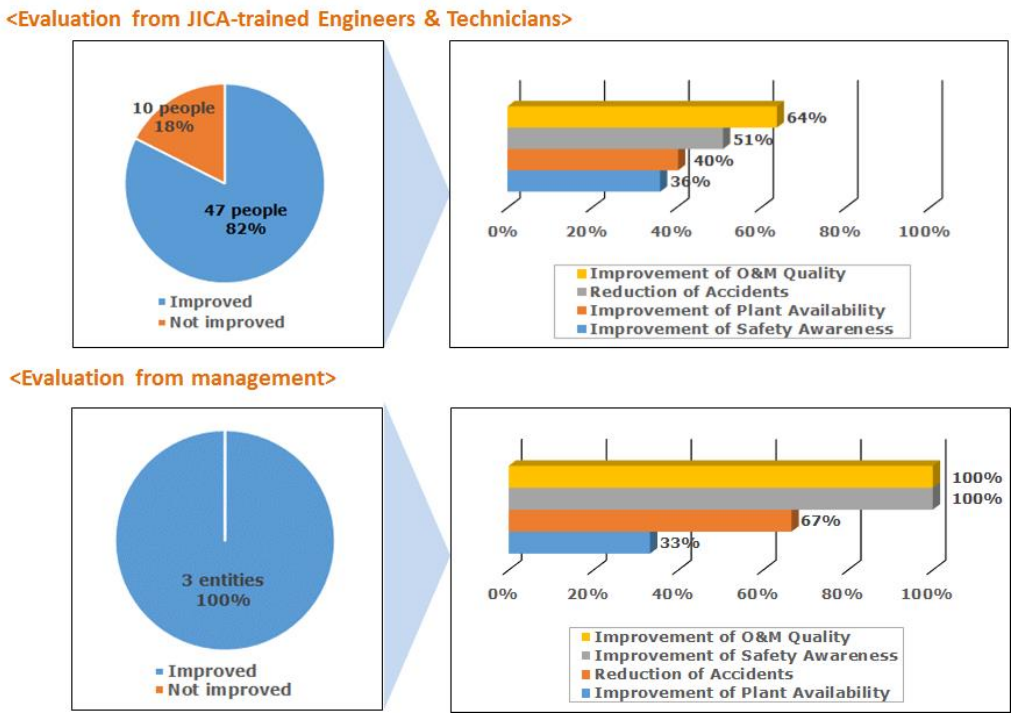


Chart 1-3: Improvement of O&M Performance by Action Plan (based on questionnaire surveys)

- ✓ At the final JCC online meeting on 19th November 2021, JICA-trained participants expressed the effects and usefulness of the Project. The followings are some specific examples.
  - JICA-trained engineer from NWPGCL was impressed with JICA Expert Team's practice of sharing lessons learned from past accidents and suggested that the same practice should be developed at TPPs in Bangladesh.
  - JICA-trained engineer from RPCL successfully solved pump vibration issue at TPP utilizing knowledge and skills regarding the vibration analysis and the alignment.
  - JICA-trained engineer from CPGCBL utilizes knowledge and skills regarding the vibration analysis, alignment and NDT (Non-destructive-testing) during the construction phase of TPP.

- Issues related to the achievement of the Project Purpose are as follows.
  - ✓ The number of trainings and beneficiaries has been achieved at satisfactory level by implementing additional activities (Action Plan Implementation by participants trained in additional online training) to complement for the delay in Output 4, but the achievement level of the Action Plans is not yet completed.
  - ✓ At the final JCC online meeting on 19th November 2021, JET requested further support from the Bangladesh side for the implementation and monitoring of Action Plans by JICA-trained engineers & technicians even after the Project completion. The Bangladesh side acknowledged the contents of the explanation and agreed to meet the request from JET and will continue to implement the Action Plans

even after the Project completion.

- *Project Evaluation by DAC Evaluation Criteria*
  - The results of evaluating the Project to date in accordance with the five criteria set by DAC (Development Assistance Committee) Evaluation Criteria, namely (1) relevance, (2) effectiveness, (3) impact, (4) efficiency and (5) sustainability are shown below. (The parts revised / added from the Project Monitoring Sheer Ver.6 are underlined.)

(1) Relevance

Relevance is considered "high" for the following reasons.

Priority	✓ In the public power generation companies of Bangladesh, it is an urgent task to efficiently operate and maintain gas-fired power generation, which is consistent with the goal of the Project.
Adequacy of Project Approach	✓ As for the approach of the Project, it is appropriate that O&M personnel in leading positions are trained as instructors through O&M training in Japan including practical training, and the trained instructors implement dissemination activities at their power plants.
Consistency with the Japanese ODA policy	✓ The Project is consistent with Japanese Official Development Assistance (ODA) policy for Bangladesh.

(2) Effectiveness

Effectiveness is considered "high" for the following reasons.

Achievement of Project Outputs	✓ The Output 1 to 3 are achieved. ✓ The Output 4, O&M training at TPPs is improved, was negatively affected due to unexpected disruption caused by the spread of the COVID-19 since activities relevant to the Output 4 were supposed to be carried out mainly in the last half of the Project. ✓ JET conducted the additional training (4th batch training) for complementing delays and deficit of Output 4 originally planned, and 18 electrical engineers were additionally trained as expected instructors. ✓ The number of trainings and beneficiaries has been achieved at satisfactory level by implementing additional activities (Action Plan Implementation by participants trained in additional online training) to complement for the delay in Output 4, but the achievement level of the Action Plans is not yet completed. ✓ At the final JCC online meeting on 19th November 2021, JET requested further support from the Bangladesh side for the implementation and monitoring of Action Plans by JICA-trained engineers & technicians even after the Project completion. The Bangladesh side acknowledged the

	contents of the explanation and agreed to meet the request from JET and will continue to implement the Action Plans even after the Project completion.
Achievement of Project Purpose	✓ The Project Purpose has been achieved considering evaluation indicators such as number of improved new training courses and number of trainers. ✓ The Output 4 was negatively affected due to unexpected disruption caused by the spread of the COVID-19 since activities relevant to the Output 4 were supposed to be carried out mainly in the last half of the Project. ✓ JET conducted the additional training (4th batch training) for complementing delays and deficit of Output 4 originally planned, and 18 electrical engineers were additionally trained as expected instructors. ✓ The number of trainings and beneficiaries has been achieved at satisfactory level by implementing additional activities (Action Plan Implementation by participants trained in additional online training) to complement for the delay in Output 4, but the achievement level of the Action Plans is not yet completed. ✓ At the final JCC online meeting on 19th November 2021, JET requested further support from the Bangladesh side for the implementation and monitoring of Action Plans by JICA-trained engineers & technicians even after the Project completion. The Bangladesh side acknowledged the contents of the explanation and agreed to meet the request from JET and will continue to implement the Action Plans even after the Project completion.
Beneficiaries of Project	✓ As to the beneficiaries of the Project, each participant as the trainer was able to disseminate the knowledge and skills learned during JICA trainings to 626 colleagues, which was more than the target figure (600) set in the PDM.

(3) Impact

Impact is considered “high” for the following reasons.

Prospect of achieving Overall Goal	✓ Improvements of training capacity on O&M at TPPs have been confirmed. In addition, as per the questionnaire surveys for management and participants, improvements of O&M performance at TPPs have already been confirmed. Therefore, it is highly possible that Overall Goal will be achieved.
Ripple Effects	✓ The participants not only have implemented training to disseminate the knowledge and skills learned during O&M Training in Japan, but have worked on the improvement activities through 4S (Sort, Set in order, Shine and Standardize) activities and TBM (Tool Box Meeting) learned

	in Japan. The improvement activities have a positive impact on the safety and quality at TPPs.

(4) Efficiency

Efficiency is considered “relatively high” for the following reasons.

Inputs	✓ As for the inputs of the Japanese side, the dispatch of the Japanese experts was not conducted as planned due to the interruption of the 2nd survey (the 1st follow-up survey) and the cancellation of the 4th survey (the 3rd follow-up survey) and the final survey. However, JET substituted the activities with exchanging e-mails with each participant frequently and conducting the additional questionnaire surveys and web conference for management and participants, which was appropriate to produce the outputs as planned. ✓ The inputs of the Bangladesh side were carried out as planned.
Improvement of Efficiency	✓ Since the Project was conducted as the same program including other countries, synergistic effects could be achieved by laterally applying the activity results of each project. In addition, the efficiency of the Project was able to improve.

(5) Sustainability

Sustainability is considered “relatively high” for the following aspects.

Policy / Institutional aspect	✓ It is not predicted any policy or institutional change that may affect the sustainability of the Project effects.
Organization aspect	✓ As an organizational change that has a positive effect on the sustainability of the effects produced by this project, Bangladesh Power Management Institute (BPMI) was established by the MoPEMR Power Division in 2017, and training was started in May 2018 for engineers and staff engaged in the power sector. BPMI aims to develop the technical and managerial capability and improve the quality of the human resources employed in the power sector through technical and general training. Since it contributes to "Create provisions for future trainers & to get the experts through Training of Trainer (TOT)", which is one of the items of the HRD Action Plan prepared by the management, the JET believes that it will have a positive effect on the sustainability of the effects produced by this project. However, even at BPMI, it is limited to classroom learning for engineers only. At each electricity generation utility including BPMI, there is still room for improvement in organizational issues such as identifying training needs and designing trainings curricula, securing budget and equipment for practical training, etc. for effective and

		systematic HRD. ✓ The HRD Action Plan prepared by management includes the items that resolve the organization issues, and it is considered that it is essential to implement the HRD Action Plan by management in order to enhance sustainability. ✓ Implementation of the HRD Action Plan by management was almost completed, however, some action plans are still in progress.
	Technical aspect	✓ In the trainings in Japan and additional online training, engineers and technicians prepared the Action Plans for improvement of the O&M capacity of TPPs. Due to the dissemination of knowledge through the implementation of the Action Plans, basic technical and safety knowledge of the O&M staff at TPPs were enhanced, which lead to reduction in accidents at TPPs, and improvement of O&M quality of the staff at TPPs. ✓ The HRD Action Plan prepared by management includes the items that support, promote and supervise the Action Plans of engineers and technicians, and it is considered that it is essential to implement the HRD Action Plan by management in order to sustainably disseminate the knowledge and skills learned by JICA training.
	Financial aspect	✓ As aforementioned in the organization aspect, it is necessary to secure budget and equipment for practical training for effective and systematic HRD※. The HRD Action Plan prepared by management includes the items that resolve the issues, and it is considered that it is essential to implement the HRD Action Plan by management in order to enhance sustainability. ※: At each electricity generation utility, training and education costs are budgeted every year, and costs related to the purchase of training materials and equipment are disbursed from this budget.

1-5 Changes of Risks and Actions for Mitigation

N/A

1-6 Progress of Actions undertaken by JICA

N/A

1-7 Progress of Actions undertaken by Gov. of Bangladesh

N/A

1-8 Other remarkable/considerable issues related/affect to the project (such as other JICA's projects, activities of counterparts, other donors, private sectors, NGOs

etc.)

N/A

2 Delay of Work Schedule and/or Problems (if any)

2-1 Detail

- Although JET planned to conduct the final survey (the 4th follow-up survey) in Bangladesh by October 2021, JET won't be able to conduct the survey in Bangladesh due to the spread of the Covid-19.
- About 48% of instructors were not able to implement the Action Plan as planned and some action plans are still in progress.

2-2 Cause

- Global spread of the COVID-19.

2-3 Action to be taken

- Regarding the activities to be carried out in the final survey (the 4th follow-up survey), JET substituted the activities with exchanging e-mails with each participant frequently and conducting the additional questionnaire surveys for management and participants.
- The final JCC, which was planned to be conducted during the final survey (the 4th follow-up survey) in Bangladesh, was held online instead of face-to-face.
- At the final JCC online meeting on 19th November 2021, JET requested further support from the Bangladesh side for the implementation and monitoring of Action Plans by JICA-trained engineers & technicians even after the Project completion. The Bangladesh side acknowledged the contents of the explanation and agreed to meet the request from JET and will continue to implement the Action Plans even after the Project completion.

2-4 Roles of Responsible Persons/Organization (JICA, Gov. of Bangladesh, etc.)

N/A

3 Modification of the Project Implementation Plan

3-1 PO

N/A

3-2 Other modifications on detailed implementation plan

(Remarks: The amendment of R/D and PDM (title of the project, duration, project site(s), target group(s), implementation structure, overall goal, project purpose, outputs, activities,

and input) should be authorized by JICA HDQs. If the project team deems it necessary to modify any part of R/D and PDM, the team may propose the draft.)

N/A

4 Preparation of Gov. of Bangladesh toward after completion of the Project

- In order to sustain the Project effects after finishing the Project, it is essential to implement the HRD Action Plan by management as planned.

  On the Bangladesh side, it is necessary to follow up on whether the HRD Action Plan is being properly implemented after finishing the Project.

II. Project Monitoring Sheet I & II *as Attached*

Project Design Matrix (PDM)

Project Title: The Project for Capacity Development for Operation and Maintenance of Thermal Power Stations

Implementing Agency: MoPEMR Power Division, BPDB, NWPGCL, EGCB, CPGCBL, APSCL and RPCL

Target Group: O&M personnel of implementing Agencies

Period of Project: October 2017 - March 2022

Project Site: Thermal power stations under public utilities

Updated Version of Version 7

Dated on 25th February, 2022

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption	Achievement	Remarks
Overall Goal					
Capacity of O&M of thermal power plants (TPP) is strengthened.	- O&M action plans are prepared and regularly updated in order to improve O&M through action plans.	- Project Monitoring Sheet, including regular training reports at each TPP provided by trained instructors.		- Due to the dissemination of knowledge through the implementation of the Action Plans, basic technical and safety knowledge of the O&M staff of TPPs were enhanced, which lead to reduction in accidents at TPPs, and improvement of O&M quality of the staff of TPPs.	
Project Purpose					
Training capacity on O&M of thermal power stations is strengthened.	- Number of improved and/or new training courses regularly operated for TPP O&M at targeted TPP. - Number of assigned trainers who were trained and conduct trainings (in total)	- Project Monitoring Sheet, including regular training reports at each TPP provided by trained instructors.	- Trained instructors will not resign and transfer from BPDB and targeted TPP.	The Project Purpose has been achieved considering evaluation indicators such as number of improved new training courses and number of trainers. However, it is necessary for management to implement the Human Resource Development (HRD) Action Plan in order to further strengthen the training capacity on O&M of TPPs. - According to the training reports from JICA training participants (46 engineers & 28 technicians), they conducted 273 improved/new trainings for 2,997 O&M personnel at TPPs (in total). - Forty-six (46) engineers and twenty-eight (28) technicians were trained as expected instructors in the trainings in Japan and online training. The participants in respective trainings answered that they had almost achieved the training objective. ("Training capacity of the participants for O&M of TPPs will be strengthened.") - The curricula and teaching materials for O&M training at TPPs have been improved. Most of the O&M staff who received the training by the participants said that they helped enhance their basic technical knowledge, so it is considered that above improvements have helped to improve the training capacity on O&M of TPPs. - The implementation of the HRD Action Plan, which was developed by managers who have participated in management trainings in Japan, was almost completed, however, some action plans are still in progress.	Issues related to the achievement of the Project Purpose are as follows. - It is necessary for management to implement the HRD Action Plan in order to further strengthen the training capacity on O&M of TPPs. - At the final Joint Coordination Committee (JCC) online meeting on 19th November 2021, JICA Expert Team (JET) explained that the implementation of the HRD Action Plan is essential to further strengthen the training capacity on O&M of TPPs. Bangladesh side agreed on this point.
Outputs					
1. Current situation of O&M of TPP is analyzed and training needs are identified.	- Training needs are compiled based on the current situation.	- Project Monitoring Sheet		Output 1 has been achieved as follows: - JET analyzed the current situation of O&M and training system at TPPs through 3 times of field surveys, interviews with participants trained in Japan and the training need assessment. - Based on these analysis results, JET confirmed the training needs of each technical level and proposed the training needs to Bangladesh side.	
2. Instructors of TPP are trained and secured.	- Training program is prepared based on the training needs. - Number of trained instructors.	- Project Monitoring Sheet	- Trained instructors continue to work for BPDB and target TPP during the duration.	Output 2 has been achieved as follows: - Based on the analysis of training needs shown in Output 1, JET prepared the training program which were held 3 times in Japan and the additional online training program. - JET provided the training programs as the measures to fill the gap between the actual conditions and the ideal conditions for the O&M of TPPs obtained from the opinions of participants, survey results and issue analysis training. - Forty-six (46) engineers and twenty-eight (28) technicians were trained as expected instructors in the trainings in Japan and the online training. The participants in respective trainings answered that they had almost achieved the training objective ("Training capacity of the participants for O&M of TPPs will be strengthened."), and that the knowledge and experience they acquired can be directly applied or adaptable to their work. On the other hand, two participants answered "not achieves" due to the online training without any practical training and site visit though JET endeavored to provide practical knowledge in the online training. - In the trainings in Japan and the online training, engineers and technicians prepared the Action Plans for improvement of the O&M capacity of TPPs. Due to the dissemination of knowledge through the implementation of the Action Plans, basic technical and safety knowledge of the O&M staff of TPPs were enhanced, which lead to reduction in accidents at TPPs, and improvement of O&M quality of the staff of TPPs.	

3. Training curricula and materials of O&M are improved.	- Training curricula and materials of O&M are proposed and modified if necessary.	- Project Monitoring Sheet, including regular training reports at each TPP provided by trained instructors.		Output 3 has been achieved as follows: - In the HRD training for management, the participants (7 managers) analyzed issues related to HRD and confirmed the actual training situation at Kansai Electric Power, thereby they were able to grasp the gap between actual condition of HRD in Bangladesh and ideal condition, and identified countermeasures to be implemented. - The curricula and teaching materials for O&M training at TPPs have been improved as follows. Most of the O&M staff who received the training by the participants said that they helped enhance their basic technical knowledge, so it is considered that above improvements have helped to improve the training capacity on O&M of TPPs. ・The trainings to be implemented by the participants were incorporated into the annual training program in some public utilities. ・The training courses that had never been included in the training curriculum at each public utility were provided, such as Non-Destructive Inspection, Pump Alignment and Fault Tree Analysis. ・Most of the trainings were performed with utilizing the training materials provided by JET. ・Some of the trainings were performed using training materials created by the participants based on training materials provided by JET. - Implementation of the HRD Action Plan by management to continuously improve training curricula and materials for O&M training at TPPs was almost completed, however, some action plans are still in progress.	Issues related to the achievement of Output 3 are as follows. - In order to continuously improve training curricula and materials for O&M training at TPPs, it is necessary to appropriately implement the HRD Action Plan prepared by management to improve the HRD plan. - At the final JCC online meeting on 19th November 2021, JET explained that the implementation of the HRD Action Plan is essential to continuously improve training curricula and materials for O&M training at TPPs. Bangladesh side agreed on this point and will continue to improve the training curricula and materials by themselves even after the Project completion.
4. O&M Training at TPP is improved.	- Number of training (OJTs) conducted at TPP. - Achievement level of action plans prepared by trained instructors.	- Project Monitoring Sheet, including regular training reports at each TPP provided by trained instructors.	- Trained instructors continue to work for BPDB and target TPP during the duration.	Output 4 has been achieved as follows except for the achievement level of the Action Plans: - According to the training reports from JICA training participants (46 engineers & 28 technicians), they conducted 273 improved/new trainings for 2,997 O&M personnel at TPPs (in total). - As to the beneficiaries of the Project, each participant as the trainer was able to disseminate the knowledge and skills learned during JICA trainings to 626 colleagues, which was more than the target figure (600) set in the PDM. - About 52% of the trained instructors were able to implement the Action Plan as planned. The remaining about 48% of instructors were able to implement only partial Action Plans due to the spread of the COVID-19. - Implementation of the HRD Action Plan by management to continuously improve O&M training at TPPs was almost completed, however, some action plans are still in progress.	Issues related to the achievement of output 4 are as follows. - The number of trainings and beneficiaries has been achieved at satisfactory level by implementing additional activities (Action Plan Implementation by participants trained in additional online training) to complement for the delay in Output 4, but the achievement level of the Action Plans is not yet completed. - At the final JCC online meeting on 19th November 2021, JET requested further support from the Bangladesh side for the implementation and monitoring of Action Plans by JICA-trained engineers & technicians even after the Project completion. The Bangladesh side acknowledged the contents of the explanation and agreed to meet the request from JET and will continue to implement the Action Plans even after the Project completion.

Activities	Inputs		Important Assumption
	The Japanese Side	**The Bangladesh Side**	
1-1 To analyze the current situation of O&M at TPP and grasp the need of trainings. 1-2 To review the training system of TPP staff, and analyze the current situation and issues of each technical level of O&M staff. 1-3 To confirm and propose the training needs of each technical level.	a. Dispatch of Experts - Chief Advisor / Thermal Power Generation Operation & Maintenance - Thermal Power Generation Operation - Thermal Power Generation Maintenance (Mechanical) - Thermal Power Generation Maintenance (Electrical) - Thermal Power Generation Maintenance (C&I) b. Training in Japan	a. Assignment of Counterpart personnel - Project Representatives - Counterpart members b. Dispatch of participants for the training in Japan c. Other operational cost	
2-1 To prepare the program of training in Japan for instructors and O&M staff by identifying issues and training needs. 2-2 To conduct trainings in Japan and develop capacity of instructors and O&M staff of TPP. 2-3 To prepare action plans of trainings for O&M of TPP.			**Pre-Conditions**
3-1 To propose of human resource development plan, staff development plan, and accreditation system in the target TPP. 3-2 To improve training curricula and materials for O&M training at TPP (OJTs) and training centers.			
4-1 To conduct trainings at each TPP by instructors. 4-2 To modify the training contents, curricula and materials as necessary based on feedback of trainings in Bangladesh.			**<Issues and countermeasures>**

Project Monitoring Sheet II (Revision of Plan of Operation)

Updated Version of Version 7

Dated on 25th February, 2022

Project Title: The Project for Capacity Development for Operation and Maintenance of Thermal Power Stations in Bangladesh

Inputs	Plan / Actual	2017		2018				2019				2020				2021				2022		Remarks	Monitoring: Issue	Monitoring: Solution
		III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II			
Expert	Month	7 8 9	10 11 12	1 2 3	4 5 6	7 8 9	10 11 12	1 2 3	4 5 6	7 8 9	10 11 12	1 2 3	4 5 6	7 8 9	10 11 12	1 2 3	4 5 6	7 8 9	10 11 12	1 2 3	4 5 6			
Chief Advisor/ Thermal Power Generation O&M	Plan																							
	Actual																							
Thermal Power Generation Operation	Plan																							
	Actual																							
Thermal Power Generation Maintenance (Mechanical)	Plan																							
	Actual																							
Thermal Power Generation Maintenance (Electrical)	Plan																							
	Actual																							
Thermal Power Generation Maintenance (C&I)	Plan																							
	Actual																							
Equipment																								
Necessary Equipment if any	Plan																							
	Actual																							
Training in Japan/Online Training																								
Training on O&M of thermal power stations	Plan																							
	Actual																							
In-country/Third country Training																								
	Plan																							
	Actual																							

Activities / Sub-Activities	Plan / Actual	2017		2018				2019				2020				2021				2022		Responsible Organization		Achievements	Issue & Countermeasures
		III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	Japan	GoB		
Output 1: Current situation of O&M of thermal power stations is analyzed and training needs are identified.																									
1.1 To analyze the current situation of O&M at TPP and grasp the need of trainings.	Plan																							1.1 / 1.2 JICA Expert Team (JET) analyzed the current situation of O&M and training system at TPPs through 3 times of field surveys, interviews with particiapants trained in Japan and the training needs assessment.	
	Actual																								
1.2 To review the training system of TPP staff, and analyze the current situation and issues of each technical level of O&M staff.	Plan																								
	Actual																								
1.3 To confirm and propose the training needs of each technical level.	Plan																							1.3 Based on these analysis results, JET confirmed the training needs of each technical level and proposed the training needs to Bangladesh side.	
	Actual																								
Output 2: Instructors of TPP are trained and secured.																									
2.1 To prepare the program of training in Japan for instructors and O&M staff by identifying issues and training needs.	Plan																							2.1 Based on the analysis of training needs shown in Output 1, JET prepared the training program which were held 3 times in Japan and the additional online training program. JET provided the training programs as the measures to fill the gap between the actual conditions and the ideal conditions for the O&M of TPPs obtained from the opinions of participants, survey results and issue analysis training.	
	Actual																								
2.2 To conduct trainings in Japan and develop capacity of instructors and O&M staff of TPP.	Plan																							2.2 Forty-six (46) engineers and twenty-eight (28) technicians were trained as expected instructors in the trainings in Japan and the online training. The participants in respective trainings answered that they had almost achieved the training objective ("Training capacity of the participants for O&M of TPPs will be strengthened."), and that the knowledge and experience they acquired can be directly applied or adaptable to their work. On the other hand, two participants answered "not achieves" due to the online training without any practical training and site visit though JET endeavored to provide practical knowledge in the online training.	
	Actual																								
2.3 To prepare action plans of trainings for O&M of TPP.	Plan																							2.3 In the trainings in Japan and the online training, engineers and technicians prepared the Action Plans for improvement of the O&M capacity of TPPs. Due to the dissemination of knowledge through the implementation of the Action Plans, basic technical and safety knowledge of the O&M staff of TPPs were enhanced, which lead to reduction in accidents at TPPs, and improvement of O&M quality of the staff of TPPs.	
	Actual																								

Output 3: Training curricula and materials of O&M are improved.					
3.1 To propose of human resource development plan and staff development plan, and accreditation system in the target TPP.	Plan / Actual		3.1 In the Human Resource Development (HRD) training for management, the participants (7 managers) analyzed issues related to HRD and confirmed the actual training situation at Kansai Electric Power, thereby they were able to grasp the gap between actual condition of HRD in Bangladesh and ideal condition, and identified countermeasures to be implemented.	<Issue> In order to continuously improve training curricula and materials for O&M training at TPPs, it is necessary to appropriately implement the HRD Action Plan prepared by management to improve the HRD plan. <Countermeasures> At the final JCC online meeting on 19th November 2021, JET explained that the implementation of the HRD Action Plan is essential to continuously improve training curricula and materials for O&M training at TPPs. Bangladesh side agreed on this point and will continue to improve the training curricula and materials by themselves even after the Project completion.
3.2 To improve training curricula and materials for O&M training at TPP (OJTs) and training centers.	Plan / Actual		3.2 The curricula and teaching materials for O&M training at TPPs have been improved as follows. Most of the O&M staff who received the training by the participants said that they helped enhance their basic technical knowledge, so it is considered that above improvements have helped to improve the training capacity on O&M of TPPs. - The trainings to be implemented by the participants were incorporated into the annual training program in some public utilities. - The training courses that had never been included in the training curriculum at each public utility were provided, such as Non-Destructive Inspection, Pump Alignment and Fault Tree Analysis. - Most of the trainings were performed with utilizing the training materials provided by JET. - Some of the trainings were performed using training materials created by the participants based on training materials provided by JET. Implementation of the HRD Action Plan by management to continuously improve training curricula and materials for O&M training at TPPs was almost completed, however, some action plans are still in progress.	
Output 4: O&M Training at TPP is improved.					
4.1 To conduct trainings at each TPP by instructors.	Plan / Actual		4.1 / 4.2 According to the training reports from JICA training participants (46 engineers & 28 technicians), they conducted 273 improved/new trainings for 2,997 O&M personnel at TPPs (in total). As to the beneficiaries of the Project, each participant as the trainer was able to disseminate the knowledge and skills learned during JICA trainings to 626 colleagues, which was more than the target figure (600) set in the PDM. About 52% of the trained instructors were able to implement the Action Plan as planned. The remaining about 48% of instructors were able to implement only partial Action Plans due to the spread of the COVID-19. Implementation of the HRD Action Plan by management to continuously improve O&M training at TPPs was almost completed, however, some action plans are still in progress.	<Issue> The number of trainings and beneficiaries has been achieved at satisfactory level by implementing additional activities (Action Plan Implementation by participants trained in additional online training) to complement for the delay in Output 4, but the achievement level of the Action Plans is not yet completed. <Countermeasures> At the final JCC online meeting on 19th November 2021, JET requested further support from the Bangladesh side for the implementation and monitoring of Action Plans by JICA-trained engineers & technicians even after the Project completion. The Bangladesh side acknowledged the contents of the explanation and agreed to meet the request from JET and will continue to implement the Action Plans even after the Project completion.
4.2 To modify the training contents, curricula and materials as necessary based on feedback of trainings in Bangladesh.	Plan / Actual			
Duration / Phasing	Plan / Actual			

Monitoring Plan		2017		2018				2019				2020				2021				2022		Remarks	Issue	Solution
	Actual	Ⅲ	Ⅳ	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅰ	Ⅱ			
Monitoring																								
JCC (Joint Coordination Committee)	Plan / Actual																						Cancellation of the 3rd monitoring mission (incl. the 3rd JCC) and the final monitoring mission (incl. the final JCC) due to the spread of the COVID-19.	The 3rd JCC and final JCC were held online instead of face-to-face.
Submission of Monitoring Sheet	Plan / Actual																							
Monitoring Mission from Japan	Plan / Actual																						Cancellation of the 3rd monitoring mission and the final monitoring mission due to the spread of the COVID-19.	Substituted with exchanging e-mails with each participant frequently and conducting the additional questionnaire surveys for management and participants.
Reports/Documents																								
Work Plan	Plan / Actual																							
Baseline Survey Report	Plan / Actual																							
Progress Report	Plan / Actual																							
Project Completion Report	Plan / Actual																					Due to the extension of the project period, Project Completion Report will be submitted in February 2022.		
Public Relations																								
	Plan / Actual																							
	Plan / Actual																							

エジプト国 添付資料

添付 6-3-1　第 1 回本邦研修員名簿(エンジニア)

添付 6-3-2　第 1 回本邦研修行程(エンジニア)

添付 6-3-3　第 1 回本邦研修員名簿(テクニシャン)

添付 6-3-4　第 1 回本邦研修行程(テクニシャン)

添付 6-3-5　第 1 回本邦研修アクションプラン(エンジニア)

添付 6-3-6　第 1 回現地業務行程

添付 6-3-7　調査対象発電所概要

添付 6-3-8　Action Plan ヒアリング参加状況(第 1 次現地調査)

添付 6-3-9　第 1 回現地業務ラップアップミーティング議事録

添付 6-3-10　第 2 回本邦研修員名簿(エンジニア)

添付 6-3-11　第 2 回本邦研修行程(エンジニア)

添付 6-3-12　第 2 回本邦研修員名簿(テクニシャン)

添付 6-3-13　第 2 回本邦研修行程(テクニシャン)

添付 6-3-14　第 2 回本邦研修アクションプラン(エンジニア)

添付 6-3-15　第 2 回現地業務行程

添付 6-3-16　Action Plan ヒアリング参加状況(第 2 次現地調査)

添付 6-3-17　第 2 回現地業務ラップアップミーティング議事録

添付 6-3-1

第１回本邦研修員名簿(エンジニア)

第1回本邦研修研修員名簿(エンジニア)

エ国エンジニア		
1	Mr.BADERELDINE Moustafa Esmat Ahmed	Senior Engineer,Gas Turbine Maint./Cairo North Power Station,Egyptian Electricity Holding Company (EEHC)
2	Mr.IBRAHEM Ayman Ibrahem Mohamed	Senior Engineer,Turbine Maint./Cairo Power Station,Egyptian Electricity Holding Company (EEHC)
3	Mr.MEWAFY Abdelrahman Saad Abdelrahman	Senior Engineer,Turbine Maint./Cairo North Power Station,Egyptian Electricity Holding Company (EEHC)
4	Mr.SAAD Ayman Saad Azer	Operation Supervisor,Operation Management./Nubaria Power Station,Middle Delta Electricity Company / (EEHC)
5	Mr.ELSAEIDY Ibrahim Ahmed Osman	Team Leader,Mechanical Maintenance Dept.,Middle Delta Electrical Production Company/(EEHC)
6	Mr.ELSHEKH Mohamed Hamdy Ibrahim Abdelmak	Head section engineer,Turbine Maint.Dept/Sidi Krir Combined cycle pow.stat.,West Delta For Electricity Production Company / (EEHC)
7	Mr.ABDELHAMID Tarek Moustafa Mohamed	Shift Charge Engineer,Operation Dept./Sidi Krir Power Station,West Delta For Electricity Production Company / (EEHC)
8	Mr.AWAD Abdelmoneim Ali Ahmed Mohamed	Head /Dept.Mech.Maint.Eng.,Sidi Krir Power Station,West Delta For Electricity Production Company / (EEHC)
9	Mr.KAOUD Mekhaimer Abozeid Mekhaimer	Maintenance Eng,Maint.Dept.of Water Treat./Assiut Power Plant,Upper Egypt Electricity Production Company / (EEHC)
10	Mr.TAWFIK Mohamed Aboueleyoun Hassan Oraby	Maintenance Eng,Maint.Dept.of Boiler/Assiut Power Plant,Upper Egypt Electricity Production Company / (EEHC)

添付 6-3-2

第 1 回本邦研修行程(エンジニア)

第1回本邦研修行程(エンジニア)

日付	時間	研修項目	講師等	研修場所
2017/11/25(土)	－	来日		
2017/11/26(日)	－	休日		
2017/11/27(月)	10:00～11:30	ブリーフィング		JICA関西
	13:00～14:30	コースオリエンテーション	藤井　健雄	
	14:30～16:00	プログラムオリエンテーション	大井　佳子	
2017/11/28(火)	14:00～17:00	ジョブレポート発表	藤井　健雄	JICA関西
2017/11/29(水)	9:15～12:00	関西電力概要／燃料	杉田　義幸	関西電力
			伊藤　英一	
	13:00～16:00	火力発電所　（GTCC概要／石炭概要）	岡垣　義也	
			渡辺　彰平	
2017/11/30(木)	9:00～12:00	オリエンテーション	萩原　敏男	関西電力
	13:00～15:15	アクションプラン作成指導	河合　徹	
			吉竹　茂	
			土井　祥宏	
			田原　明子	
2017/12/1(金)	9:00～11:30	アクションプラン作成指導	河合　徹	関西電力
			土井　祥宏	
			田原　明子	
	13:00～15:45	安全体感	藤尾　真司	
2017/12/2(土)	－	休日		
2017/12/3(日)	－	休日		
2017/12/4(月)	9:00～12:00	人材育成・効率管理	藤井　健雄	関西電力
			平塚　進	
	13:00～16:00	品質管理、振動基礎技術	萩原　敏男	
			小寺　輝明	
2017/12/5(火)	9:00～12:00	振動基礎技術	小寺　輝明	関西電力
	13:00～15:30	振動基礎技術、過去教訓(あすなろ館)	小寺　輝明	
			福満　和基	
2017/12/6(水)	9:00～16:00	振動基礎技術	小寺　輝明	関西電力
2017/12/7(木)	9:00～14:30	振動基礎技術	小寺　輝明	関西電力
2017/12/8(金)	13:10～16:30	石川島播磨重工業株式会社　工場視察	藤井　健雄	IHI相生工場
2017/12/9(土)	－	休日		
2017/12/10(日)	－	休日		
2017/12/11(月)	10:00～12:00	設備見学:姫路第二発電所	藤井　健雄	姫路第二発電所
	13:30～16:45	三菱日立パワーシステムズ株式会社　工場見学		MHPS高砂工場
2017/12/12(火)	9:00～12:00	非破壊検査概要、MT	森下　敏行	関西電力
			小西　良胤	
	13:00～15:00	PT	篠田　邦彦	
2017/12/13(水)	9:00～12:00	UT、SUMP	森下　敏行	関西電力
			小西　良胤	
	13:00～16:00	SUMP、RT	篠田　邦彦	

日付	時間	研修項目	講師等	研修場所
2017/12/14(木)	9:00～12:00	GTCC概要(ST, HRSG含む)	山根 透	関西電力
	13:00～15:30	GT＆高温部品	吉竹 茂	
2017/12/15(金)	9:00～12:00	GTCCの保全、最新技術の紹介	山根 透	関西電力
			吉竹 茂	
	13:00～14:00	GT(発電機)	小寺 輝明	
2017/12/16(土)	－	休日		
2017/12/17(日)	－	休日		
2017/12/18(月)	9:00～12:00	GT(制御)	宮原 文隆	関西電力
	13:00～15:00	給水処理	藤尾 真司	
2017/12/19(火)	10:00～16:00	アクションプラン作成	土井 祥宏	JICA関西
2017/12/20(水)	10:00～12:00	アクションプラン作成	土井 祥宏	JICA関西
	14:00～16:30	アクションプラン発表	土井 祥宏	
			岡垣 義也	
2017/12/21(木)	13:30～16:45	川崎重工業株式会社 工場見学	藤井 健雄	川崎重工明石工場
2017/12/22(金)	10:00～11:00	評価会	大井 佳子	JICA関西
	11:00～11:30	閉講式	平畑 弘樹	
	11:30～12:30	意見交換会	藤井 健雄	
2017/12/23(土)	－	離日		

添付 6-3-3

第１回本邦研修員名簿(テクニシャン)

第1回本邦研修研修員名簿(テクニシャン)

エ国テクニシャン		
1	Mr.MOHAMED Emad Abdelrahim Rashidy	Technician,Turbine Mainten./Cairo Power Station,Egyptian Electricity Holding Company (EEHC)
2	Mr.IBRAHEM Khtab Ragab	Technician,Turbine Mainten./Cairo Power Station,Egyptian Electricity Holding Company (EEHC)
3	Mr.SHAHIN Mohamed Said Elsayed	Technician,Turbine Mainten./Cairo Power Station,Egyptian Electricity Holding Company (EEHC)
4	Mr.KALIFA Mohamed Helal	Chief of Turbine Workshop,Turbine Mainten.Dept/Bubaria Power Plant,Middle Delta Electricity Production Co./EEHC
5	Mr.ABDELHAFEZ Elshahat Abdalla	Mechanical Supervisor,Nubaria Power Station,Middle Delta Electrical Production Company (EEHC)
6	Mr.ABDELAAL Omar Mohamedyoussef	Technical Supervisor,Turbine Mainten./Sidi Krir Combined cycle pow.stat.,West Delta For Electricity Production Company / (EEHC)
7	Mr.BASHA Ashraf Abdelaziz	Technical Supervisor,Turbine Mainten./Sidi Krir Combined cycle pow.stat.,West Delta For Electricity Production Company / (EEHC)
8	Mr.ELTAHAN Mohamed Abdallah	Technical Supervisor,Turbine Mainten./Sidi Krir Combined cycle pow.stat.,West Delta For Electricity Production Company / (EEHC)
9	Mr.ABBAS Amir Kamal Abdellatif	Supervisor,Turbines Mech. Mainten./Cairo Power Station,Upper Egypt Electricity Production Co./ (EEHC)
10	Mr.ELIAN Samir Ayesh Abdelazim	Supervisor,Mech. Mainten./Elkurimat Power Station,Upper Egypt Electricity Production Co./ (EEHC)
11	Mr.MOHAMED Sayed Ali Mahmoud	Supervisor,Mech. Mainten./Thermal Power Plant,Upper Egypt Electricity Production Co./ (EEHC)

添付 6-3-4

第１回本邦研修行程(テクニシャン)

第1回本邦研修行程(テクニシャン)

日付	時間	研修項目	講師等	研修場所
2017/11/25(土)	―	来日		
2017/11/26(日)	―	休日		
2017/11/27(月)	10:00～11:30	ブリーフィング		JICA関西
	13:00～14:30	プログラムオリエンテーション	大井　佳子	
	14:40～16:00	コースオリエンテーション	藤井　健雄	
2017/11/28(火)	10:00～12:10	ジョブリポート発表会	藤井　健雄	JICA関西
2017/11/29(水)	9:00～12:00	関西電力概要／燃料	杉田　義幸	関西電力
			伊藤　英一	
	14:00～16:15	火力発電所　(GTCC概要／石炭概要)	岡垣　義也	
			渡辺　彰平	
2017/11/30(木)	9:00～12:00	オリエンテーション	浄聖　重己	関電プラント
	13:00～17:00	アクションプラン作成指導	森本　研二	
2017/12/1(金)	9:00～12:00	金属材料取扱い	山田　浩次	関電プラント
	13:00～15:50	安全体感訓練	向井　工	
2017/12/2(土)	―	休日		
2017/12/3(日)	―	休日		
2017/12/4(月)	9:00～12:00	溶接施工の基礎	北　貴之	関電プラント
	13:00～16:00	品質体感訓練	稲垣　雄二	
2017/12/5(火)	9:00～11:30	高温高圧配管の保守、弁分解点検	山田　浩次	関電プラント
			稲垣　雄二	
	13:00～15:50	弁分解点検	稲垣　雄二	
2017/12/6(水)	9:00～12:00	高温高圧配管の保守、モータ分解点検	山田　浩次	関電プラント
			芦田　雅士	
	13:00～16:00	モータ分解点検	芦田　雅士	
2017/12/7(木)	9:00～16:10	非破壊検査	山田　浩次	関電プラント
2017/12/8(金)	13:10～16:25	石川島播磨重工業株式会社　工場視察	森本　研二	IHI相生工場
2017/12/9(土)	―	休日		
2017/12/10(日)	―	休日		
2017/12/11(月)	10:00～12:00	設備見学:姫路第二発電所	森本　研二	姫路第二発電所
	13:30～16:40	三菱日立パワーシステムズ株式会社　工場見学		
2017/12/12(火)	9:00～11:45	計器類の保守	住友　宏行	関電プラント
	13:00～16:45	事故災害未然防止	芦田　雅士	
2017/12/13(水)	9:00～19:45	アクションプラン作成	森本　研二	関電プラント
2017/12/14(木)	10:30～11:45	アクションプラン作成	森本　研二	JICA関西
	13:00～16:00	アクションプラン発表	森本　研二	

日付	時間	研修項目	講師等	研修場所
2017/12/15(金)	10:00～11:00	評価会	大井 佳子	JICA関西
			浄聖 重己	
	11:00～11:40	閉講式	森本 研二	
	11:50～12:30	意見交換会	平畑 弘樹	
	13:30～14:45	反省会	藤井 健雄	
2017/12/16(土)	－	離日		

添付 6-3-5

第1回本邦研修アクションプラン(エンジニア)

添付 6-3-6

第 1 回現地業務行程

Capacity Development for Operation & Maintenance of Thermal Power Stations
Egypt 2017
Action Plan (Engineers/Technicians)

Name of the Power Company: Cairo North Power Station
Name of the member: Engineers (Moustafa Esmat Ahmed, Ayman Ibrahim Mohamed Ibrahim, Abdel Rahman Saad Abdel Rahman) and Technicians (Mohamed Emad Abdelrahim, Ibrahim Khatab Ragab Khatab, Shahin Mohamed Said Elsayed)

Overall Goal (Core Objective)	Surrounding Equipment is repaired efficiently
Project Purpose	1. Engineer and technicians have enough skills 2. Maintenance is done in proper timing
Outputs (Positive effects by implementing the Activities)	1. Internal Training is organized 2. Communication between operation section and maintenance section is done smoothly
Activities	1. See separate document “Detailed Plan of Training” for details. 2-1 Invite operation engineers/technicians for bilateral meeting with maintenance engineers/technicians every Sunday morning to increase cooperation and share information, experience and lessons learned. 2-2 Make “Daily Monitoring Round Report” by maintenance team members every day.
Person & Section in charge	Maintenance department (60 technicians & 6 engineers) and Operation department (40 technicians & 6 engineers)
Financial Source	(Just some tea money through contributions from Engineers and Management)
Risk (Possible Obstacles)	A-Outages that need continuous work for maintenance we may divide in three shifts to maintain the turbine in minimum time. B- Some sister plants may borrow some technicians to help them in their outages.

Detailed Plan of Training

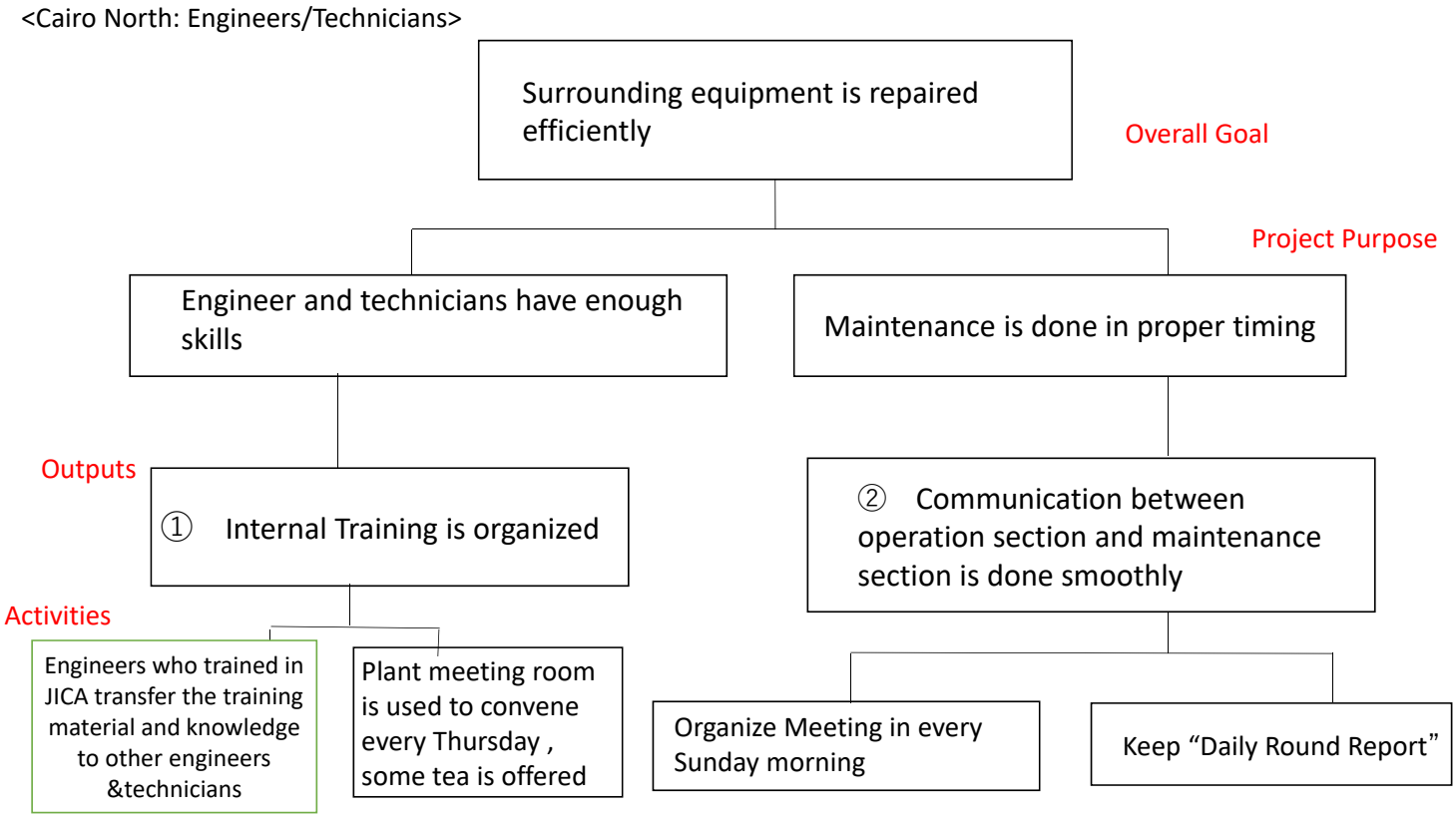
Name of the Power Plant: **Cairo North Power Station** E.E.H.C (Engineers/Technicians)

Title of the Training	
Internal Training	
Person/Section in charge	
Maintenance Engineers	
Things that have to be considered in implementing the Training	
- Venue: Power Station meeting room - Facilities, equipment etc.: TBD - Lecturers: Engineers & Technicians who joined JICA training, Experienced personnel within PS - Financial source: Just some tea money through contributions from Engineers and management) Risks (possible obstacles): A-Outages that need continuous work for maintenance we may divide in three shifts to maintain the turbine in minimum time. - B- Some sister plants may borrow some technicians to help them in their outages.	
Target Group of the Training Technicians and Engineers	
Syllabus 1) Work safety and disaster avoidance 2) Vibration balancing 3) Pump operation and maintenance 4) Welding procedures 5) Valve maintenance 6) NDI 7) Quality Control & Efficiency management	Timeframe 2 hours every Thursday

Capacity Development for Operation & Maintenance of Thermal Power Stations, Egypt 2017 (Engineers/Technicians)

Cairo North

Action Plan



添付 6-3-7

調査対象発電所概要

調査対象発電所概要

公社	発電所	ユニット		COD	Fuel	Output	GT	ST	HRSG	GEN
CEPC (カイロ電力会社)	Cairo North発電所	Module1	Unit-1	Jul-04	NG	250MW	三菱重工	－	NEM	三菱電機
			Unit-2	Jul-04	NG	250MW	三菱重工	－	NEM	三菱電機
			Unit-3	Jan-06	－	250MW	－	日立	－	三菱電機
		Module2	Unit-4	Jun-06	NG	250MW	GE	－	NEM	GE
			Unit-5	Apr-06	NG	250MW	GE	－	NEM	GE
			Unit-6	Jul-08	－	250MW	－	ALSTOM	－	ALSTOM
MDEPC (中デルタ電力会社	Nubaria発電所	#1 & #2	Unit-1	Jul-05	N.G	250MW	Siemens	－	ALSTOM	Siemens
			Unit-2	Aug-05	N.G	250MW	Siemens	－	ALSTOM	Siemens
			Unit-3	Sep-05	N.G	250MW	Siemens	－	ALSTOM	Siemens
			Unit-4	Sep-05	N.G	250MW	Siemens	－	ALSTOM	Siemens
			Unit-5	Aug-06	－	250MW	－	MHI	－	MHI
			Unit-6	Sep-06	－	250MW	－	MHI	－	MHI
		#3	Unit-1	May-09	N.G	250MW	GE	－	STF ITALY	GE
			Unit-2	Jul-09	N.G	250MW	GE	－	STF ITALY	GE
			Unit-3	Oct-10	－	276MW	－	ALSTOM	－	ALSTOM
	Talkha発電所	Unit-1		Aug-06	N.G	250MW	Siemens	－	ALSTOM	Siemens
		Unit-2		Aug-06	N.G	250MW	Siemens	－	ALSTOM	Siemens
		Unit-3		Feb-10	－	250MW	－		－	ALSTOM
WDEPC (西デルタ電力会社)	Sidi Krir発電所	Conventional	Unit-1	Jan-00		320MW	－			
			Unit-2	Mar-00		320MW	－			
		Combined Cycle	CTG1	Aug-09	N.G	250MW	三菱重工	－	NEM	三菱電機
			CTG2	Sep-09	N.G	250MW	三菱重工	－	NEM	三菱電機
			STG	Aug-10	－	270MW	－	ANSALDO		ANSALDO
UEEPC (上エジプト電力会社)	Assiut発電所 (Walidia発電所)	Unit-1		Mar-92	N.G	300MW	－			
		Unit-2		Feb-97	N.G	300MW	－			
	Kuriemat発電所	#1	Unit-1	Nov-97	N.G	627MW	－	GE	Babcock	
			Unit-2	Aug-98	N.G	627MW	－	GE	Babcok	
		#2	Unit-1	Feb-07	N.G	250MW	Siemens	－	CMI	Siemens
			Unit-2	Oct-07	N.G	250MW	Siemens	－	CMI	Siemens
			Unit-3	Jun-09	－	250MW	－	ALSTOM	－	ALSTOM
		#3	Unit-1	Jan-09	N.G	250MW	GE	－	CMI	GE
			Unit-2	Jul-09	N.G	250MW	GE	－	CMI	GE
			Unit-3	Oct-11	－	250MW	－	ALSTOM	－	ALSTOM

添付 6-3-8

Action Plan ヒアリング参加状況(第 1 次現地調査)

Action Planヒアリング参加状況(第1次現地調査)

	氏名	担当分野	職位	出欠
Cairo North発電所	Mr.BADERELDINE Moustafa Esmat Ahmed	Gas Turbine Maintenance	Engineer	✓
	Mr.IBRAHEM Ayman Ibrahem Mohamed	Turbine Maintenance	Engineer	✓
	Mr.MEWAFY Abdelrahman Saad Abdelrahman	Turbine Maintenance	Engineer	Due to another business
	Mr.MOHAMED Emad Abdelrahim Rashidy	Turbine Maintenance	Technician	✓
	Mr.IBRAHEM Khtab Ragab	Turbine Maintenance	Technician	✓
	Mr.SHAHIN Mohamed Said Elsayed	Turbine Maintenance	Technician	✓
Nubaria発電所	Mr.SAAD Ayman Saad Azer	Operation Management.	Engineer	✓
	Mr.ELSAEIDY Ibrahim Ahmed Osman	Mechanical Maintenance	Engineer	✓
	Mr.KALIFA Mohamed Helal	Turbine Maintenance	Technician	✓
	Mr.ABDELHAFEZ Elshahat Abdalla	Mechanical	Technician	✓
Sidi Krir発電所	Mr.ELSHEKH Mohamed Hamdy Ibrahim Abdelmak	Turbine Maintenance	Engineer	✓
	Mr.ABDELHAMID Tarek Moustafa Mohamed	Operation Dept.	Engineer	✓
	Mr.AWAD Abdelmoneim Ali Ahmed Mohamed	Mechanical Maintenance	Engineer	✓
	Mr.ABDELAAL Omar Mohamedyoussef	Turbine Maintenance	Technician	Due to another business
	Mr.BASHA Ashraf Abdelaziz	Turbine Maintenance	Technician	Due to another business
	Mr.ELTAHAN Mohamed Abdallah	Turbine Maintenance	Technician	Due to another business
Assiut発電所 (Walidia発電所)	Mr.KAOUD Mekhaimer Abozeid Mekhaimer	Maint.Dept.of Water Treat.	Engineer	✓
	Mr.TAWFIK Mohamed Aboueleyoun Hassan Oraby	Maint.Dept.of Boiler	Engineer	✓
Kuriemat発電所	Mr.ABBAS Amir Kamal Abdellatif	Turbine Maintenance	Technician	✓
	Mr.ELIAN Samir Ayesh Abdelazim	Mechanical Maintenance	Technician	✓
	Mr.MOHAMED Sayed Ali Mahmoud	Mechanical Maintenance	Technician	✓

添付 6-3-9

第１回現地業務ラップアップミーティング議事録

Minutes Of Meeting
for
The First Wrap-Up Meeting
on
The Project for Capacity Building & Strengthening of Thermal Power Generation Operation & Maintenance
between
Japan International Cooperation Agency
and
The Government Of Arab Republic Of Egypt

Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the follow-up mission (hereinafter referred to as "the Mission") for "The Project for Capacity Building & Strengthening of Thermal Power Generation Operation & Maintenance" (hereinafter referred to as "the Project") to discuss the detail of the Project with the officials of Egyptian Electricity Holding Company (hereinafter referred to as "EEHC") for the effective and successful implementation.

The JICA Mission and the officials of EEHC hereby confirmed the result of discussions in the wrap up meeting (hereinafter referred to as "the Meeting") on 12th July 2018, at EEHC Head Office, chaired by Eng. Gaber Desouki Moustafa, the chairman of EEHC.

As a result of discussions in the Meeting, the Japanese side and Egyptian side have confirmed the main items described in the Annex.

Cairo, 12th July 2018

Mr. Hiroshi Tadokoro
Mission Leader
Senior Advisor, Industrial development and Public Policy Department,
Japan International Cooperation Agency

Eng. Gaber Desouki Moustafa
Chairman
Egyptian Electricity Holding Company

Mr. Hiroki Hirahata
JICA Expert / Chief Advisor

ANNEX

1. Project Outline
   (1) Confirmation of Project Outline
   The JICA Mission has explained the scope of works, overall schedule and the activities to be conducted in the Project. The JICA Mission requested further close collaboration to the Egyptian side for the implementation of the Project activities as well as for organizing the Meeting.
   The Egyptian side acknowledged the contents of the explanation and the request from the JICA Mission, and agreed the plan in principle.
   The both sides confirmed the overall of the Project Summary and the second training in Japan as below.

2. Project Summary
   (1) Targeted Type of Power Generation
   Gas Turbine Combined Cycle (GTCC)
   (2) Project Sites
   Thermal Power Plants (TPPs) of EEHC and its affiliated production companies
   (3) Beneficiaries
   Engineers & technicians of production companies trained by JICA and their trainees
   (4) Counterparts
   Ministry of Electricity and Renewable Energy (MoERE)
   Egyptian Electricity Holding Company (EEHC)
   Cairo Electricity Production Company (CEPC)
   East Delta Electricity Production Company (EDEPC)
   Middle Delta Electricity Production Company (MDEPC)
   West Delta Electricity Production Company (WDEPC)
   Upper Egypt Electricity Production Company (UEEPC)
   (5) Duration
   October 2017 – September 2019(2 years)
   (6) Project Purpose
   ✓Overall Goal:
   Capacity of O&M of Thermal Power Plants (TPPs) is strengthened.
   ✓Project Goal:
   Training capacity on O&M of EEHC is strengthened.
   (7) Project Output
   ✓Output 1: Training needs are identified based on current situation of O&M.
   ✓Output 2: Capacity of instructors as well as engineers and technicians of EEHC and its affiliate production companies is enhanced.
   ✓Output 3: O&M training activity at TPPs is reviewed.

(8) Project Work Flowchart
The Project will be planned according to the below schedule.

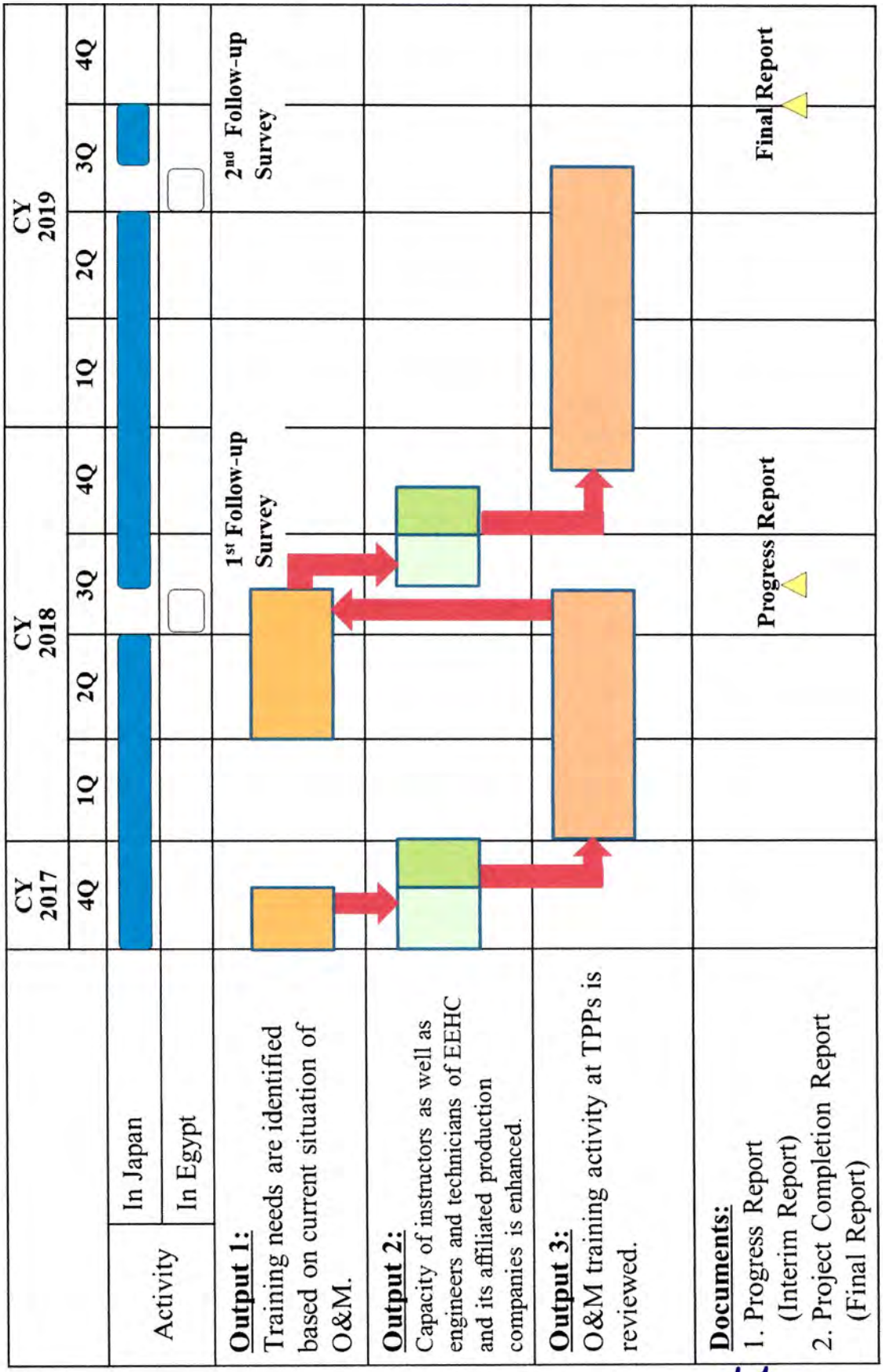


Fig1. Project Work Flowchart

3. The Second Training in Japan

(1) Schedule

Counterpart Training in Japan is tentatively planned from 8th October to 10th November for engineers and from 8th to 27th October for technicians, 2018. (from arrival to departure)

(2) Goal

The goal of the second training in Japan is to develop capacity of instructors and O&M staff and conduct trainings at each thermal power station by the instructors. Based on the result of the first training, the second training will be focused on more practical and advanced curriculum such as "Participation on GTCC Overhaul", "Human Error Prevention." and "Overhauling the Rotary Pumps".

(3) Overall Contents

The both sides confirmed that the overall tentative contents of the second training in Japan shall be as follow;

Engineers

- ✓ Introduction of the latest technology in TPP
- ✓ Experience-based Safety Training
- ✓ Human Resource Development
- ✓ Quality Management
- ✓ Thermal Efficiency Management
- ✓ Basic Training of Vibration (Balancing)
- ✓ Non-Destructive Inspection
- ✓ GT & High Temperature Parts / Maintenance of GTCC (inc. HRSG/Generator)
- ✓ Remaining Life Assessment (advanced)
- ✓ Feed Water Treatment
- ✓ Site Visit on TPP and Manufacture's factory
- ✓ Lessons Learned from Accidents
- ✓ **Participation in GTCC Overhaul**
- ✓ **Human Error Prevention**
- ✓ **Welding Quality Management in Japan**
- ✓ **Effective Maintenance for Quality Electric Power Infrastructure**
- ✓ Methodology to Formulate Action Plan

Technicians

- ✓ Introduction of the latest technology in TPP
- ✓ Experiential Safety Training
- ✓ Welding Procedure Management
- ✓ Experiential Quality Training
- ✓ Metal Material
- ✓ **Overhauling Rotary Pumps**
- ✓ Basics of Non-Destructive Inspection Skills
- ✓ Maintenance of High Temperature and High Pressure Piping
- ✓ **Occupational HSE (especially Safety)**
- ✓ **General System and Outline of GTCC**
- ✓ Site Visit on TPP and Manufacture's factory
- ✓ Prevention of Accidents and Disasters
- ✓ **Participation in GTCC Overhaul**
- ✓ Methodology to Formulate Action Plan

* New training subjects as shown in blue underlined & boldfaced type

Fig2. Overall training contents

(1) Egyptian Side will take necessary measures to:

a. select participants based on the selection criteria (by 15th AUG, 2018); and
b. secure other operational cost if necessary; and
c. report to Japanese side O&M training activities at TPPs implemented by JICA-trained engineers & technicians.

(2) Japanese Side will take necessary measures to:

a. conduct the O&M training in Japan for each 10 engineers/technicians as participants (OCT/NOV, 2018); and
b. review O&M training activities at TPPs implemented by JICA-trained engineers & technicians.

Attachment 1 Attendance List in the Wrap-Up Meeting
Attachment 2 Presentation Materials

A.J.

meeting title: _____

Capacity Building for Operation & Maintenance of Thermal Power Plant
in Arab Republic of Egypt

Wrap up Meeting Attendance List

Date: 12th July 2018

Time: 14 : 30 - 15 : 00

Place: EEHC office

Name	Position	Company	Signature
Gaber Desouky	Chairman	EEHC.	
Akram Ibrahim	General Manager for Investment	EEHC	
Mosataka Takeshita	Director, Middle East Division 1	JICA	竹下
Mizuki Matsuzaki	Senior Representative JICA Egypt Office	JICA	
Hiroshi TADOKORO	Senior Advisor	JICA	田所
Mayada Mougely	Chief Program Officer	JICA	M. Mougely
Hikaru TSUYUZAKISHI	Representative	JICA Egypt Office	
Aisha Ghaneim	program officer	JICA Egypt Office	Aisha
Yuki Obe	C&I Engineer	KEPCO	大部祐貴
Hiroki Washida	General Manager	KEPCO	鷲田弘樹
Yoshihiro Doi	Mech Eng	KEPCO	Yoshihiro Doi
[illegible]	Electrical Engineer	KEPCO	[illegible]
Shigeru Yoshitake	Mech eng	KEPCO	吉竹

JICA

Kansai Electric Power
power with heart

JICA

Kansai Electric Power
power with heart

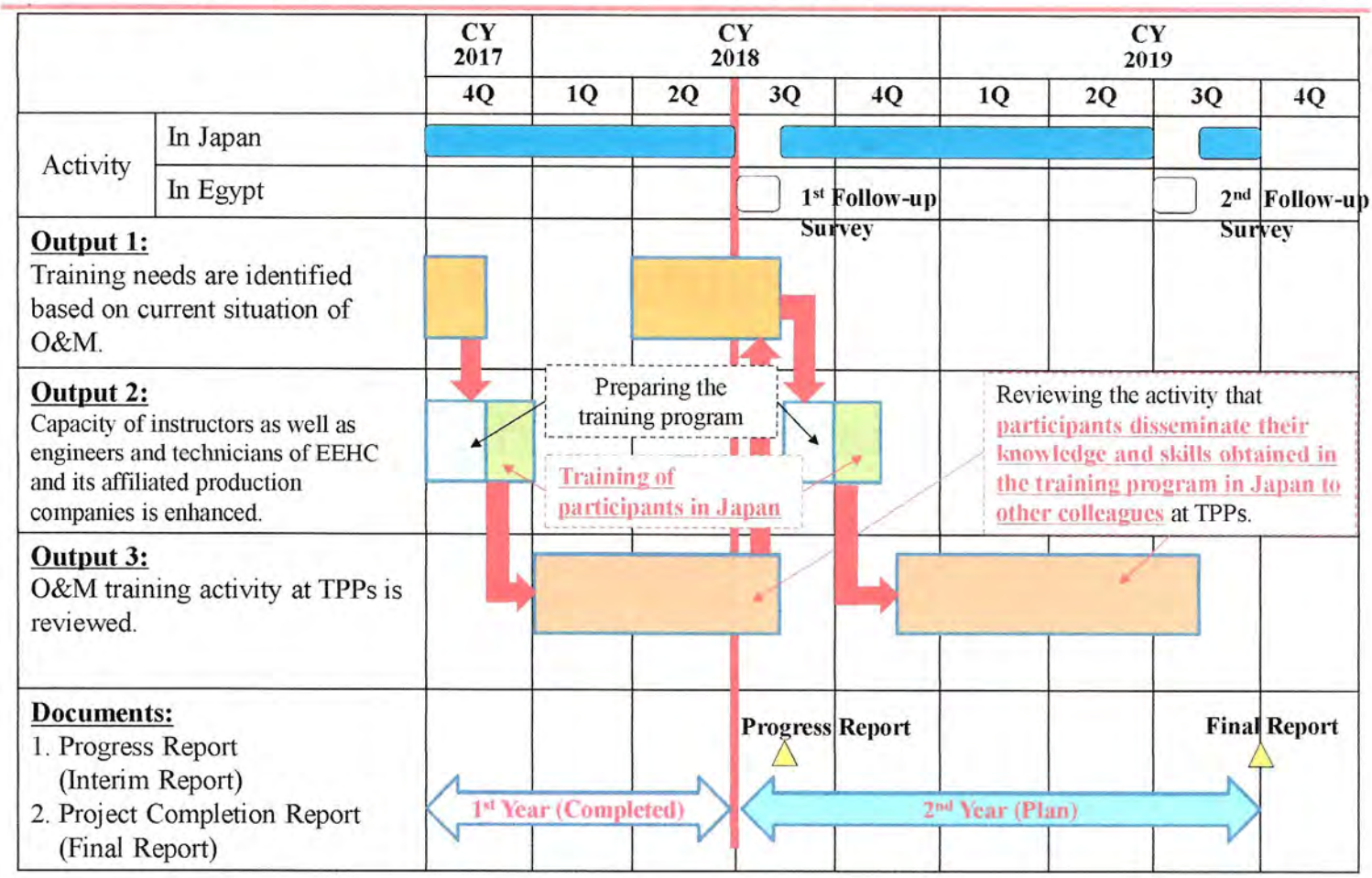
SURVEY REPORT and NEXT ACTION

July 2018

Japan International Cooperation Agency (JICA)
The Kansai Electric Power Co., Inc.

Contents

1. Project Summary: Work Flowchart



1. Project Summary: Actual Itinerary of Follow-up Survey

Date		Activities			Contents
2.Jul.	Mon	Meeting	Cairo	EEHC	Briefing on the Interim Report
		SiteVisit		EEHC Training Center	Interview with each counterpart and Site Visit at the these TPPs/Training Centers.
3.Jul.	Tue	Meeting	Alexandria	Sidi Krir Power Station	
		Site Visit			
4.Jul.	Wed	Meeting	Alexandria	WDEPC	
		Site Visit		WDEPC Training Center	
			Nubaria	Nubaria Power Station	
5.Jul.	Thu	Meeting	Talkha	MDEPC	
		Site Visit		MDEPC Training Center	
				Talkha Power Station	
8.Jul.	Sun	Meeting	Assuit	UEEPC	
		Site Visit		Assuit Power Station	
9.Jul.	Mon	Site Visit	Kuriemat	UEEPC Training Center	
				Kuriemat Power Station	
10.Jul.	Tue	Meeting	Cairo	CEPC	
		Site Visit		CEPC Training Center	
				Cairo North Power Station	
11.Jul.	Wed	Pre-Meeting	Cairo	JICA Members	Preparation for the Wrap-up Meeting
12.Jul.	Thu	Wrap-up Meeting	Cairo	All Members	Briefing on the Survey Report

2. O&M Training in Japan: Important Assumption

Finding of this Mission: Thermal Power Plants (TPPs)

- ✓ TPPs are so well operated and maintained that EEHC can attain high O&M quality of TPPs, despite of some technical issues.
- ✓ Aging GTCCs have concern of **Flow Accelerated Corrosion (FAC)** in Heat Recovery Steam Generator (HRSG) .
- ✓ Some TPPs require "energy management" followed by O&M cost reduction and higher availability factor: **major technical troubles** and **the latest maintenance technology** in case of Japanese GTCC etc.

Finding of this Mission: JICA-trained Engineers/Technicians

- ✓ JICA trained engineers & technicians are utilizing their knowledge and skills obtained in Japan, through **not only dissemination to other colleagues but also actual trouble-shooting** at TPPs.
- ✓ Engineers shall take **the responsibility of O&M work** implemented by technicians.

2. O&M Training in Japan: GTCC Line-up of EEHC

Company	CCGT Station	No. of Units	Installed Capacity	Fuel	Commissioning Date
	Cairo South II	1x110L1x55	165	NG/LFO	1995
Cairo	Cairo North	4x250+2x250	1500	NG/LFO	2004-'06-'07-'08
	North Giza	6x250+3x250	2250	NG/LFO	2014-'15-'16
East Delta	Damietta	6x132+3x136	1200	NG/LFO	1989-1993
	Talkha	8x19.5+2x40	236	NG	'79-'80-1989
Concern of FAC in HRSG	Talkha 750	2x250+1x250	750	NG	2006-2010
	Nubaria 1,2	4x250+2x250	1500	NG/LFO	2005-2006
Middle Delta	Nubaria 3	2x250+1x250	750	NG/LFO	2009-2010
Remarkable issue of FAC in HRSG	Mahmoudia	8x21+2x50	268	NG/LFO	1983-1995
	El-Arf	2x250+1x250	750	NG/LFO	2009-2010
	Banha	2x250+1x250	750	NG/LFO	2014-2015
	Damanhour	4x25+1x58	158	NG/LFO	1985-1995
West Delta	Sidi Krir	2x250+1x250	750	NG/LFO	2009-2010
	Kuriemat 1	2x250+1x250	750	NG	2007-2009
Upper Egypt	Kuriemat 2	2x250+1x250	750	NG	2009-2011
	Burulls	6x400 (Gas Unit)	2400	NG/LFO	2017
Siemens	Beni Suef	6x400 (Gas Unit)	2400	NG/LFO	2017
	New Capital	2x400 (Gas Unit)	800	NG/LFO	2017

*Source: EEHC Annual Report 2016/2017

Kansai Electric Power
power with heart

SURVEY REPORT and NEXT ACTION

July 2018

Japan International Cooperation Agency (JICA)
The Kansai Electric Power Co., Inc.

Contents

1. Project Summary

This JICA project aims to implement capacity building for O&M at Thermal Power Plants (TPPs), in order to make continuous technical support for EEHC.

Project Purpose

Overall Goal	Capacity of O&M of Thermal Power Plants (TPPs) is strengthened.
Project Goal	Training capacity on O&M of EEHC is strengthened.

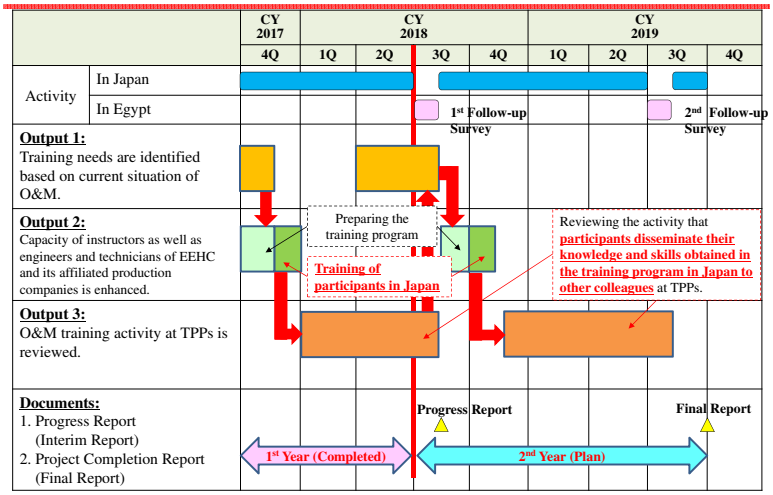
Project Output

Output 1	Training needs are identified based on current situation of O&M.
Output 2	Capacity of instructors as well as engineers and technicians of EEHC and its affiliated production companies is enhanced.
Output 3	O&M training activity at TPPs is reviewed.

1. Project Summary

Targeted Type of Power Generation	Gas Turbine Combined Cycle (GTCC)
Project Sites	Thermal Power Plants (TPPs) of EEHC and its affiliated production companies
Counterpart	Ministry of Electricity and Renewable Energy (MoERE) Egyptian Electricity Holding Company (EEHC) Cairo Electricity Production Company (CEPC) East Delta Electricity Production Company (EDEPC) Middle Delta Electricity Production Company (MDEPC) West Delta Electricity Production Company (WDEPC) Upper Egypt Electricity Production Company (UEEPC)
Beneficiaries	Engineers & technicians trained by JICA and their trainees
Duration	October 2017 – September 2019 (2 years)

1. Project Summary: Work Flowchart



1. Project Summary: Actual Itinerary of Follow-up Survey

Date		Activities			Contents
2.Jul.	Mon	Meeting	Cairo	EEHC	Briefing on the Interim Report
		SiteVisit		EEHC Training Center	Interview with each counterpart and Site Visit at the these TPPs/Training Centers.
3.Jul.	Tue	Meeting	Alexandria	Sidi Krir Power Station	
		Site Visit			
4.Jul.	Wed	Meeting	Alexandria	WDEPC	
		Site Visit		WDEPC Training Center	
			Nubaria	Nubaria Power Station	
5.Jul.	Thu	Meeting	Talkha	MDEPC	
		Site Visit		MDEPC Training Center	
				Talkha Power Station	
8.Jul.	Sun	Meeting	Assuit	UEEPC	
		Site Visit		Assuit Power Station	
9.Jul.	Mon	Site Visit	Kuriemat	UEEPC Training Center	
				Kuriemat Power Station	
10.Jul.	Tue	Meeting	Cairo	CEPC	
		Site Visit		CEPC Training Center	
				Cairo North Power Station	
11.Jul.	Wed	Pre-Meeting	Cairo	JICA Members	Preparation for the Wrap-up Meeting
12.Jul.	Thu	Wrap-up Meeting	Cairo	All Members	Briefing on the Survey Report

Contents

7

2. O&M Training in Japan: Participant's Comments

8

	Main Suggestion	Especially Useful Subjects	Required Additional Subjects
Engineers	➢ We need **more practical training** (participation in turbine inspection) and **more technical-advanced training** (not beginner). ➢ The program is theoretical but we need **practical a lot**. ➢ **Practical application** should be more than theoretical lectures.	➢ Basic Training of Vibration (Balancing) ➢ Non-Destructive Inspection ➢ Introduction of the latest technology in GTCC ➢ GT & High Temperature Parts / Maintenance of GTCC	➢ **Welding Quality Management in Japan** ➢ Heat Recovery Steam Generator **(HRSG) Maintenance**
Technicians	➢ We need **more technical-advanced training.** ➢ We need more time in comparison with training contents.	➢ Metal Material ➢ Experiential Safety Training ➢ Welding Procedure Management ➢ Basics of Non-Destructive Inspection Skills	➢ **Practical Skill at Rotary Equipment** (Alignment and Balancing) ➢ **Participation in GTCC Overhaul**

2. O&M Training in Japan: Important Assumption

9

Finding of this Mission: Thermal Power Plants (TPPs)

- ✓ TPPs are so well operated and maintained that EEHC can attain high O&M quality of TPPs, despite of some technical issues.
- ✓ Aging GTCCs have concern of **Flow Accelerated Corrosion (FAC)** in Heat Recovery Steam Generator (HRSG) .
- ✓ Some TPPs require "energy management" followed by O&M cost reduction and higher availability factor: **major technical troubles** and **the latest maintenance technology** in case of Japanese GTCC etc.

Finding of this Mission: JICA-trained Engineers/Technicians

- ✓ JICA trained engineers & technicians are utilizing their knowledge and skills obtained in Japan, through **not only dissemination to other colleagues but also actual trouble-shooting** at TPPs.
- ✓ Engineers shall take **the responsibility of O&M work** implemented by technicians.

2. O&M Training in Japan: GTCC Line-up of EEHC

10

Company	CCGT Station	No. of Units	Installed Capacity	Fuel	Commissioning Date
Cairo	Cairo South II	1x110L1x55	165	NG/LFO	1995
	Cairo North	4x250+2x250	1500	NG/LFO	2004-'06-'07-'08
	North Giza	6x250+3x250	2250	NG/LFO	2014-'15-'16
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Remarkable issue of FAC in HRSG	Mahmoudia	8x21+2x50	268	NG/LFO	1983-1995
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	Kuriemat 2	2x250+1x250	750	NG	2009-2011
Siemens	Burulls	6x400 (Gas Unit)	2400	NG/LFO	2017
	Beni Suef	6x400 (Gas Unit)	2400	NG/LFO	2017
	New Capital	2x400 (Gas Unit)	800	NG/LFO	2017

*Source: EEHC Annual Report 2016/2017

2. O&M Training in Japan: Important Assumption

11

Finding of this Mission: Training Centers (T/Cs)

- ✓ EEHC has various training curriculum from management skill in Leaders Development Center (LDC) to technical expertise in T/Cs of each Electric Production Company (EPC).
- ✓ T/Cs have O&M training program including mechanical workshop, but there is still room for reinforcing **O&M training program (especially GTCC)**.
- ✓ While every T/C implements safety management, some TPPs are expected to enhance Health, Safety and Environment (HSE), **especially safety**.
- ✓ Some T/Cs have old-fashioned training facilities (under renovation), and have potential needs such as **non-destructive inspection** and **remaining life assessment** for aging main equipment of TPPs.

2. O&M Training in Japan: Training Program

12

Engineers	Technicians
✓ Introduction of the latest technology in TPP	✓ Introduction of the latest technology in TPP
✓ Experience-based Safety Training	✓ Experiential Safety Training
✓ Human Resource Development	✓ Welding Procedure Management
✓ Quality Management	✓ Experiential Quality Training
✓ Thermal Efficiency Management	✓ Metal Material
✓ Basic Training of Vibration (Balancing)	✓ **Overhauling Rotary Pumps**
✓ Non-Destructive Inspection	✓ Basics of Non-Destructive Inspection Skills
✓ GT & High Temperature Parts / Maintenance of GTCC (inc. **HRSG**/Generator)	✓ Maintenance of High Temperature and High Pressure Piping
✓ Remaining Life Assessment (**advanced**)	✓ **Occupational HSE (especially Safety)**
✓ Feed Water Treatment	✓ **General System and Outline of GTCC**
✓ Site Visit on TPP and Manufacture's factory	✓ Site Visit on TPP and Manufacture's factory
✓ Lessons Learned from Accidents	✓ Prevention of Accidents and Disasters
✓ **Participation in GTCC Overhaul**	✓ **Participation in GTCC Overhaul**
✓ **Human Error Prevention**	✓ Methodology to Formulate Action Plan
✓ **Welding Quality Management in Japan**	
✓ **Effective Maintenance for Quality Electric Power Infrastructure**	
✓ Methodology to Formulate Action Plan	

Practical Skill

Workshop

Action Plan

* New training subjects as shown in blue underlined & boldfaced type

Contents

1. Project Summary
2. O&M Training in Japan: OCT/NOV, 2018
3. **Selection Criteria for Next Participants: Engineers & Technicians**
4. Summary on the Mission for Next Step

3. Selection Criteria: Important Assumption

Finding of this Mission: TPPs and T/Cs

- ✓ Each EPC has its own T/C and implements its own training program for engineers and technician, but there is still room for reinforcing **O&M training program (especially GTCC)** in some T/Cs.
- ✓ **Mechanical participants** are preferable to electrical and C&I, considering foreseeable aging impact on O&M quality and cost in the near future.
- ✓ **There is no officer dedicated only for instructors.** At the request of T/Cs, leading officer of TPPs usually implements training course as instructor.

Suggestion from JICA Expert

- ✓ Target should be **leading engineers and technicians who are capable of disseminating their knowledge and skills obtained in O&M training in Japan to other colleagues** at TPPs.

3. Selection Criteria for Next Participants

Items	Qualification (Engineers)	Qualification (Technicians)
Number	10 persons per annual	10 persons per annual
Training Term	About 1 month	About 3 weeks
Current Duties	Be a leading engineer working on thermal power plants, and has expertise related to **mechanical engineering in GTCC**, who are capable to be instructors to train other engineers.	Be a leading technician working on thermal power plants, and has expertise related to **mechanical work in GTCC**, who are capable to be instructors to train other technicians.
Experience in the relevant field	Have **from 5 to 10 years' experience in the field O&M of GTCC** including GT, ST and HRSG.	
Educational Background	Be a graduate of university	Be a diploma of technical high school or college, or higher
Language	Have a competent command of spoken and written English.	None*1
Health	Must be in good health, both physically and mentally, to participate in the program in Japan.	

*1:Lecture will be made in Japanese and translated to English or Arabic. Course materials will be prepared in English, and participants are expected to prepare job reports and action plans in English.

Contents

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4. Summary on the Mission for Next Step

✓ **Request for Next Step:**

Giving us comments from Egyptian side for Minutes of Meeting (MoM) **by JUL 31, 2018**, if any, especially,

- ➢ O&M training program in Japan, and
- ➢ Selection criteria for next participants.

✓ **Undertaking by Egyptian Side:**

- ➢ Selecting participants based on the selection criteria **(by AUG 15, 2018),**
- ➢ Securing other operational cost if necessary and
- ➢ Reporting O&M training activity at TPPs implemented by JICA-trained engineers & technicians.

✓ **Undertaking by Japanese Side:**

- ➢ Conducting the O&M training in Japan for each 10 engineers/technicians as participants **(OCT/NOV, 2018),** and
- ➢ Reviewing O&M training activity at TPPs implemented by JICA-trained engineers & technicians.

Hiroki HIRAHATA (Focal Point)
hirahata.hiroki@b5.kepco.co.jp
Thermal Power Division
The Kansai Electric Power Co.,Inc.

Current Situation: Power Supply and Demand

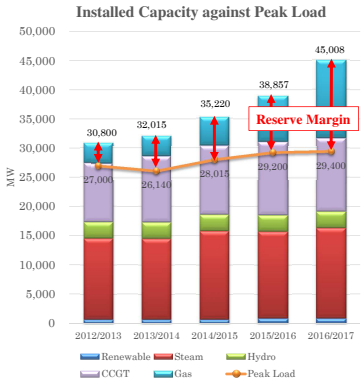
No additional thermal power plants are needed under the 8th Five-Year Plan (2017-2022), EEHC (2016/17*1)

Current Situation

✓**Meeting the peak load** in 2016/2017 that reached 29,400MW without load shedding.

✓**Increase of total installed capacity** to the unified national grid up to 45,008MW, including Fast Track Plan (3,636MW) and Siemens Project (5,600MW).

✓Consequently, progressive **increase of reserve margin** relative to peak load.



*1: EEHC Annual Report 2016/2017

Current Situation: Diversifying Generation Capacity Mix

Current Situation*1

✓ **Excessive reliance on thermal assets** (90+% of installed capacity)

✓ Frequent power outages due to natural gas and fuel shortage

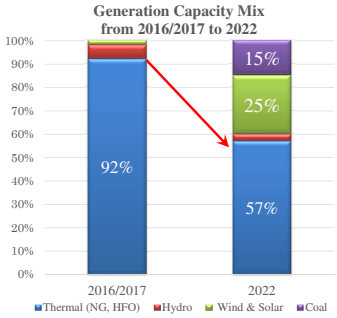
Various countermeasures to **overcome the undiversified power generation mix** taken by EEHC.

Recent Activity for Improving Energy Mix

✓ **The renewable energy** will generate over 20% of electricity.

✓ **Clean coal thermal power plant** will be installed.

✓ **Nuclear power plant** will be installed.



*1: MoERE Addressing Egypt's Electricity Vision 2015

Current Situation: Drastic Change in role of TPPs

In the near future, many existing thermal power plants are increasingly required to **switch the operation from base & cyclic to peak (including standby reserve)**.

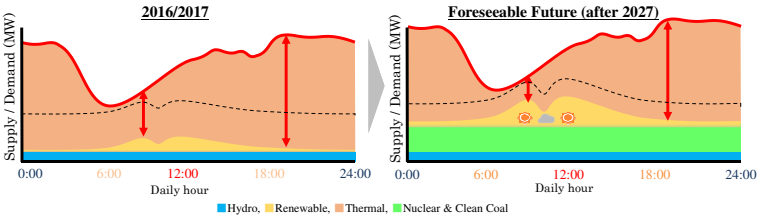
Main Dominant Factors:

✓ Recent peak load growth relatively stable.

➡ **No more drastic change in demand growth expected in next decade.**

✓ Brand-new clean coal/nuclear power plant as base load operation.

✓ Positive installation of intermittent renewable energy sources.



Issue in O&M of Thermal Power Plants (TPPs)

Foreseeable Critical Issues (O&M needs)

✓ Frequent Partial Load

➡ **Thermal efficiency deteriorates at the partial load** because power plants are designed to attain the best performance at the rated output

✓ Frequent Start-up & Shut-down

➡ TPPs suffer from not only creep damage at base & moderate cyclic operation but also **fatigue damage at intense cyclic & peak operation**.

✓ 1/3 installed capacity is over 20 years.

➡ **Aging impact on O&M quality and cost** (especially major overhaul)

✓ Increase in Standby Reserve

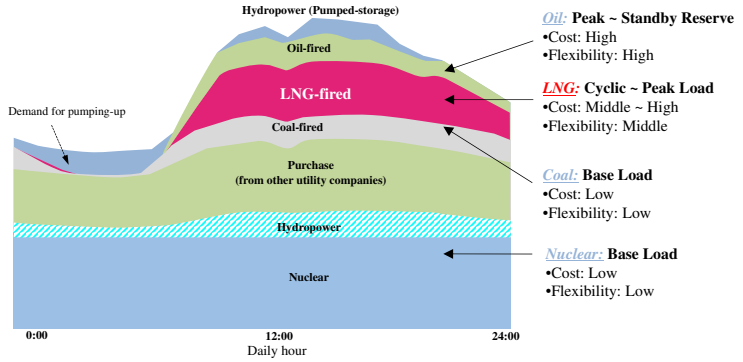
➡ Standby reserve TPPs require some amount of fixed O&M cost.

✓ Considering the current situation, EEHC is expected to **improve plant performance** and **respond to peak demand fluctuation:** Thermal efficiency, availability factor and unplanned outage rate etc.

Kansai's Technical Solutions

Kansai Electric: Long history in Responding demand fluctuation

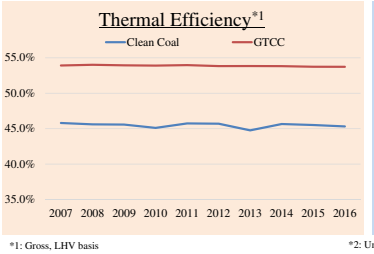
In Kansai's power generation portfolio, LNG and Oil thermal power plants have been responding to peak demand fluctuation and contribute to the consistent and stable supply of electricity.

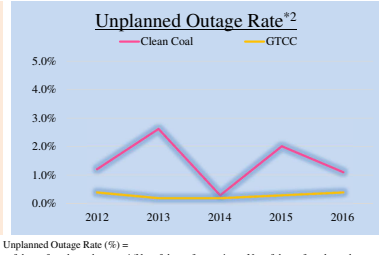


Kansai's Technical Solutions

Kansai has accumulated precious experience and maintained technical knowledge and skill of high quality O&M for over 65 years.

The following know-how contributes to **low degradation of thermal efficiency** and **low unplanned outage rate**; for example,
"thermal efficiency management", "non-destructive inspection", "safety management", "quality management", and "remaining life assessment" etc.

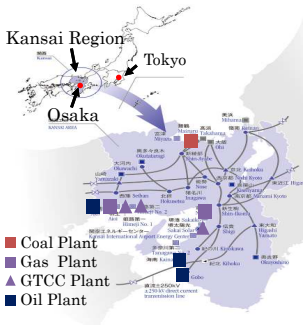




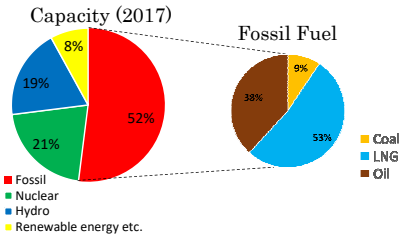
*1: Gross, LHV basis

*2: Unplanned Outage Rate (%) =
No. of days of unplanned outage / (No. of days of operation + No. of days of unplanned outage)

General Information: Kansai Electric Power Co., Inc.

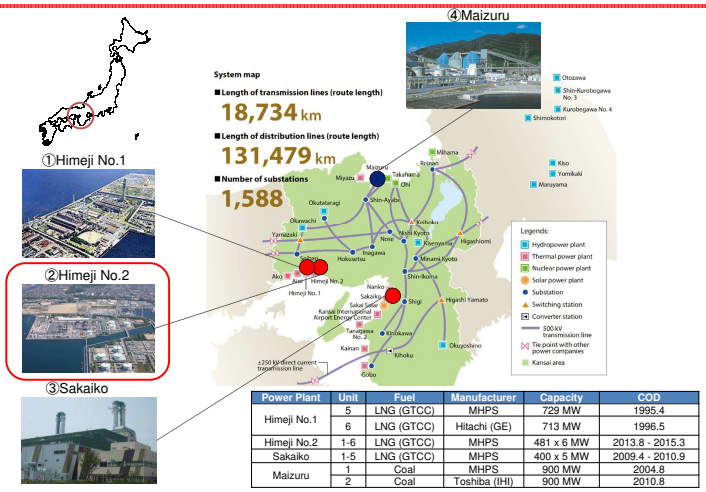


- Established in 1951
- Electricity Sales : 127,516 GWh
- The authorized Capacity : 36.6 GW



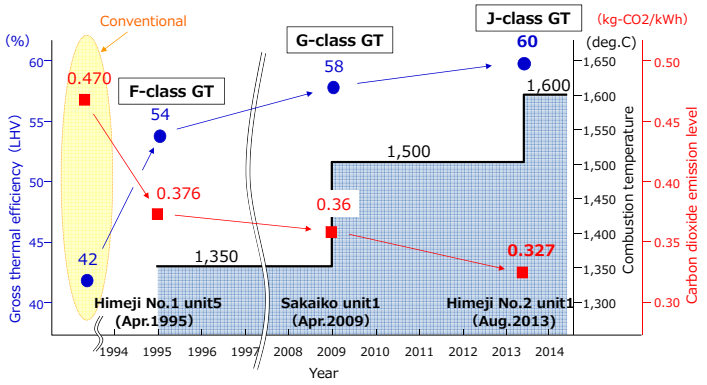
Kansai's Overseas Project

Kansai's GTCC and Coal Fired Power Plants



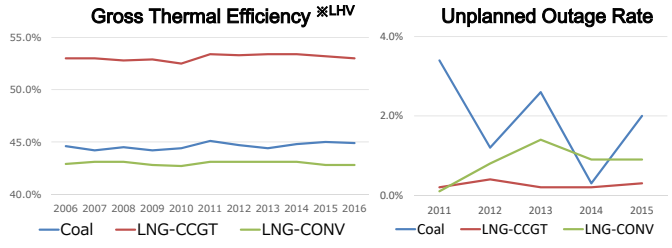
Power Plant	Unit	Fuel	Manufacturer	Capacity	COD
Himeji No.1	5	LNG (GTCC)	MHPS	729 MW	1995.4
	6	LNG (GTCC)	Hitachi (GE)	713 MW	1996.5
Himeji No.2	1-6	LNG (GTCC)	MHPS	481 x 6 MW	2013.8 - 2015.3
Sakaiko	1-5	LNG (GTCC)	MHPS	400 x 5 MW	2009.4 - 2010.9
Maizuru	1	Coal	MHPS	900 MW	2004.8
	2	Coal	Toshiba (IHI)	900 MW	2010.8

Kansai's GTCC Performance Improvement



- 30% reduction of fuel consumption and carbon dioxide emission compared to conventional power plants.

Kansai's Operational Performance

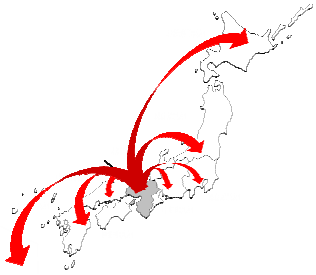


※Gross Thermal Efficiency : electricity generated/energy input
※Unplanned Outage Rate :
unplanned outage days/(operation days+ unplanned outage days)

LNG-CONV: LNG Conventional

- Able to keep a high level of *Gross thermal Efficiency* and a low level of *Unplanned Outage Rate*
- Tackling various troubles and improving operational efficiency constantly.

Updated Business Environment in Japan



Before
- 10 Electric Power Companies dominated and controlled the market.

After
- Full liberalization of the electricity market in 2016
- Opening a new market
  - 200 billion USD market scale

Kansai's Technical Service Strategy

31

Know-How Experience

New Services & Products

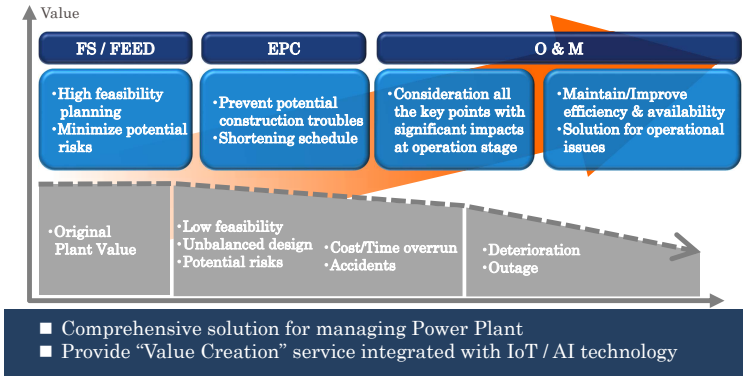
	Existing	New
Our existing Power Plants	Enhance Existing Business Profits ☐ Reform Cost Structure • **O&M Optimization** • **Fuel Conversion**	Develop New Services & Products ☐ Integrate our Know-How with Advanced Digital Technology • **Operation Optimization using AI**
New (Customer)	Expand Business Domain ☐ Provide Solution Services • **Engineering Services** • **O&M Support**	Challenges to New Field ☐ Provide New Services & Products to New Markets • **Remote Monitoring Service**

New Markets

Kansai Value Creation Service

K-VaCS

32



- Comprehensive solution for managing Power Plant
- Provide "Value Creation" service integrated with IoT / AI technology

Challenges in Optimizing O&M at Kansai

33

Operation Optimization
- Enhancing plant power output & efficiency
- Unplanned Down Time Reduction

Early Anomaly Detection

Maintenance Optimization
- Applying CBM instead of TBM
- Introducing advanced device & method

Drone

Operation

Maintenance

➢ Big Data Analysis System with AI

➢ IoT / ICT devices
➢ Advanced device

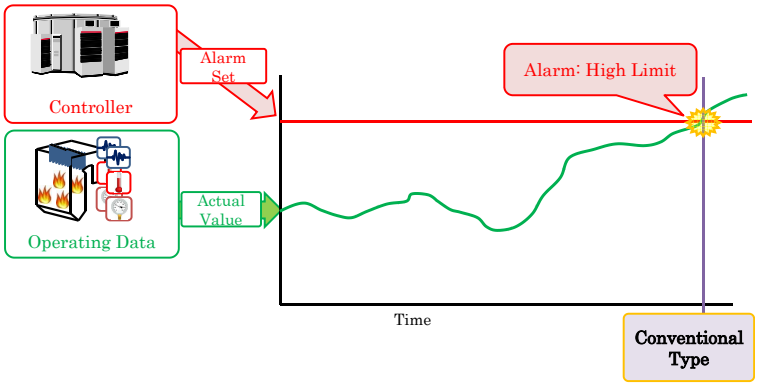
Data Management Infrastructure

Operating Data | Knowledge | Experience

Early Anomaly Detection System (Before Installation)

34

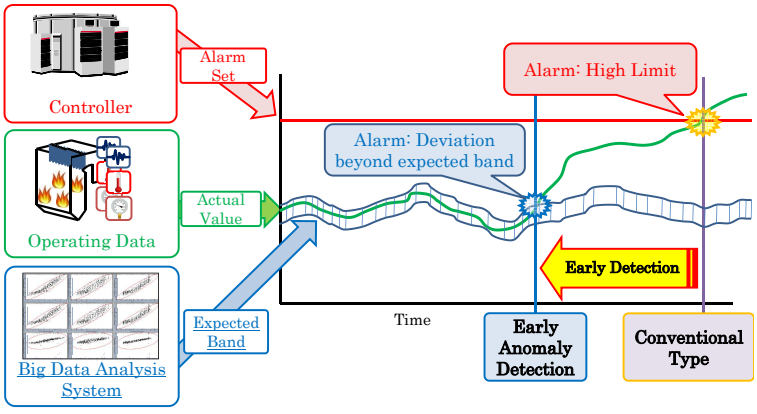
Operators are notified of alarm if any actual value of operating data is detected beyond limit, which is NOT adjusted according to various operating condition.



Early Anomaly Detection System (After Installation)

35

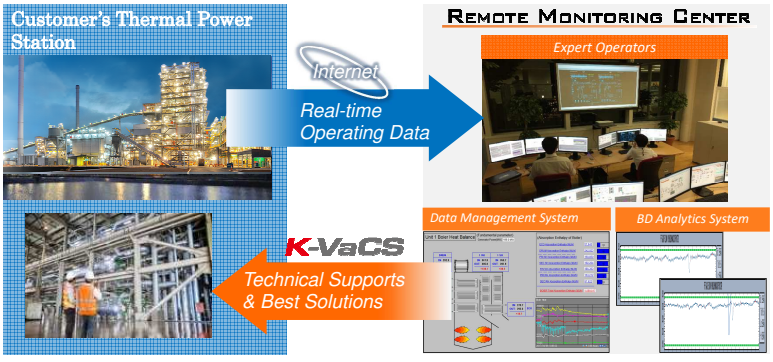
Early anomaly detection system helps operators to detect symptom of trouble earlier, by setting expected band through big data analysis system.



Kansai's Remote Monitoring Service

K-VaCS Kansai Value Creation Service

36



Together with real-time notification by the early anomaly detection system with AI, our experienced O&M expert provides total solution from user's point of view

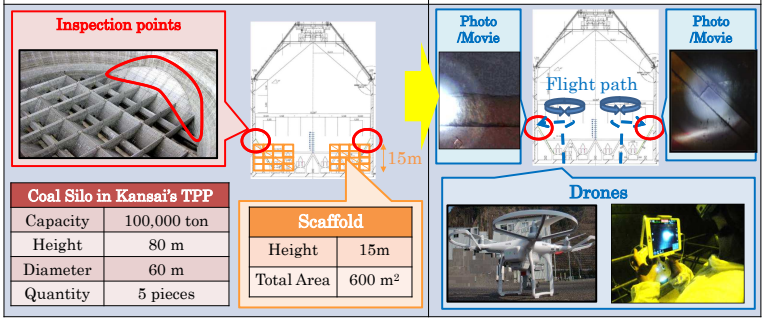
Introducing Advanced Device and Method: Drone

By using drone, it is possible to implement inspection work **without assembly & disassembly of scaffold** in Kansai's TPP.

➡ ***More safety, Shorter maintenance period and Cost-saving !***

Example: Inspection work at coal silo

(Before) Inspection by scaffold	(After) Inspection by drone



Coal Silo in Kansai's TPP	
Capacity	100,000 ton
Height	80 m
Diameter	60 m
Quantity	5 pieces

Scaffold	
Height	15m
Total Area	600 m²

O&M Training Participants: Engineers (1st Year Completed: 2017)

	Participants	EHHC	Power Station	Title
1	Mr. BADERELDINE Moustafa Esmat Ahmed	CEPC	Cairo North	Senior Engineer (GT Maintenance)
2	Mr. MOHAMED Ayman Ibrahem	CEPC	Cairo North	Senior Engineer (Turbine Maintenance)
3	Mr. ABDULRAHMAN abdelrahman Saad	CEPC	Cairo North	Senior Engineer (Turbine Maintenance)
4	Mr. AZERQ Ayman Saad	MDEPC	Nubaria	Supervisor (Operation Manager)
5	Mr. ELSAEIDY Ibrahim Ahmed Osman	MDEPC	Nubaria	Team Leader (Mech. Maintenance)
6	Mr. ABDELMAKSOUD Mohamed Hamdy Ibrahim	WDEPC	Sidi Krir	Head Engineer (Turbine Maintenance)
7	Mr. ABDELHAMID Tarek Mousafa	WDEPC	Sidi Krir	Shift Charge Engineer (Operation)
8	Mr. MOHAMEDAWAD Abdelmoneim Aliahmed	WDEPC	Sidi Krir	Head Engineer (Mech. Maintenance)
9	Mr. MEKHAIMER Mekhaimer Abozeid	UEEPC	Assuit	Maint. Engineer (Water Treat)
10	Mr. ORABY Mohamed Aboueleyoun Hassan	UEEPC	Assuit	Maint. Eng. (Boiler)

O&M Training Participants: Technicians (1st Year Completed: 2017)

	Participants	EHHC	Power Station	Title
1	Mr. MOHAMED Emad Abdelrehem	CEPC	Cairo North	Technician (Turbine Maintenance)
2	Mr. IBRAHIM Khtab Ragab	CEPC	Cairo North	Technician (Turbine Maintenance)
3	Mr. SHAHEN Mohamed Saaed	CEPC	Cairo North	Technician (Turbine Maintenance)
4	Mr. KALIFA Mohamed Helal	MDEPC	Nubaria	Chief (Turbine Maintenance)
5	Mr. ABDELHAFEZ Elshahat Abdalla	MDEPC	Nubaria	Mechanical Supervisor
6	Mr. ABDELAAL Omal Mohamedyoussef	WDEPC	Sidi Krir	Technical SV (Turbine Maintenance)
7	Mr. BASHA Ashraf Abdelaziz	WDEPC	Sidi Krir	Technical SV (Turbine Maintenance)
8	Mr. ELTAHAN Mohamed Abdallah	WDEPC	Sidi Krir	Technical SV (Turbine Maintenance)
9	Mr. ABDULATIF Amir Kamal	UEEPC	Kuriemat	SV (Turbine Maintenance)
10	Mr. ABDELAZIEM Samir Ayesh	UEEPC	Kuriemat	SV (Mech. Maintenance)
11	Mr.MOHMOUD Sayed Aly	UEEPC	Kuriemat	SV (Mech. Maintenance)

O&M Training in Japan: Training Program (1st Year Completed: 2017)

Engineers (from 25th Nov. to 23rd Dec., 2017)	Technicians (from 25th Nov. to 16th Dec., 2017)
■ **Develop Capacity of Instructors of TPP**	■ **Develop Capacity of Instructors of TPP**
✓ Introduction of the latest technology in TPP	✓ Introduction of the latest technology in TPP
✓ **Experience-based Safety Training**	✓ **Experiential Safety Training**
✓ Human Resource Development	✓ Welding Procedure Management
✓ **Quality Management**	✓ **Experiential Quality Training**
✓ Lesson Learned from Accidents	✓ Metal Material
✓ **Thermal Efficiency Management**	✓ Valve Maintenance skills and Overhauling Motors
✓ Basic Training of Vibration (Balancing)	✓ Maintenance Technique of Industrial Instruments
✓ **Non-Destructive Inspection**	✓ **Basics of Non-Destructive Inspection Skills**
✓ GT & High Temperature Parts / Maintenance of GTCC (inc. **Remaining Life Assessment**)	✓ Maintenance of High Temperature and High Pressure Piping
✓ Feed Water Treatment	✓ Prevention of Accidents and Disasters
✓ Site Visit on TPP and Manufacture's factory	✓ Site Visit on TPP and Manufacture's factory
■ **Conduct Trainings at each TPP by the Instructors**	■ **Conduct Trainings at each TPP by the Instructors**
✓ Job Report Presentation	✓ Job Report Presentation
✓ Methodology to Formulate Action Plan	✓ Methodology to Formulate Action Plan
✓ Presentation about Action Plan	✓ Presentation about Action Plan

O&M Training in Japan: Photos (1st Year Completed: 2017)

Engineers: Basic Training of Vibration (Balancing)

Technicians: Experiential Safety Training

Engineers: Presentation about Action Plan

Technicians: Basics of Non-Destructive Inspection Skills

Action Plan in Cairo North & West Delta (1st Year Completed: 2017)

【Cairo North (Engineers/Technicians)】

Overall Goal	Project Purpose	Outputs	Activities
Surrounding equipment is repaired efficiently.	Engineers and technicians have enough skills.	Internal training is organized.	✓ JICA-trained engineers transfer the training material and knowledge to other engineers & technicians ✓ Plant meeting room is used to convene every Thursday, some tea is offered.
	Maintenance is done in proper timing.	Communication between operation section and maintenance section is done smoothly.	✓ Organize Meeting in every Sunday morning. ✓ Keep "Daily Round Report".

【West Delta (Engineers/Technicians)】

Overall Goal	Project Purpose	Outputs	Activities
Maintenance is done efficiency	Employees do their duties as planned.	There is an institution to praise those who work hard.	✓ Provide an award competition to encourage those who work hard.
		Workers are skilled enough to know the importance of their duties.	✓ Organized TBT (Tool Box Talk) among colleagues to share experience. ✓ Provide training opportunities for workers

Action Plan in Middle Delta (1st Year Completed: 2017)

【Middle Delta (Engineers)】

Overall Goal	Project Purpose	Outputs	Activities
Surrounding equipment is repaired efficiently.	Spare parts are available to do maintenance.	Right maintenance plan is made and followed	✓ Improve maintenance planning skill. ✓ Organize training to brush up skills, in order to grasp current condition of the machines

【Middle Delta (Technicians)】

Overall Goal	Project Purpose	Outputs	Activities
Surrounding equipment is repaired efficiently.	Required maintenance is implemented in proper way.	Spare parts are purchased on time.	Prepare purchase order for required spare parts at specified intervals.
		Skilled human resource is enough.	Internal training is organized.

Action Plan in Upper Egypt (1st Year Completed: 2017)

【Upper Egypt (Engineers)】

Overall Goal	Project Purpose	Outputs	Activities
Surrounding equipment is repaired efficiently.	Spare parts are ready to use.	Spare parts are ordered on time.	✓ Make a plan early enough. ✓ Begin to process the paperwork and make purchase order according to the plan.
		There is efficient workshop.	✓ Organize training for engineers. ✓ Repair the old parts in workshop

【Upper Egypt (Technicians)】

Overall Goal	Project Purpose	Outputs	Activities
Surrounding equipment is repaired efficiently.	Required maintenance is implemented in proper way.	Monitoring tool is used for daily operation.	✓ Inspection sheet and time table are developed.
		Technicians have enough skills.	✓ Information and experience is exchanged among technicians at the weekly meeting. ✓ Training is provided to improve skills.

Activity Report on Action Plan (1st Year Completed: 2017)

Number of Trainees (Engineers : 10 , Technician : 11)

	Question	Cairo	MDEPC		WDEPC	UEEPC	
		Engineer(3)/ Technician(3)	Engineer(2)	Technician(2)	Engineer(3) /Technician(3)	Engineer(2)	Tech.(3)
General	Is training in Japan effective?	Yes	Yes		Yes	Yes	
	What kind of Action Plan is effective for improving O&M?	Need to develop programs to fill the gap between expected and actual.	Spare parts are available to do maintenance.		To be confirmed	Following action plan with sector head– trainees	
Training in Egypt	Implementation status of the training program	Implemented	Implemented		Implemented	Implemented	To be confirmed
	How many times a month?	2～3 times per month.	Every daily work permit.		Monthly	3 months	
	How many people have participated in training so far?	20 person	The number of people participating in the training is not specified.		All colleagues in the department	60 person	
	Feeling the effect of the training	Yes	Yes		Yes	Yes	

Targeted Scope of Capacity Building for O&M at TPPs

Training in Japan will focus on **maintenance knowledge and skill,** especially **mechanical field in GTCC**.

Operation Training: More Suitable Condition (especially advanced course)

- ✓ Collective training for **operators in shift team.**
- ✓ Using actual facilities or simulator which has **same specification** as current workplace.
- ✓ Learning operation knowledge and skill including **normal/urgent operation**.

➡ ***Manufacturer's support in the workplace seems more effective.***

Maintenance Training: More Suitable Condition

- ✓ Collective training for **engineers/technicians with equal competence**.
- ✓ Using main equipment which has **same type of power generation** as current workplace.
- ✓ Learning maintenance knowledge and skill including **updated trouble-shooting.**
- ✓ **Mechanical** preferable to electrical/C&I, considering foreseeable aging impact on O&M quality and cost in the near future.

➡ ***From utility's viewpoint, Kansai can contribute to EEHC more effectively.***

添付 6-3-10

第 2 回本邦研修員名簿(エンジニア)

第2回本邦研修研修員名簿(エンジニア)

エ国エンジニア		
1	Mr.OTHMAN Medhat Sayed Mahmoud	Head of Tech.Affairs Technical Affairs Sector for Production Companies Egyptian Electricity Holding Company (EEHC) / MOERE(2016)
2	Mr.NAKHLA Essam Attia Nagib	Director of Boiler Dept West Delta Electricity Productoin Co. (WDEPCo.) Egyptian Electricity Holding Company (EEHC) / MOERE(2016)
3	Mr.KAMAR Tamer Farouk Aly Hassan	Shift Charge Engineer West Delta Electricity Productoin Co. (WDEPCo.) Egyptian Electricity Holding Company (EEHC) / MOERE(2017)
4	Mr.TELEB Farag Elsayed Ibrahim	Shift Charge Engineer West Delta Electricity Productoin Co. (WDEPCo.) Egyptian Electricity Holding Company (EEHC) / MOERE(2012)
5	Mr.EMARA Ahmed Elsayed Azzazi	Gas Turbine Mec.Maint.Eng. New Talkha Compined Cycle Power Plant Middle Delta fElectricity Productoin /(EEHC) / MOERE(2005)
6	Mr.YOUNIS Ibrahim Mohamed Shabana	Lead Operation Eng. Operation Dept/New Talkha Comp.Cycle P.Plant Middle Delta Electricity Productoin /(EEHC) / MOERE(2010)
7	Mr.HASSAN Ahmed Hassan Farag	Operation Engineer Mech. Mainten./Upper Egypt Elrect.Produc.Co. Egyptian Electricity Holding Company (EEHC) / MOERE(2014)
8	Mr.FAYED Mohamed Korany Mohamed	Maintenance Manager Eng Mech. Mainten./Upper Egypt Elrect.Produc.Co. Egyptian Electricity Holding Company (EEHC) / MOERE(2014)
9	Mr.MOHAMED Ahmed Mohamed Abdelmohsen	Mechanical Maint.Eng.(2nd Eng.) HRSG(Heat Ecov.Steam Generation) Maint.Dept Upper Egypt Electricity Production Company / (EEHC)(2017)
10		

添付 6-3-11

第 2 回本邦研修行程(エンジニア)

第2回本邦研修行程(エンジニア)

日付	時間	研修項目	講師等	研修場所
2018/10/8(月)	－	来日		
2018/10/9(火)	10:00～11:30	ブリーフィング	澤井　亜也香	JICA関西
			松下　莉恵	
	11:30～12:15	プログラムオリエンテーション	大井　佳子	
	12:15～13:00	コースオリエンテーション	土井　祥宏	
	14:00～17:00	ジョブレポート発表会		
	18:00～19:30	日本語講習	一階　礼子	
2018/10/10(水)	9:00～12:00	関西電力概要／燃料	杉田　善幸	JICA関西
			大西　慎太郎	
	14:00～16:00	関西電力中央給電指令所／RMC見学＋K-vaCS紹介	阿達　孝之	関西電力
			中澤　忠廣	
	18:00～19:30	日本語講習	一階　礼子	JICA関西
2018/10/11(木)	9:00～12:00	アクションプラン作成指導	大井　佳子	JICA関西
	13:00～16:00	アクションプラン作成指導	田原　明子	
	18:00～19:30	日本語講習	一階　礼子	
2018/10/12(金)	9:00～12:00	アクションプラン作成指導	田原　明子	JICA関西
	13:00～16:00	GTCC概要、石炭概要	松岡　晃弘	
			毛利　友宙	
2018/10/13(土)	－	休日		
2018/10/14(日)	－	休日		
2018/10/15(月)	9:00～12:00	オリエンテーション	間森　毅	関西電力
			桜井　貞仁	
	13:00～16:00	品質管理、効率管理	高畑　智裕	
			平塚　進	
2018/10/16(火)	9:00～12:00	GTCC	小堺　瑛	関西電力
	13:00～16:00	ガスタービン	小堺　瑛	
2018/10/17(水)	9:00～12:00	蒸気タービン	小堺　瑛	関西電力
	13:00～16:00	HRSG	小堺　瑛	
2018/10/18(木)	13:00～17:00	石川島播磨重工業株式会社　工場視察	北川　和代	IHI相生工場
2018/10/19(金)	9:30～12:00	設備見学:姫路第二発電所	滝本　恵介	姫路第二発電所
	13:30～17:00	三菱日立パワーシステムズ株式会社　工場見学	吉竹　茂	MHPS高砂工場
2018/10/20(土)	－	休日		
2018/10/21(日)	－	休日		
2018/10/22(月)	9:30～12:00	設備見学:姫路第二発電所	滝本　恵介	姫路第二発電所
	14:00～16:30	設備見学:姫路第一発電所	大西　亮介	姫路第一発電所
2018/10/23(火)	9:00～12:00	高温部品	有野　剛史	関西電力
	13:00～16:00	給水処理、溶接管理	藤尾　真司	
			森下　敏行	

日付	時間	研修項目	講師等	研修場所
2018/10/24(水)	9:00～12:00	非破壊検査	森下　敏行	関西電力
	13:00～16:00	非破壊検査	森下　敏行	
2018/10/25(木)	9:00～12:00	非破壊検査	森下　敏行	関西電力
	13:00～16:00	非破壊検査	森下　敏行	
2018/10/26(金)	9:00～12:00	余寿命診断	有野　剛史	関西電力
	13:00～16:00	余寿命診断	有野　剛史	
2018/10/27(土)	－	休日		
2018/10/28(日)	－	休日		
2018/10/29(月)	9:00～10:30	人材育成	土井　祥宏	関西電力
	10:30～12:00	過去教訓	福満　和基	
	13:00～16:00	GTCC制御、ヒューマンエラー	宮原　文隆	
			福満　和基	
2018/10/30(火)	9:00～12:00	振動基礎技術	山根　透	関西電力
	13:00～16:00	振動基礎技術	山根　透	
2018/10/31(水)	9:00～12:00	振動基礎技術	山根　透	関西電力
	13:00～16:00	振動基礎技術	山根　透	
2018/11/1(木)	9:00～12:00	振動基礎技術	山根　透	関西電力
	13:00～16:00	振動基礎技術	山根　透	
2018/11/2(金)	9:00～12:00	振動基礎技術	山根　透	関西電力
	13:00～16:00	振動基礎技術	山根　透	
2018/11/3(土)	－	休日		
2018/11/4(日)	－	休日		
2018/11/5(月)	9:00～12:00	ポンプアライメント	千葉　裕之	関西電力
			井上　功	
	13:00～16:00	ポンプアライメント	千葉　裕之	
			井上　功	
2018/11/6(火)	9:00～12:00	安全体感	藤尾　真司	関西電力
	13:00～16:00	O&M、質の高いインフラ	土井　祥宏	
			北川　和代	
2018/11/7(水)	11:00～16:00	アクションプラン作成		JICA関西
2018/11/8(木)	9:00～16:00	アクションプラン作成		JICA関西
2018/11/9(金)	9:00～12:00	アクションプラン発表		JICA関西
	13:00～14:00	評価会		
	14:00～14:30	閉講式		
	14:30～15:30	反省会		
2018/11/10(土)		離日		

添付 6-3-12

第2回本邦研修員名簿(テクニシャン)

第2回本邦研修研修員名簿(テクニシャン)

エ国テクニシャン		
1	Mr.GABALA Mohamed Ibrahim Abdelaziz	Technical Supervisor West Delta Electricity Productoin Co. (WDEPCo.) Egyptian Electricity Holding Company (EEHC)/MOERE(2011)
2	Mr.ASHERY Mohamed Abdelmotaleb Mohamed Mansour	Technical Supervisor West Delta Electricity Productoin Co. (WDEPCo.) Egyptian Electricity Holding Company (EEHC)/MOERE(2013)
3	Mr.ALY Mohamed Moustafa Mohamed	Technical Supervisor West Delta Electricity Productoin Co. (WDEPCo.) Egyptian Electricity Holding Company (EEHC) /MOERE(2016)
4	Mr.MOUSA Ali Abouzeid Mousa Abouzeid	Gas Turbine Mec.Maint.Eng. New Talkha Compined Cycle Power Middle Delta Electricity Productoin /(EEHC)/MOERE(2003)
5	Mr.BAYOUMI Ali Ghanem Ali	Comb.Cycl.Oper.Techn. New Talkha Compined Cycle Power Plant Middle Delta Electricity Productoin /(EEHC)/MOERE(2007)
6	Mr.SALEH Khaled Sayed Mohamed	Mechanic. Maint.Supervisor Mech. Mainten./Upper Egypt Elrect.Produc.Co. Egyptian Electricity Holding Company (EEHC)/MOERE(2014)
7	Mr.TAHA Walid Mohamed Mahmoud Mohamed	Operation Technician Operation Dept./Upper Egypt Elrect.Produc.Co. Egyptian Electricity Holding Company (EEHC)/MOERE(2016)
8	Mr.AWWAD Hassan Awwad Hassan	Operation Technician Operation Dept/Shobra El-khima Power Plant Cairo Elect.Produc.Co.(CRPC)/ (EEHC)/MOERE(2015)
9	Mr.FARAG Mahmoud Aly Abdellatif	Operation Technician Operation Dept/Shobra el-khima Power Plant Cairo Elect.Produc.Co.(CEPC)/ (EEHC)/MOERE(2015)
10	Mr.ELSAYYAD Amr Mohamed Hamdy Abdelazim	Technician Mech. Mainten./Giza North Station Cairo Elect.Produc.Co.(CEPC)/ (EEHC)/MOERE(2018)

添付 6-3-13

第 2 回本邦研修行程(テクニシャン)

第2回本邦研修行程(テクニシャン)

日付	時間	研修項目	講師等	研修場所
2018/10/8(月)		来日		
2018/10/9(火)	9:00～10:00	必要事項確認	藤井　健雄	JICA関西
	10:00～11:30	ブリーフィング		
	11:30～12:15	プログラムオリエンテーション		
	12:15～13:00	コースオリエンテーション	土井　祥宏	
	14:00～17:00	ジョブレポート発表会		
	18:00～19:30	日本語講習	速水　はるみ	
2018/10/10(水)	9:00～12:00	関西電力概要／燃料	杉田　義幸	JICA関西
			大西　慎太郎	
	14:00～16:00	関西電力中央給電指令所見学	阿達　孝之	関西電力
			中澤　忠廣	
	18:00～19:30	日本語講習	速水　はるみ	JICA関西
2018/10/11(木)	9:00～12:00	アクションプラン作成指導	大井　佳子	JICA関西
	13:00～16:00	アクションプラン作成指導	大井　佳子	
	18:00～19:30	日本語講習	速水　はるみ	
2018/10/12(金)	9:00～10:30	アクションプラン作成指導	大井　佳子	JICA関西
	13:00～16:00	GTCC概要／石炭概要	松岡　晃弘	
			毛利　友宙	
2018/10/13(土)	－	休日		
2018/10/14(日)	－	休日		
2018/10/15(月)	9:00～11:00	オリエンテーション	浄聖　重巳	関電プラント
	11:00～14:00	GT、ST、HRSG概要／構造	山田　浩次	
	14:00～16:00	品質体感訓練	芦田　雅士	
2018/10/16(火)	9:00～12:00	金属材料取扱い	山田　浩次	関電プラント
	13:00～14:00	溶接施工基礎	真鍋　紀明	
	14:00～16:30	溶接施工・実習	真鍋　紀明	
2018/10/17(水)	9:00～11:00	ポンプ分解点検・講義	山田　浩次	関電プラント
	11:00～12:00	ポンプ分解点検・実習	山田　浩次	
	13:00～16:30	ポンプ分解点検・実習	山田　浩次	
2018/10/18(木)	13:00～17:00	石川島播磨重工業株式会社相生工場視察	北川　和代	IHI相生工場
2018/10/19(金)	9:30～12:00	関西電力姫路第二発電所	滝本　恵介	姫路第二発電所
	13:30～17:00	三菱日立パワーシステムズ　高砂工場視察	吉竹　茂	MHPS高砂工場
2018/10/20(土)	－	休日		
2018/10/21(日)	－	休日		
2018/10/22(月)	9:00～12:00	高温高圧配管の保守	山田　浩次	関電プラント
	13:00～13:20	労働安全	向井　工	
	13:30～16:30	安全体感訓練	向井　工	
2018/10/23(火)	9:00～12:00	非破壊の種類と特徴	山田　浩次	関電プラント
	13:00～16:30	非破壊検査・実習	山田　浩次	
	9:00～11:00	事故災害未然防止	芦田　雅士	

日付	時間	研修項目	講師等	研修場所
2018/10/24(水)	11:00～12:00	GT、ST、HRSG概要／構造	山田　浩次	関電プラント
	13:00～16:00	GT、ST、HRSG概要／構造	山田　浩次	
2018/10/25(木)	9:00～12:00	アクションプラン作成		JICA関西
	13:00～16:00	アクションプラン作成		
2018/10/26(金)	9:00～12:00	アクションプラン発表		JICA関西
	13:00～14:00	評価会		
	14:00～14:30	閉講式		
	14:30～15:30	反省会		
2018/10/27(土)	－	離日		

添付 6-3-14

第2回本邦研修アクションプラン(エンジニア)

■**Detailed Plan of OJT for Objective 1: To Improve Skills of Engineers through On the Job Training (OJT)**

NO.	Training Subject	Purpose	Training Item		Effect	Important Points	Trainer	Where	How	Tools	Achievements		2018			2019										Remarks
													OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	
1	Service Life Diagnosis	(1) To understand the outline of Service Life Evaluation (2) To understand the various type of deterioration events of Thermal Power plant (3) To understand the evaluation methods and their process (4) To understand important check points for evaluation	1-1	Purpose of Service Life Evaluation	(1)/(2)	- Why Service Life Evaluation is important	JICA-trained participant	TPP	Lecture	- Textbook (provided by JICA) - O&M Manual (provided by manufacturers)	Plan	No. of times			1											
												No. of participants			5											
											Result	No. of times														
												No. of participants														
			1-2	Main Deterioration Events and their Mechanism of Deterioration	(2)	- What are the main damage factors - How each damage factor causes what kind of damage on where.	JICA-trained participant	TPP	Lecture	- Textbook (provided by JICA) - O&M Manual (provided by manufacturers)	Plan	No. of times			1											
												No. of participants			5											
											Result	No. of times														
												No. of participants														
			1-3	Service Life Diagnosis Methods	(2)/(3)	- Where & how to check the damage, according to the kinds of damage	JICA-trained participant	TPP	Lecture	- Textbook (provided by JICA) - Manual (provided by manufacturers)	Plan	No. of times			1											
												No. of participants			5											
											Result	No. of times														
												No. of participants														
2	Vibration	(1) To understand the mechanism of vibration (2) To understand the important checking points.	2-1	Basics of Vibration	(1)	- How vibrations occur.	JICA-trained participant	TPP	Lecture	- Textbook (provided by JICA)	Plan	No. of times				1										
												No. of participants				5										
											Result	No. of times														
												No. of participants														
			2-2	Analysis of Vibration	(1)/(2)	- How to read and follow up the vibration trend and take action.	JICA-trained participant	TPP	Practical training	- Textbook (provided by JICA)	Plan	No. of times				1										
												No. of participants				5										
											Result	No. of times														
												No. of participants														
3	HRSG Problems	(1)FAC phenomena & Main causes. (2)How to prevent FAC (3)How to fix FAC damages	3-1	Basic of flow accelerated corrosion(FAC)	(1)	- How FAC occurs	JICA-trained participant	TPP	Lecture	- Textbook (provided by JICA)	Plan	No. of times					1									
												No. of participants					5									
											Result	No. of times														
												No. of participants														
			3-2	Factors affect FAC	(2)	- How to prevent FAC	JICA-trained participant	TPP	Lecture	- Textbook (provided by JICA) -Damage pipes due to FAC	Plan	No. of times					1									
												No. of participants					5									
											Result	No. of times														
												No. of participants														
			3-3	Repair methods	(3)	- How to repair the damage	JICA-trained participant	TPP	Practical training	- Textbook (provided by JICA)	Plan	No. of times					1									
												No. of participants					5									
											Result	No. of times														
												No. of participants														

■**Detailed Plan of OJT for Objective 1: To Improve Skills of Engineers through On the Job Training (OJT)**

NO.	Training Subject	Purpose	Training Item		Effect	Important Points	Trainer	Where	How	Tools	Achievements		2018			2019										Remarks
													OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	
4	Operation troubleshooting	(1)To protect TPP equipment.	4-1	Training operation staff to safe equipment during startup in normal and emergency shutdown	(1)	start&stop equipment according to manufacture procedure safe shutdown during trips	JICA-trained participant	TPP	Lecture	- Manual (provided by manufacturers)	Plan	No. of times						1							
												No. of participants						5							
											Result	No. of times													
												No. of participants													
5	Industrial Safety	To improve safety at work	1	Support other engineers to organize safety training	1	- wearing a safety belt and experiencing a suspended load - experience of climbing up and down stepladder - experience of lifting & transport heavy loads - experience of impact of falling object on helmet - experience of getting caught in rotating objects - experience of risk of electrical shock	JICA-trained participant	TPP	Lecture	- Textbook (provided by JICA)	Plan	No. of times						1							
												No. of participants						5							
											Result	No. of times													
												No. of participants													

■**Activities for the Objective2: To make sure the OJT for technicians is organized smoothly**

NO.	Activities	Purpose	Detailed Actions		Important Points	Who to lead	Where	How	tools	Achievements		2018			2019										Remarks
												OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	
1	Support technicians	Support technicians to apply their action plan	1	supply them by data,tools and organize work to give them some time to apply their action plan.	follow up and motivate them	JICA-trained technicians	TPP	support	- Textbook (provided by JICA)	Plan	No. of times							1							
											No. of participants							10							
										Result	No. of times														
											No. of participants														

■**Activities for the Objective 3: Prevention of Human Errors**

NO.	Activities	Purpose		Detailed Actions	Important Points	Who to lead	Where	How	tools	Achievements		2018			2019									Remarks
												OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	
1	Prevention of Human Errors	To prevent Human Errors	3-1	learning & discussion human factors to reduce human errors	-limitation of human senses	JICA-trained technicians	TPP	Lecture	- Textbook (provided by JICA)	Plan	No. of times								1					
											No. of participants								5					
										Result	No. of times													
											No. of participants													
			3-2	learning & discussion about negative effect of human errors on TPP	-increase awareness on importance of human life -Reducing of economic loss.	JICA-trained technicians	TPP	Lecture	- Textbook (provided by JICA)	Plan	No. of times								1					
											No. of participants								5					
										Result	No. of times													
											No. of participants													
			3-3	Reduce influence of human errors	-creative methods to reduce human errors	JICA-trained technicians	TPP	Practical training	- Textbook (provided by JICA)	Plan	No. of times								1					
											No. of participants								5					
										Result	No. of times													
											No. of participants													

■**Detailed Action Plan for Objective 4: To Improve the Key Performance Index (KPI) for employees & equipment**

NO.	Activities	Purpose	Detailed Actions		Important Points	Who to lead	Where	How	tools	Achievements		2018			2019									Remarks
												OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	
1	Human Resource Development	To improve the skills of employees	1-1	- Operation, Maintenance, Water Treatment and Technical Affairs of power plant '- Weekly test	Basic informations	Technical affairs department in TPP under supervision of Head of Technical Affairs Sector for Production Companies (JICA-trained participant)	TPP	Lecture	- Textbook (provided by JICA) - O&M Manual (provided by manufacturers) - Past experience of TPP engineers	Plan	No. of times				1									
			1-2	- Training in the field. '- Simulator training. '- Solving problems.	things learned in('1-1)			Practical training			No. of participants				5									
			1-3	- Visits to other power plants in the same company and in other companies. '- Visit to National Energy Dispatch Center.	to see another types of TPP How is the work in National Energy Dispatch Center			Observation		Result	No. of times													
											No. of participants													
2	Implementation of Preventive Maintenance with Fault Tree Analysis	To improve the Key Performance Index (KPI) of GT/ST/HRSG	2-1	Make FTA charts for some typical faults/troubles.	equipment, data and systems affected due to troubles	Maintenance engineers and Technical affairs engineers at TPP with the help and support of Head of Technical Affairs Sector for Production Companies (JICA-trained participant)	TPP	Lecture and Practical training	- Monitoring indicator is number of FTA charts newly made after this training. - Please confirm the number in the monthly meeting																
			2-2	Refer the FTA charts every time when faults/troubles occur in order to analyze the causes.																				
			2-3	Make additional FTA chart every time when special troubles occur and accumulate FTA charts.																				

■**Detailed Action Plan for Objective 4: To Improve the Key Performance Index (KPI) for employees & equipment**

NO.	Activities	Purpose	Detailed Actions		Important Points	Who to lead	Where	How	tools	Achievements	2018			2019									Remarks
											OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	
3	Implementation of Heat Efficiency Management by analyzing data	To improve the Key Performance Index (KPI) of GT/ST/HRSG	3-1	Determine the standard value of heat efficiency of boiler/turbine/condenser	- Standard values need to be determined on the fixed load.	Technical affairs engineers and Operation engineers at TPP with the help and support of Head of Technical Affairs Sector for Production Companies (JICA-trained participant)	TPP	Lecture and Practical training	- Please confirm whether the process of 3-2 to 3-4 is properly implemented at each TPP in the monthly meeting - If not properly implemented, please advise the Tipp's responsible organization.														
			3-2	Collect the data of heat efficiency.	Load - energy - fuel - operating hours - ……																		
			3-3	Analyze the data to see if there are any deviations.	See if any notable deviations between standard values and actual values.																		
			3-4	Find out the causes	- To reduce or prevent the repeat of such an action																		
			3-5	Feed back with new values	fuel - air - …																		
			3-6	Continue to implement from 3-2 to 3-4 once a month.	- To adjust the Performance of TPP																		
4	Implementation of Sustainable Management Cycle	To improve the Key Performance Index (KPI) of GT/ST/HRSG	4-1	Record the events of failures/troubles each time.	- When, what, why it happened and how to repair - Condition (data logging) - Heat rate/Fuel consumption rate	Maintenance engineers and Technical affairs engineers at TPP with the help and support of Head of Technical Affairs Sector for Production Companies (JICA-trained participant)	TPP	Lecture and Practical training	- Please confirm whether the process of 4-1 to 4-3 is properly implemented at each TPP in the monthly meeting - If not properly implemented, please advise the TPP's responsible organization.														
			4-2	Analyze the records periodically	- Whether the same equipment failed - See if there are some tendency towards failure. - Whether the Heat rate getting worse.																		
			4-3	Identify the Root Causes and solve them	- To reduce or prevent the repeat of such an action																		
			4-4	Make the whole process (4-1 to 4-3) routine and official.	- Activities should be repeatable by being incorporated in the organizational structure.																		

Action Plan

Capacity Building & Strengthening of Thermal Power Generation Operation & Maintenance (Engineers)

Action Plan

Plants & Participants

Name of the Plant	Names of the Participants
EEHC	Medhat Othman
Giza North	Ahmed Hassan
Sidi krir	Essam Attia
	Farag ELsayed
	Tamer Farouk
Talkha	Ibrahim Mohamed
	Ahmed Azazy
Elkorimat	Mohamed Korny
	Ahmed Mohamed

Background: Current Situation at the TPP

- Shortage in spare parts
- Shortage in training
- Low efficiency of some power plants due to:
  - Degradation of some power plants.
  - Bad locations of some power plants.
- Poor connection between technical office and O&M departments in the power plants.
- Most of power plants working using fossil fuel.
- Weak of safety rules implementation.

What we have learned in Japan

useful skills/practice/ideas/knowledge we have acquired in Japan

1. Human Error Reduction
2. Different types of TPP
3. New Method For Alignment
4. Non Destructive Tests
5. Methods Of Blades & Harps Manufacturing
6. Importance Of Human Resource Development
7. Follow Safety Instructions

Overview of the Action Plan

Overall goal	Human Resource for effective O&M is developed at TPP.
Project Purpose	Engineers at TPP improve their skills and knowledge on effective O&M
Objective 1	To Improve Skills of Engineers through On the Job Training (OJT)
Objective 2	To make sure the OJT for technicians is organized smoothly
Objective 3	Prevention of Human Errors
Objective 4	To Improve the Key Performance Index (KPI) of GT/ST/HRSG

Overview of the Action Plan

Financial Source	Budget of each TPP
Section responsible for supervision	JICA-trained participant
Section / Person responsible for implementation	JICA-trained O&M Section
Participants of OJT	Engineers
Risk /Possible Obstacles	Need co-operation taking action

Detailed Plan of OJT for Objective 1

To improve Skills of Engineers through On-the-Job Training (OJT)

Training Subject 1: Service Life Diagnosis

Purpose:

- To understand the outline of Service Life Evaluation
- To understand the various type of deterioration events of Thermal Power
- To understand the evaluation methods and their process
- To understand important check points for evaluation

Training Items:

- Purpose of Service Life Evaluation
- Main Deterioration Events and their Mechanism of Deterioration
- Service Life Diagnosis Methods

Detailed Plan of OJT for Objective 1

Important Points:

- Why Service Life Evaluation is important.
- What are the main damage factors.
- How each damage factor causes what kind of damage on where.
- Where & how to check the damage, according to the kinds of damage.

Detailed Plan of OJT for Objective 1

To improve Skills of Engineers through On-the-Job Training (OJT)

Training Subject 2: Vibration

Purpose:

- To understand the mechanism of vibration
- To understand the important checking points.

Training Items:

- Basics of Vibration
- Analysis of Vibration

Important Points:

- How vibrations occur.
- How to read and follow up the vibration trend and take action.

Detailed Plan of OJT for Objective 1

To improve Skills of Engineers through On-the-Job Training (OJT)

Training Subject 3: HRSG Problems

Purpose:

- FAC phenomena & Main causes.
- How to prevent FAC
- How to fix FAC damages.

Training Items:

- Basic of flow accelerated corrosion(FAC)
- Factors affect FAC
- Repair methods

Important Points:

- How FAC occurs
- How to prevent FAC
- How to repair the damage

Detailed Plan of OJT for Objective 1

To improve Skills of Engineers through On-the-Job Training (OJT)

Training Subject 4: Operation troubleshooting

Purpose:

- To protect TPP equipment.

Training Items:

- Training operation staff to safe equipment during .startup in normal and emergency shutdown.

Important Points:

- start & stop equipment according to manufacture procedure.
- safe shutdown during trips.

Detailed Plan of OJT for Objective 1

To improve Skills of Engineers through On-the-Job Training (OJT)

Training Subject 5: Industrial Safety

Purpose:

- To improve safety at work

Training Items:

- Support engineers to organize safety training

Important Points:

- wearing a safety belt and experiencing a suspended load
- experience of climbing up and down stepladder
- experience of lifting & transport heavy loads
- experience of impact of falling object on helmet
- experience of getting caught in rotating objects
- experience of risk of electrical shock

Detailed Plan of OJT for Objective 2

To make sure the OJT for technicians is organized smoothly

Training Subject 1: Support technicians

Purpose:

- Support technicians to apply their action plan

Training Items:

- supply them by data, tools and organize work to give them some time to apply their action plan.

Important Points:

- follow up and motivate them

Detailed Plan of OJT for Objective 3

Prevention of Human Errors

Training Subject 1: Prevention of Human Errors

Purpose:

- To prevent Human Errors

Training Items:

- learning & discussion human factors to reduce human errors
- learning & discussion about negative effect of human errors on TPP
- Reduce influence of human errors

Important Points:

- limitation of human senses
- increase awareness on importance of human life
- Reducing of economic loss.
- creative methods to reduce human errors

Detailed Plan of OJT for Objective 4

To Improve the Key Performance Index (KPI) for employees & equipments

Training Subject 1: Human Resource Development

Purpose:

- To improve the skills of employees

Training Items:

- Operation, Maintenance, Water Treatment and Technical Affairs of power plant
- Weekly test
- Training in the field.
- Simulator training.
- Solving problems.
- Visits to other power plants in the same company and in other companies.
- Visit to National Energy Dispatch Center.

Detailed Plan of OJT for Objective 4

Important Points:

- Basic informations
- things learned
- to see another types of TPP
- to see How is the work in National Energy Dispatch Center

Detailed Plan of OJT for Objective 4

To Improve the Key Performance Index (KPI) for employees & equipments

Training Subject 2: Implementation of Preventive Maintenance with Fault Tree Analysis

Purpose:

- To improve the Key Performance Index (KPI) of GT/ST/HRSG

Training Items:

- Make FTA charts for some typical faults/troubles.
- Refer the FTA charts every time when faults/troubles occur in order to analyze the causes.
- Make additional FTA chart every time when special troubles occur and accumulate FTA charts.

Important Points:

- equipments, data and systems affected due to troubles

Detailed Plan of OJT for Objective 4

To Improve the Key Performance Index (KPI) for employees & equipments

Training Subject 3: Implementation of Heat Efficiency Management by analyzing data

Purpose:

- To improve the Key Performance Index (KPI) of GT/ST/HRSG

Training Items:

- Determine the standard value of heat efficiency of boiler/turbine/condenser
- Collect the data of heat efficiency
- Analyze the data to see if there are any deviations.
- Find out the causes
- Feed back with new values
- Continue to implement from Collecting data to Find out the causes once a month

Detailed Plan of OJT for Objective 4

Important Points:

- Standard values need to be determined on the fixed load.
- Load - energy - fuel - operating hours - ……
- See if any notable deviations between standard values and actual values.
- To reduce or prevent the repeat of such an action
- fuel - air - …
- To adjust the Performance of TPP

Detailed Plan of OJT for Objective 4

To Improve the Key Performance Index (KPI) for employees & equipments

Training Subject 4: Implementation of Sustainable Management Cycle

Purpose:

- To improve the Key Performance Index (KPI) of GT/ST/HRSG

Training Items:

- Record the events of failures/troubles each time.
- Analyze the records periodically
- Identify the Root Causes and solve them
- Make the whole process from first point to third point routine and official.

Detailed Plan of OJT for Objective 4

Important Points:

- When, what, why it happened and how to repair
- Condition (data logging)
- Heat rate/Fuel consumption rate
- Whether the same equipment failed
- See if there are some tendency towards failure.
- Whether the Heat rate getting worse.
- To reduce or prevent the repeat of such an action.
- Activities should be repeatable by being incorporated in the organizational structure.

添付 6-3-15

第 2 回現地業務行程

第2回現地業務行程

日付	時間	訪問先・業務等	カウンターパート	宿泊
2019/6/22(土)	23:45～04:50	移動 (KIX―DXB)	－	機内泊
2019/6/23(日)	08:15～10:05	移動 (DXB – CAI)	－	Cairo
2019/6/24(月)	11:00～12:00	【訪問先】JICA Egypt Office 【業務】JICAメンバーとのミーティング	JICA	Cairo
2019/6/25(火)	11:00～14:00	【訪問先】WDEPC Office 【業務】プロジェクト概要説明・情報収集・本邦研修参加者との面談	WDEPC (Alexandria)	Cairo
2019/6/26(水)	11:00～14:00	【訪問先】MDEPC Office 【業務】プロジェクト概要説明・情報収集・本邦研修参加者との面談	MDEPC (Talkha)	Cairo
2019/6/27(木)	11:00～14:00	【訪問先】UEEPC ffice 【業務】プロジェクト概要説明・情報収集・本邦研修参加者との面談	UEEPC (Kuriemat)	Cairo
2019/6/28(金)	終日	Document Preparation	－	Cairo
2019/6/29(土)	終日	Document Preparation	－	Cairo
2019/6/30(日)	終日	Document Preparation	－	Cairo
2019/7/1(月)	10:00～13:00	【訪問先】CEPC Office 【業務】プロジェクト概要説明・情報収集・本邦研修参加者との面談	CEPC (Cairo)	Cairo
2019/7/2(火)	14:00～15:00	【訪問先】JICA Egypt Office 【業務】Wrap upミーティングにかかる事前打合せ	－	Cairo
2019/7/3(水)	10:00～12:00	【訪問先】EEHC Office 【業務】Wrap upミーティング、MoM作成・署名	EEHC (Cairo)	機内泊
	18:40～0:25	移動 (CAI－DXB)	－	
2019/7/4(木)	3:40～17:50	移動 (DXB－KIX)	－	－

添付 6-3-16

Action Plan ヒアリング参加状況(第 2 次現地調査)

Action Planヒアリング参加状況(第2次現地調査)

	研修	氏名	担当分野	職位	出欠
CEPC	1st	Mr.BADERELDINE Moustafa Esmat Ahmed	Gas Turbine Maintenance	Engineer	✓
	1st	Mr.IBRAHEM Ayman Ibrahem Mohamed	Turbine Maintenance	Engineer	✓
	1st	Mr.MEWAFY Abdelrahman Saad Abdelrahman	Turbine Maintenance	Engineer	Due to another business
	1st	Mr.MOHAMED Emad Abdelrahim Rashidy	Turbine Maintenance	Technician	✓
	1st	Mr.IBRAHEM Khtab Ragab	Turbine Maintenance	Technician	Due to another business
	1st	Mr.SHAHIN Mohamed Said Elsayed	Turbine Maintenance	Technician	✓
	2nd	Mr.HASSAN Ahmed Hassan Farag	Operation Engineer	Engineer	✓
	2nd	Mr.AWWAD Hassan Awwad Hassan	Operation Technician	Technician	✓
	2nd	Mr.FARAG Mahmoud Aly Abdellatif	Operation Technician	Technician	✓
	2nd	Mr.ELSAYYAD Amr Mohamed Hamdy Abdelazim	Technician	Technician	✓
MDEPC	1st	Mr.SAAD Ayman Saad Azer	Operation Management.	Engineer	✓
	1st	Mr.ELSAEIDY Ibrahim Ahmed Osman	Mechanical Maintenance	Engineer	✓
	1st	Mr.KALIFA Mohamed Helal	Turbine Maintenance	Technician	✓
	1st	Mr.ABDELHAFEZ Elshahat Abdalla	Mechanical	Technician	✓
	2nd	Mr.EMARA Ahmed Elsayed Azzazi	Gas Turbine Mec.Maint.Eng.	Engineer	✓
	2nd	Mr.YOUNIS Ibrahim Mohamed Shabana	Lead Operation Eng.	Engineer	✓
	2nd	Mr.MOUSA Ali Abouzeid Mousa Abouzeid	Gas Turbine Mec.Maint.Eng.	Technician	✓
	2nd	Mr.BAYOUMI Ali Ghanem Ali	Comb.Cycl.Oper.Techn.	Technician	✓
WDEPC	1st	Mr.ELSHEKH Mohamed Hamdy Ibrahim Abdelmak	Turbine Maintenance	Engineer	Due to another business
	1st	Mr.ABDELHAMID Tarek Moustafa Mohamed	Operation Dept.	Engineer	Due to job change
	1st	Mr.AWAD Abdelmoneim Ali Ahmed Mohamed	Mechanical Maintenance	Engineer	✓
	1st	Mr.ABDELAAL Omar Mohamedyoussef	Turbine Maintenance	Technician	✓
	1st	Mr.BASHA Ashraf Abdelaziz	Turbine Maintenance	Technician	✓
	1st	Mr.ELTAHAN Mohamed Abdallah	Turbine Maintenance	Technician	✓
	2nd	Mr.NAKHLA Essam Attia Nagib	Director of Boiler Dept	Engineer	✓
	2nd	Mr.KAMAR Tamer Farouk Aly Hassan	Shift Charge Engineer	Engineer	✓
	2nd	Mr.TELEB Farag Elsayed Ibrahim	Shift Charge Engineer	Engineer	✓
	2nd	Mr.GABALA Mohamed Ibrahim Abdelaziz	Technical Supervisor	Technician	✓
	2nd	Mr.ASHERY Mohamed Abdelmotaleb Mohamed Mansour	Technical Supervisor	Technician	✓
	2nd	Mr.ALY Mohamed Moustafa Mohamed	Technical Supervisor	Technician	✓

	研修	氏名	担当分野	職位	出欠
UEEPC	1st	Mr.KAOUD Mekhaimer Abozeid Mekhaimer	Maint.Dept.of Water Treat.	Engineer	Due to another business
	1st	Mr.TAWFIK Mohamed Aboueleyoun Hassan Oraby	Maint.Dept.of Boiler	Engineer	Due to another business
	1st	Mr.ABBAS Amir Kamal Abdellatif	Turbine Maintenance	Technician	Due to another business
	1st	Mr.ELIAN Samir Ayesh Abdelazim	Mechanical Maintenance	Technician	✓
	1st	Mr.MOHAMED Sayed Ali Mahmoud	Mechanical Maintenance	Technician	✓
	2nd	Mr.FAYED Mohamed Korany Mohamed	Maintenance Manager Eng	Engineer	✓
	2nd	Mr.MOHAMED Ahmed Mohamed Abdelmohsen	Mechanical Maint.Eng.	Engineer	✓
	2nd	Mr.SALEH Khaled Sayed Mohamed	Mechanic. Maint.Supervisor	Technician	✓
	2nd	Mr.TAHA Walid Mohamed Mahmoud Mohamed	Operation Technician	Technician	✓

添付 6-3-17

第 2 回現地業務ラップアップミーティング議事録

Minutes of Meeting
for
The Second Wrap-Up Meeting
on
The Project for Capacity Building & Strengthening of Thermal Power Generation Operation & Maintenance
between
Japan International Cooperation Agency
and
The Government Of Arab Republic Of Egypt

Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the follow-up mission (hereinafter referred to as "the Mission") for "The Project for Capacity Building & Strengthening of Thermal Power Generation Operation & Maintenance" (hereinafter referred to as "the Project") to discuss the detail of the Project with the officials of Egyptian Electricity Holding Company (hereinafter referred to as "EEHC") for the effective and successful implementation.

The JICA Mission and the officials of EEHC hereby confirmed the result of discussions in the wrap up meeting (hereinafter referred to as "the Meeting") on 3rd July 2019, at EEHC Head Office, chaired by Eng. Gaber Desouki Moustafa, the chairman of EEHC.

As a result of discussions in the Meeting, the Japanese side and Egyptian side have confirmed the main items described in the Annex.

Cairo, 3rd July 2019

Hiroki Hirahata

Mr. Hiroki Hirahata
JICA Expert / Chief Advisor

Gaber

Eng. Gaber Desouki Moustafa
Chairman
Egyptian Electricity Holding Company

ANNEX

1. Progress of the Project

The JICA Expert Team has explained the scope of works, the work flowchart, overall schedule and the progress made after the first wrap-up meeting including the second training courses in Japan implemented from November to December 2018. The JICA Expert Team requested further support from the Egyptian side for the implementation and monitoring of Action Plans by JICA-trained engineers & technicians, even after finishing the Project.
The Egyptian side acknowledged the contents of the explanation and agreed to meet the request from the JICA Expert Team.

2. Results of the Mission

(1) Outline of the Mission

The JICA Expert Team implemented the Mission on Egypt from 25th June to 3rd July 2019, to achieve the below purposes;

- ✓ Reviewing the activities that JICA-trained engineers & technicians disseminated their knowledge and skills obtained to the training course to other colleagues at thermal power plants (hereinafter referred to as "TPPs"),
- ✓ Discussing current situation for further improvement of O&M at TPP as the next action.

The JICA Expert Team made presentation about each topic based on Attachment 2.

(2) Result of the review of Action Plan Implementation

The JICA Expert Team explained the result of review of Action Plan implementation as follows. Egyptian side confirmed the contents.

(Actual Conditions)

- ✓ JICA-trained engineers & technicians implemented their Action Plan almost as previously arranged, and a series of their dissemination activities can help to improve the Operation and Maintenance (hereinafter referred to as "O&M") capacity at TPPs.
- ✓ They disseminated their knowledge and skills to their colleagues by mainly utilizing training materials provided by JICA Expert Team, on small unit basis, from a practical viewpoint.
- ✓ Operation team and maintenance team started to communicate with each other after the training program in Japan, and it helped them to enhance their knowledge and skills of operation and maintenance.
- ✓ Technicians started training for safety, and the effect is that they were able to complete two overhaul works without any accidents and injuries.
- ✓ Engineers applied the useful knowledge acquired in Japan to actual

work, such as Operation troubleshooting, Human Error Reduction and Non Destructive Tests

- ✓ Despite of hard tasks during major overhaul, some of them made the most of the limited opportunities of disseminating their knowledge; vibration analysis and HRSG (Heat Recovery Steam Generator) maintenance were especially useful and effective to them because these contents could meet their O&M needs directly.
- ✓ On the other hand, their various duties in each workplace often seem to restrict them to implement the action plan.
- ✓ For some action plan item, technicians need more training equipment such as welding, large size valves.

(Suggestion from JICA Expert Team)

- ✓ JICA Expert Team would like to request Egyptian side for the further understanding and continuous support for Action Plan implemented by JICA-trained engineers & technicians, even after the Project.
  - ➢ Coordinating Engineers/Technicians work to implement their Action Plan as planned.
  - ➢ Preparing necessary equipment and materials for Action Plan implementation.

(3) Result of the discussion for further improvement of O&M

The JICA Expert Team explained the result of discussion of current situation for further improvement of O&M at TPPs as follows. Egyptian side took note of it.

- ✓ The JICA Expert Team comprehensively analyzed the O&M issues of TPPs in Egypt and identified the countermeasures (not limited to Action Plan).
- ✓ As for the O&M issues that JICA-trained engineers and technicians can deal with, almost all of the countermeasures are covered with O&M training course in Japan and their Action Plan.
- ✓ On the other hand, through discussion with management/ JICA-trained engineers and technicians, there are other O&M issues to be involved by management.
- ✓ Management are expected to take the following countermeasures:
  - ➢ Sharing information on technical failures/troubles and labor accident with not only management, but also engineers and technicians.
  - ➢ Adopting evaluation system based on technical knowledge and skills for engineers and technicians, not only depending on the length of work.

3. Conclusion

Based on the implementation of the capacity building project for O&M at TPPs for around 2 years, the JICA Expert Team concluded that the Project is practical and effective to improve O&M capacity, and suggested that Egyptian side to implement the following contents for further improvement of O&M at TPPs.

- ✓ Practice makes perfect,
- ✓ Self-disciplined learner,
- ✓ Insatiable challenge.

A.J.

Attachment 1 Attendance List in the Wrap-Up Meeting
Attachment 2 Presentation Materials
Attachment 3 Minutes of Meetings during the Mission

Capacity Building for Operation & Maintenance of Thermal Power Plant
in Arab Republic of Egypt

Wrap-up Meeting Attendance List

Date: 3rd / July / 2019

Time: 10 : 10 - 11 : 30

Place: EEHC Office

No.	Name	Position	Company	Signature
1	Medhat Othman	Head of tech. and Sector	E.E.H.C	
2	Akram Ibrahim Aly	G.M. investment & Tech	EEHC	
3	Hend Mohamed Mahmoud	G.M. Performance Surv.	EEHC	Hend Mohamed
4	Mayada Magdy	Chief Prog. Officer	JICA	M. Magdy
5	Hikaru TAKAHASHI	Representative	JICA	
6	Satoko KIMURA	Energy Advisor	JICA	
7	Hiroki Hachiya	General Manager	KANSAI	
8	Yuki Obe	C&I Eng.	KANSAI	
9	Haruaki Furukawa	Elec. Eng	KANSAI	
10	Yoshihiro Doi	Mech. Eng	Kansai	Yoshi Doi

Kansai Electric Power
power with heart

Wrap-up Meeting Attendance List

No.	Name	Position	Company	Signature
11	Akira Kozakai	Mech. Eng	Kansai	小堺 晃

Kansai Electric Power
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Kansai Electric Power
power with heart

OVERVIEW of FINAL REPORT (Draft)

July 2019

Japan International Cooperation Agency (JICA)
The Kansai Electric Power Co., Inc.

Contents

1. Background: Power Supply and Demand in Egypt

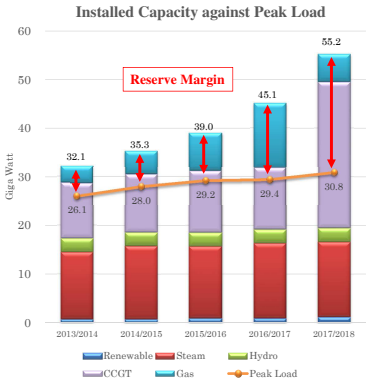
No additional thermal power plants are needed under the 8th Five-Year Plan (2017-2022), EEHC (2017/18*1)

Current Situation

✓**Meeting the peak load** in 2017/2018 that reached 30.8GW without load shedding.

✓**Increase of total installed capacity** to the unified national grid up to 55.2GigaW, including Fast Track Plan and Siemens Project.

✓Consequently, progressive **increase of reserve margin** relative to peak load.



*1: EEHC Annual Report 2017/2018

1. Background: Diversifying Generation Capacity Mix

Current Situation*1

✓ **Excessive reliance on thermal assets** (90+% of installed capacity)

✓ Frequent power outages due to natural gas and fuel shortage

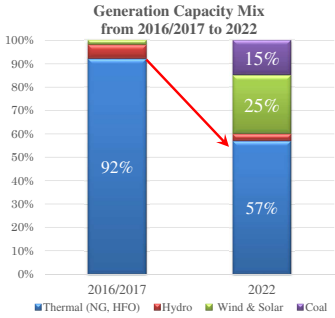
Various countermeasures to **overcome the undiversified power generation mix** taken by EEHC.

Recent Activity for Improving Energy Mix

✓ **The renewable energy** will generate over 20% of electricity.

✓ **Combined Cycle power plant, Clean coal thermal power plant** and **Pump & Storage Power** will be installed.

✓ **Nuclear power plant** will be installed.



*1: MoERE Addressing Egypt's Electricity Vision 2015, : EEHC Annual Report 2017/2018

1. Background: Drastic Change in Role of TPPs

In the near future, many existing thermal power plants are increasingly required to **switch the operation from base & cyclic to peak (including standby reserve)**.

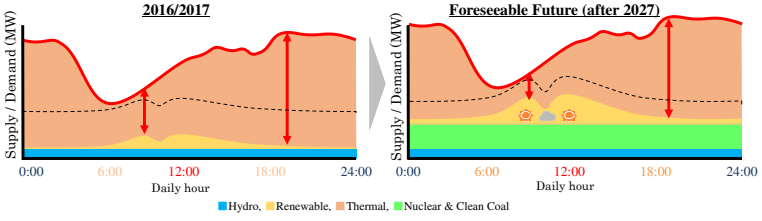
Main Dominant Factors:

✓ Recent peak load growth relatively stable.

➡ **No more drastic change in demand growth expected in next decade.**

✓ Brand-new clean coal/nuclear power plant as base load operation.

✓ Positive installation of intermittent renewable energy sources.



1. Background: Foreseeable Issues in O&M at TPPs

Foreseeable Critical Issues (O&M needs)

✓ Frequent Partial Load

➡ **Thermal efficiency deteriorates at the partial load** because power plants are designed to attain the best performance at the rated output

✓ Frequent Start-up & Shut-down

➡ TPPs suffer from not only creep damage at base & moderate cyclic operation but also **fatigue damage at intense cyclic & peak operation**.

✓ 1/3 installed capacity is over 20 years.

➡ **Aging impact on O&M quality and cost** (especially major overhaul)

✓ Increase in Standby Reserve

➡ Standby reserve TPPs require some amount of fixed O&M cost.

✓ Considering the current situation, EEHC is expected to **improve plant performance** and **respond to peak demand fluctuation:** Thermal efficiency, availability factor and unplanned outage rate etc.

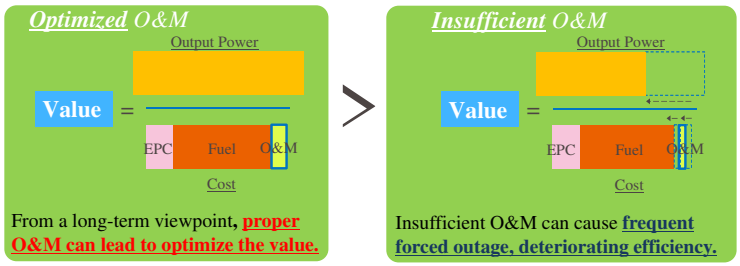
1. Background: Why is O&M at TPPs important?

➢ *What value does EPCO create?*

$$\text{Value} = \frac{\text{Output}}{\text{Input}} = \frac{\text{Output Power (kWh)}}{\text{Cost (\$)}}$$

[=CAPEX+ OPEX (Fuel, O&M)]

➢ *Why is adequate O&M at TPPs important?*



Contents

2. Project Summary: Capacity Building for O&M at TPPs

This JICA project aims to implement capacity building for O&M at TPPs in order to make continuous technical support for MoERE/EEHC.

Project Purpose

Overall Goal	Capacity of O&M of Thermal Power Plants (TPPs) is strengthened.
Project Goal	Training capacity on O&M of EEHC is strengthened.

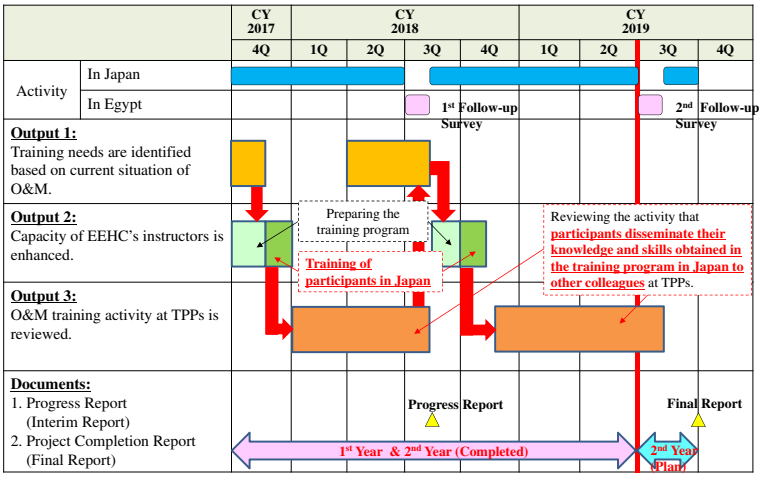
Project Output

Output 1	Training needs are identified based on current situation of O&M.
Output 2	Capacity of EEHC instructors is enhanced.
Output 3	O&M training activity at TPPs is reviewed.

2. Project Summary: Capacity Building for O&M at TPPs

Targeted Type of Power Generation	Gas Turbine Combined Cycle (GTCC)
Project Sites	EEHCs' Thermal Power Plants (TPPs) in Cairo and its suburbs
Counterpart	Ministry of Electricity and Renewable Energy (MoERE), Egyptian Electricity Holding Company (EEHC), Cairo Electricity Production Company (CEPC), Middle Delta Electricity Production Company (MDEPC), West Delta Electricity Production Company (WDEPC) and Upper Egypt Electricity Production Company (UEEPC) etc.
Beneficiaries	O&M instructors of EEHC and its trainees (Engineers & Technicians)
Duration	October 2017 – September 2019 (2 years)

2. Project Summary: Work Flowchart



2. Project Summary: 2nd Follow-up Survey

We visited MoERE/EEHC & each Electricity Production Company (EPC) as follows.

Date		Events		
25-June	Tue.	Alexandria	Meeting with management and JICA-trained participants (engineers & technicians)	WDEPC
26-June	Wed.	Talkha		MDEPC
27-June	Thu.	Kuriemat		UEEPC
1-July	Mon.	Cairo		CEPC
2-July	Tue.	Cairo	Pre-Meeting	JICA
3-July	Wed.	Cairo	Wrap-up Meeting	MoERE/EEHC

According to the following agenda, **we divided the meeting into 3 groups** at each EPC site.

Counterpart	Agenda
1.Management	➢ Final report presentation ➢ Discussion about potential needs of technical support as the next phase.
2.JICA-trained engineers 3.JICA-trained technicians	➢ Reviewing the training activity implemented by JICA-trained participants. ➢ Discussion about issue analysis of O&M at TPPs. ➢ Additional lectures: Air Cooled Condenser (ACC) & Tool Box Meeting (TBM)

Contents

3. O&M Training in Japan: Overall Framework

Job Report Presentation: Participatory (Active)
To grasp actual condition of O&M at TPPs.

Lecture & practical training at KANSAI's Training Center: Passive
To learn each essence on the training program and how to teach them to others efficiently.

Site visit to Kansai's TPPs and Japanese manufacturer's factory: Passive
To understand high-level safety & quality management at their sites directly.

Workshop for Issue Analysis: Participatory (Active)
To analyze current issues, in logical manner, especially on the cause & effect basis.

Action Plan Presentation: Participatory (Active)
To make action plan for disseminating their knowledge & skills obtained in the training program in Japan to other colleagues.

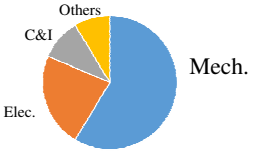
3. O&M Training in Japan: Mechanical Maintenance

For improving O&M in TPPs, We KANSAI focused on energy management (Common), especially **Mechanical Maintenance**.

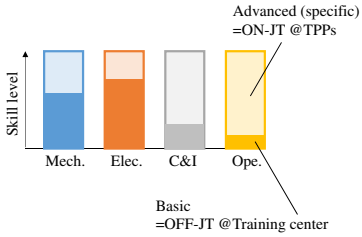
(1) Failure impact

Mechanical ≒ Electrical > C&I
(except for the causes of miss operation)

(2) Maintenance budget



(3) ON-JT and OFF-JT



3. O&M Training in Japan: Training Program in 2018

	Engineers	Technicians
Energy Management (Common)	✓ Introduction of the latest technology in TPP (inc. USC) ✓ Experience-based Safety Training → 17 ✓ Human Resource Development → 18 ✓ Quality Management ✓ Thermal Efficiency Management ✓ Lessons Learned from Accidents ✓ Human Error Prevention ✓ Effective Maintenance for Quality Electric Power Infrastructure	✓ Introduction of the latest technology in TPP (inc. USC) ✓ Experiential Safety Training ✓ Experiential Quality Training ✓ Prevention of Accidents and Disasters ✓ Occupational HSE (especially Safety)
Mechanical Maintenance	✓ Maintenance of GTCC ✓ Remaining Life Assessment (advanced) ✓ Feed Water Treatment ✓ Basic Training of Vibration (Balancing) ✓ Non-Destructive Inspection ✓ Welding Quality Management in Japan (inc. Welding Defect)	✓ General System and Outline of GTCC ✓ Maintenance of High Temperature and High Pressure Piping ✓ Overhauling Rotary Pumps ✓ Metal Material ✓ Basics of Non-Destructive Inspection Skills ✓ Welding Procedure Management
Site Visit	✓ Site Visit on TPP and Manufacture's factory → 19	✓ Site Visit on TPP and Manufacture's factory → 19
JICA Original	✓ Issue Analysis ✓ Methodology to Formulate Action Plan → 20	✓ Issue Analysis ✓ Methodology to Formulate Action Plan → 20

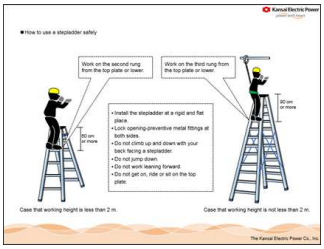
3. O&M Training in Japan: Course Examples (1)

Example: Experience-based Safety Training (Practical Training)

Training Item

Safety training using following;
1. Ladder
2. Safety belt
3. Electric shock
4. Be caught by rotation
5. Helmet

Training Materials



Effects of Training:

- ✓ Can understand the importance of labor safety and equipment safety
- ✓ Can improve capability to properly use safety equipment ready for emergency situations

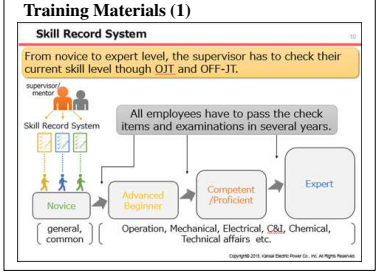
3. O&M Training in Japan: Course Examples (2)

Example: Human Resource Development in Kansai (Lecture)

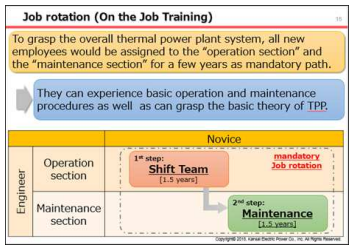
Training Item

Introduction of KANSAI's Human Resource Development
- Overall HRD structure
- Induction Training
- Refresher Training
- Training Philosophy and Contents

Training Materials (1)



Training Materials (2)



Effects of Training:

- ✓ Can grasp HRD current situation in Japanese electrical power company
- ✓ Can find out the hints for improving HRD structure in Egypt

3. O&M Training in Japan: Course Examples (3)

Example: Tour of Himeji No.2 TPP (Site Visit)

About Himeji No.2 TPP

1. Largest TPP of KANSAI (4,119 MW)
2. Introduced latest GTCC technology, and achieved high thermal efficiency of 60%
3. LNG terminal is adjacent to TPP, and integratedly operated

Effects of Training:

- ✓ **Can grasp O&M current situation in Japanese electrical power company**
- ✓ **Can understand the 5S methodology ("Sort", "Set In order", "Shine", "Standardize" and "Sustain") and its effects on quality of work**
- ✓ **Can understand how to well-operate aged-facilities**

3. O&M Training in Japan: Action Plan Presentation

Implementing their action plan in TPPs enables **not only participants but also their colleagues** to improve their O&M knowledge & skills.

About Action Plan

- ✓ Participants will be core instructors, and disseminate the knowledge and skills learned during O&M Training in Japan when they come back to Egypt.
- ✓ Participants made and presented Action Plan which illustrates the detailed actions to improve quality of work, such as On-the-Job Training at their TPP.

Introduction of Participant's Action Plan

Engineer

1. On-the-Job training (Service life evaluation, Vibration, HRSG, Trouble shooting and Industrial safety)
2. Support technicians to implement their Action Plan
3. Prevention of Human Errors
4. Improve KPI for employee and equipment

Technician

1. Maintenance and Inspection of Pumps
2. Welding (Lecture and Practical Training)
3. Non-Destructive Inspection
4. Industrial Safety
5. Maintenance and Inspection of Valves
6. High temperature and High pressure Piping

3. O&M Training in Japan: Other Activities

We provided the participants with comprehensive O&M training as well as **opportunities to learn Japanese culture.**

- **Japanese Language Lesson:** 日本語

- **Sightseeing in Kyoto: for Engineers & Technicians**

Contents

1. Background: Why is O&M at TPPs important?
2. Project Summary: Capacity Building for O&M at TPPs
3. O&M Training in Japan (2nd Year Completed: 2018)
4. **Action Plan Implementation**
5. Issue Analysis of O&M in TPP
6. Conclusion

4. Action Plan Implementation:

■Detailed Plan of OJT for Objective 1: To Improve Skills of Engineers through On the Job Training (OJT)

NO.	Training Subject	Purpose	Training Item	Effect	Important Points	Trainer	Where	How	Tools	Achievements	2018 OCT	NOV	DEC	2019 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Remarks
1	Service Life Diagnosis	1) To understand the outline of Service Life Evaluation 2) To understand the various type of deterioration events of Thermal Power plant 3) To understand the evaluation methods and their process 4) To understand important check points for evaluation	1-1 Purpose of Service Life Evaluation	(1)(2)	Why Service Life Evaluation is important	JICA-trained participant	TPP	Lecture	・Textbook (provided by JICA) ・O&M Manual (provided by manufacturers)	Plan: No. of times			1										
										Plan: No. of participants			5										
										Result: No. of times													
										Result: No. of participants													
			1-2 Main Deterioration Events and their Mechanism of Deterioration	(2)	・What are the main damage factors ・How each damage factor causes what kind of damage on where.	JICA-trained participant	TPP	Lecture	・Textbook (provided by JICA) ・O&M Manual (provided by manufacturers)	Plan: No. of times			1										
										Plan: No. of participants			5										
										Result: No. of times													
										Result: No. of participants													
			1-3 Service Life Diagnosis Methods	(2)(3)	・Where & how to check the damage, according to the kinds of damage	JICA-trained participant	TPP	Lecture	・Textbook (provided by JICA) ・Manual (provided by manufacturers)	Plan: No. of times			1										
										Plan: No. of participants			5										
										Result: No. of times													
										Result: No. of participants													
2	Vibration	1) To understand the mechanism of vibration 2) To understand the important checking points	2-1 Basics of Vibration	(1)	・How vibrations occur.	JICA-trained participant	TPP	Lecture	・Textbook (provided by JICA)	Plan: No. of times			1										
										Plan: No. of participants			5										
										Result: No. of times													
										Result: No. of participants													
			2-2 Analysis of Vibration	(1)(2)	・How to read and follow up the vibration trend and take action.	JICA-trained participant	TPP	Practical training	・Textbook (provided by JICA)	Plan: No. of times			1										
										Plan: No. of participants			5										
										Result: No. of times													
										Result: No. of participants													

4. Action Plan Implementation: Findings of the Mission

(Actual Conditions)

- ✓ JICA-trained engineers & technicians implemented their Action Plan **almost as previously arranged**, and a series of their dissemination activities can help to **improve the O&M capacity at TPPs.**
- ✓ They disseminated their knowledge and skills to their colleagues by mainly utilizing **training materials provided by JICA Expert Team, on small unit basis**, from a practical viewpoint.

4. Action Plan Implementation: Findings of the Mission

(Actual Conditions) Effect of the Action Plan

- ✓ Operation team and maintenance team **started to communicate with each other** after the training program in Japan, and it helped them to enhance their knowledge and skills of operation and maintenance.
- ✓ Technicians **started training for safety**, and the effect is that they were able to complete two overhaul works without any accidents and injuries.
- ✓ Engineers **applied the useful knowledge acquired in Japan to actual work**, such as operation troubleshooting, human error reduction and non destructive inspection.

4. Action Plan Implementation: Findings of the Mission

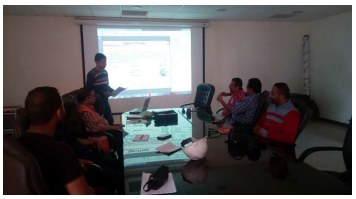
(Actual Conditions)

- ✓ Despite of hard tasks during major overhaul, **some of them made the most of the limited opportunities of disseminating their knowledge**; vibration analysis and HRSG (Heat Recovery Steam Generator) maintenance were especially useful and effective to them because **these contents could meet their O&M needs directly.**
- ✓ On the other hand, **their various duties in each workplace often seem to restrict them to implement the action plan.**
- ✓ For some action plan item, **technicians need more training equipment** such as welding, large size valves.

4. Action Plan Implementation: Findings of the Mission

(Suggestion from JICA Expert Team)

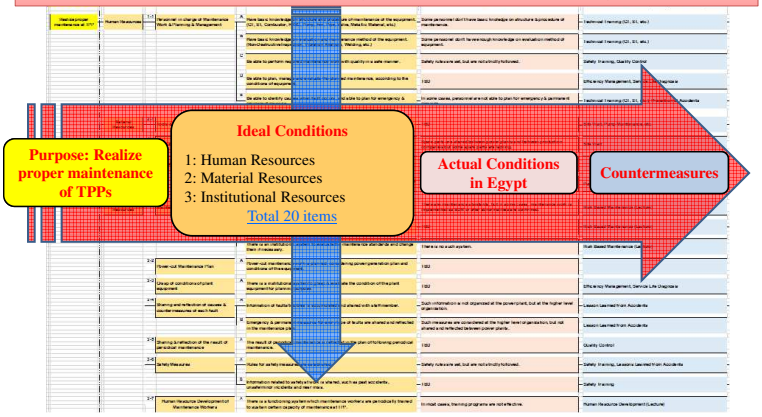
- ✓ JICA Expert Team would like to request Egyptian side for **the further understanding and continuous support for Action Plan implemented by JICA-trained engineers & technicians**, even after the Project.
  - ➢ Coordinating Engineers/Technicians work to implement their Action Plan as planned.
  - ➢ Preparing necessary equipment and materials for Action Plan implementation.



Contents

5. Issue Analysis of O&M in TPP: Basic Concept

JICA Expert Team comprehensively analyzed O&M issues of TPPs in Egypt and identified the countermeasures (not limited to Action Plan)



5. Issue Analysis of O&M in TPP: Human Resources

Category	Ideal Condition	Actual Condition	Countermeasure
Human Resources	Every personnel has basic knowledge on structure and maintenance procedure of the equipment.	Some personnel don't have basic knowledge on structure & maintenance procedure of the equipment.	Dissemination from Participants (E/T) about **GTCC (GT, ST, HRSG) etc.**
	Every personnel has basic knowledge on evaluation and maintenance method of the equipment.	Some personnel don't have enough knowledge on evaluation method of equipment.	Dissemination from Participants (E/T) about **NDI, Remaining Life Assessment, balancing etc.**
	Every personnel can perform required maintenance work with quality in a safe manner.	Safety rules are set, but are not strictly followed.	Dissemination from Participants (E/T) about **Safety/Quality Training etc.**
	Be able to plan, manage and evaluate the planned maintenance, according to the conditions of equipment.	Almost all personnel are able to do within the range of O&M manuals.	Dissemination from Participants (E/T) about **Maintenance of GTCC etc.**
	It's possible to identify causes when fault occurs, and plan for emergency & permanent measure.	In some cases, some personnel are not able to plan for emergency & permanent measure.	Dissemination from Participants (E/T) about **Maintenance of GTCC etc.**

5. Issue Analysis of O&M in TPP: Material Resources

Category	Ideal Condition	Actual Condition	Countermeasure
Material Resources	Tools and Jigs necessary for maintenance are neatly stored in designated areas, well managed and available on demand.	In some TPPs, participants keep tools and jigs tidy and in order.	Dissemination from Participants (E/T) about **5S methodology, etc.** If needed, **management may be responsible to procure it.**
	Consumables & Spare parts are stored, well managed and available on demand.	Spare parts are managed by computerized system and shared between TPPs and EPCs.	Dissemination from Participants (E/T) about **5S methodology, etc.** If needed, **management may be responsible to procure it.**
	All manuals of each equipment are available on demand.	Some manuals are existing, but are not well organized.	Making exiting manuals set in order. (E/T). If needed, **management may request the supplier/vender for additional manual.**
	Work procedures for each maintenance of each equipment are written, well kept and available on demand.	In some TPPs, work procedures are well kept in computerized system and can be shared at each TPP.	Making exiting procedures set in order. (E/T). If needed, **management may request the supplier/vender for additional manual.**

5. Issue Analysis of O&M in TPP: Institutional Resources

Category	Ideal Condition	Actual Condition	Countermeasure
Institutional Resources (1)	Each equipment has prescribed maintenance standards such as frequency, details of maintenance work.	There are maintenance standards, but in some cases, maintenance is implemented as BDM or after abnormalities are confirmed.	Dissemination from Participants (E) about **Risk Based Maintenance etc.**
	Each equipment has standard check points.	Based on O&M manuals, each equipment has standard check points. But, only within the range of O&M manuals.	Dissemination from Participants (E) about **Risk Based Maintenance etc.**
	There is an institutional system to evaluate the maintenance standards and change them if necessary.	In some TPPs, There is no such system. In other TPPs, it is managed at the head office.	Dissemination from Participants (E) about **Risk Based Maintenance etc.**
	Power-cut maintenance work is planned, considering power generation plan and conditions of the equipment.	Power-cut maintenance can be implemented as planned because there are sufficient reserve margin at present.	There is no gap between ideal and actual condition.
	There is a institutional system to grasp & evaluate the condition of the plant equipment for planning purpose.	In some TPPs, There is no such system. In other TPPs, it is managed at the head office.	Dissemination from Participants (E) about **Thermal Efficiency Management, Service Life Diagnosis etc.**

5. Issue Analysis of O&M in TPP: Institutional Resources

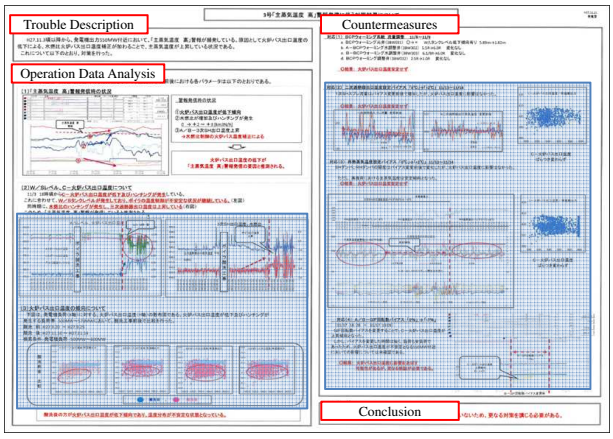
Category	Ideal Condition	Actual Condition	Countermeasure
Institutional Resources (2)	Information of faults/troubles is accumulated and shared with staff member.	Information is shared through Chief Engineers but not informed to engineers and technicians, and it would take much times and they cannot grasp the details.	Dissemination from Participants (E) about **Lesson Learned from Accidents etc.** Information sharing on technical failures/troubles by engineers & technicians.
	Emergency & permanent measures for every type of faults are shared and reflected in the maintenance plan.	Information is shared through Chief Engineers but not informed to engineers and technicians, and it would take much times and they cannot grasp the details.	Dissemination from Participants (E) about **Lesson Learned from Accidents etc.** Information sharing on technical failures/troubles by engineers & technicians.
	The result of periodical maintenance is reflected in the plan of following periodical maintenance.	Based on O&M manuals, these are implemented. But, only within the range of O&M manuals.	Dissemination from Participants (E/T) about **Quality Control etc.**
	Rules for safety measures are established.	Safety rules are set, but are not strictly followed.	Dissemination from Participants (E/T) about **Safety Training**, but **management should take the initiative in the organization.**
	Information related to safety at work is shared, such as past accidents, unsafe/minor incidents and near miss.	Information is shared through Chief Engineers but not informed to engineers and technicians, and it would take much times and they cannot grasp the details.	Dissemination from Participants (E/T) about **Safety Training** Information sharing on labor accidents by engineers & technicians.
	There is a functioning system which maintenance workers are periodically trained to sustain certain capacity of maintenance.	In most cases, training programs are not effective. And there is no institutional to evaluate the skills of engineers and technicians.	Dissemination from Participants (E/T) about **Human Resource Development.** Adopting evaluation system based on technical knowledge & skills for engineers & technicians, not only depending on the length of work.

5. Issue Analysis of O&M in TPP: Findings of the Mission

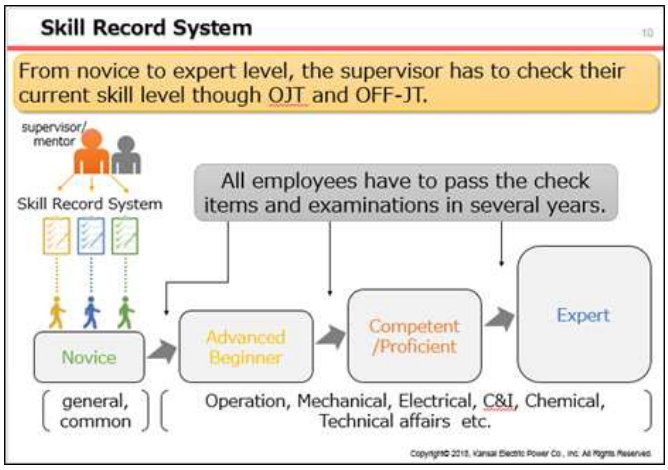
(Suggestion from JICA Expert Team)

- ✓ As for the O&M issues that JICA-trained engineers & technicians can deal with, **almost all of the countermeasures are covered with O&M training course in Japan and their Action Plan.**
- ✓ On the other hand, through discussion with management/ JICA-trained engineers & technicians, there are other **O&M issues to be involved by management.**
- ✓ Management are expected to take the following countermeasures:
  - ➢ **Sharing information** on technical failures/troubles & labor accidents with not only management, **but also engineers & technicians.**
  - ➢ **Adopting evaluation system based on technical knowledge & skills** for engineers & technicians, not only depending on the length of work.

5. Issue Analysis of O&M in TPP: Information Sharing



5. Issue Analysis of O&M in TPP: KANSAI's Skill Evaluation



Contents

6. Conclusion

Summary of the JICA project

- ✓ We've already implemented the capacity building project for O&M at TPPs for around 2 years as follows:
  - ➢ Conducting **O&M training in Japan** based on the training needs and the current situation.
  - ➢ Reviewing **dissemination from JICA-trained participants to other colleagues** about knowledge and skills obtained in Japan.
- ✓ Through analyzing the O&M issues at TPPs, we suggest **the project is practical and effective to improve O&M capacity.**

For further improvement of O&M at TPPs

The key success factor (KSF) is …

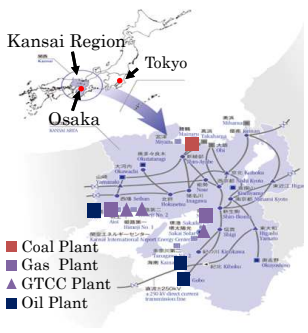
- ✓ **Practice makes perfect**: keeping the dissemination even after the project.
- ✓ **Self-disciplined learner**: avoiding excess dependence on manufacturer.
- ✓ **Insatiable challenge**: demonstrating the latest O&M technology.

Hiroki HIRAHATA (Focal Point)
hirahata.hiroki@b5.kepco.co.jp
Thermal Power Division
The Kansai Electric Power Co.,Inc.

Reference

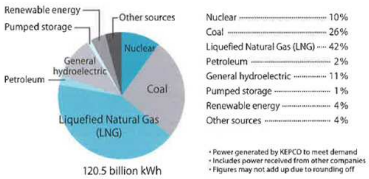
General Information: The Kansai Electric Power Co., Inc.

General Information: The Kansai Electric Power Co., Inc.



- ■ Established in 1951
- ■ Electricity Sales : 120.5 billion kWh
- ■ Capacity of power-generation: 34.2 GW

Composition of power sources (supply and demand record by source)



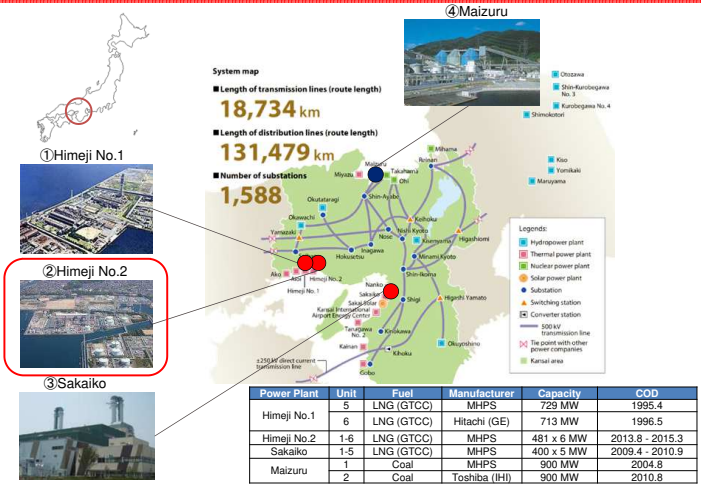
Capacity of power-generating facilities (breakdown by power source)

Thermal power	19,430 GW	(12 facilities)
Hydroelectric power	8.226 GW	(152 facilities)
Nuclear power	6.578 GW	(3 facilities)
Renewable energy	0.011 GW	(3 facilities)

• KEPCO power-generating facilities only
• Figures may not add up due to rounding off

(As of 31th March 2018)

KANSAI's GTCC and Coal Fired Power Plants

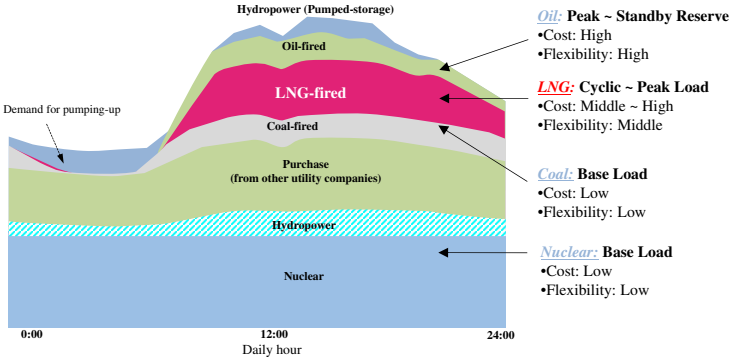


Power Plant	Unit	Fuel	Manufacturer	Capacity	COD
Himeji No.1	5	LNG (GTCC)	MHPS	729 MW	1995.4
	6	LNG (GTCC)	Hitachi (GE)	713 MW	1996.5
Himeji No.2	1-6	LNG (GTCC)	MHPS	481 x 6 MW	2013.8 - 2015.3
Sakaiko	1-5	LNG (GTCC)	MHPS	400 x 5 MW	2009.4 - 2010.9
Maizuru	1	Coal	MHPS	900 MW	2004.8
	2	Coal	Toshiba (IHI)	900 MW	2010.8

KANSAI's Power Generation Portfolio

Kansai Electric: Long history in Responding demand fluctuation

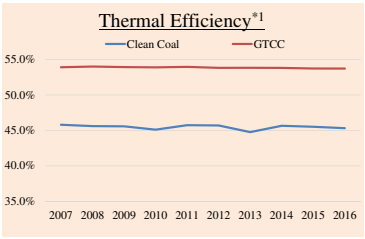
In Kansai's power generation portfolio, LNG and Oil thermal power plants have been responding to peak demand fluctuation and contribute to the consistent and stable supply of electricity.

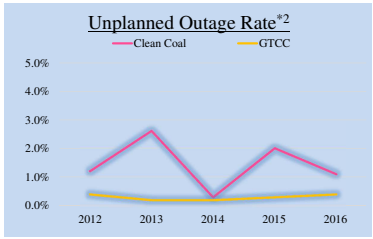


KANSAI's Quality Management

Kansai has accumulated precious experience and maintained technical knowledge and skill of high quality O&M for over 65 years.

The following know-how contributes to **low degradation of thermal efficiency** and **low unplanned outage rate**; for example,
"thermal efficiency management", "non-destructive inspection", "safety management", "quality management", and "remaining life assessment" etc.

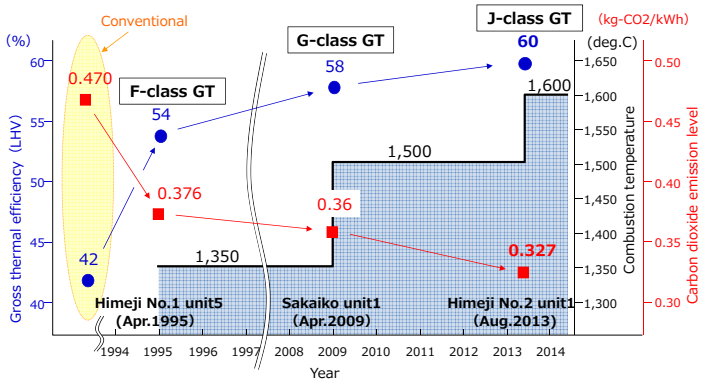




*1: Gross, LHV basis

*2: Unplanned Outage Rate (%) =
No. of days of unplanned outage / (No. of days of operation + No. of days of unplanned outage)

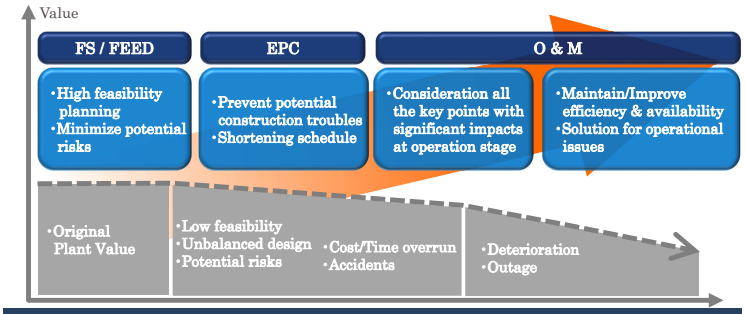
KANSAI's GTCC Performance Improvement



■ 30% reduction of fuel consumption and carbon dioxide emission compared to conventional power plants.

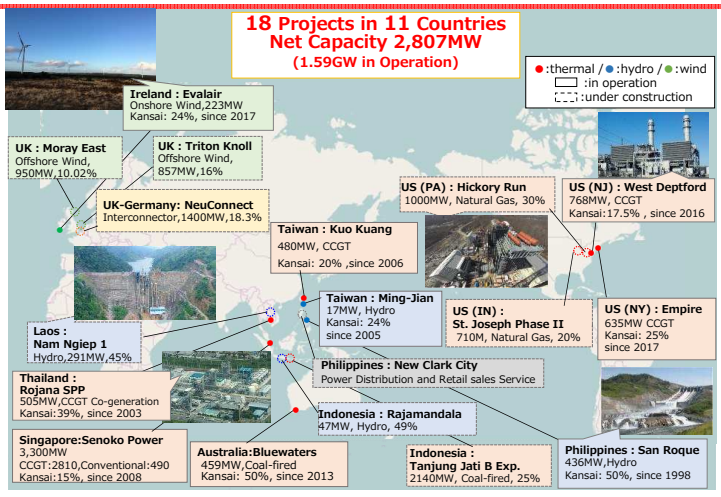
Kansai Value Creation Service

K-VaCS



■ Comprehensive solution for managing Thermal Power Plant
■ Provide "Value Creation" service integrated with IoT / AI technology

KANSAI's Overseas Project (as of April 2019)



Reference

KANSAI's Technical Proposal: Introducing RBM Setup & improving Analytic Capability

KANSAI's Technical Proposal

For sustainable and efficient O&M, the following steps are necessary

Step1. Record the events and storage

Maintenance : Record the failures systematically every time. (when, what, how to repair, why)
Operation : Record the condition(data logging)

Step2. Analyze the records periodically

Maintenance : Have the same equipment failed ?
Operation : Is there trend toward failure?

Step3. Identify and solve root-causes

Identify and solve root causes (countermeasures) of unexpected problems/risk factors through use of analytical data.

KANSAI's Technical Proposal

(1) Introducing RBM (Risk Based Maintenance)

Maintenance Optimization via RBM

Optimize Maintenance plan by utilizing a risk matrix that evaluates both PoF (Probability of failure) and CoF (Consequences of Failure).

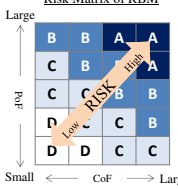
Benefits of RBM

- Can avoid impact for high-risk equipment
- Can reduce cost for low-risk equipment
- **Lead to reduce maintenance cost while keeping high quality**

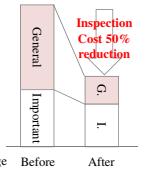
Risk High Area
- Consider measures to reduce risk
- Modify equipment
- Strengthen the inspection of equipment
- Change operation

Risk Low Area
- Consider measures to reduce cost
- Reduce inspection scope
- Extend inspection interval

Risk Matrix of RBM



Effect (example)



Note: It is possible that RBM scope is limited to equipment beyond existing LTSA.

KANSAI's Technical Proposal

(2) Improving Analytic Capability (e.g. Introduction of FTA)

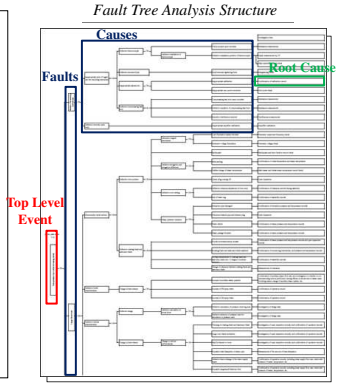
About Fault Tree Analysis (FTA)

1. Deductive Analytic Method
2. Visually indicating a failure path
3. Can identify the root causes of Trouble

Benefits of Fault Tree Analysis

- When trouble happens, engineers and technicians **can easily check the possible causes** at glance
- Engineers and technicians **can quickly identify the root causes of the trouble**
- Can prevent the recurrence of the trouble
- **Lead to reduce down-time of TPP**

Fault Tree Analysis Structure



KANSAI's Technical Proposal

- ✓ At the request of MoERE/EEHC, KANSAI can offer **comprehensive technical service package** as the next phase (after this project).
- ✓ And we'd like to clarify **potential needs of technical support** (not limited to capacity building) through discussion with counterparts in this follow-up survey.

No.	Item	Beneficiaries	Number of Participants	Duration
(1)	**O&M Enhancement by introducing RBM** (Implementation Support)	Engineer/Technician (Maintenance)	40	1 year
(2)	**O&M Enhancement by improving Analytic Capability (Data Analysis, FTA etc.)** (Capacity Building)	Engineer/Technician (Maintenance) and Operator		

KANSAI's Technical Proposal

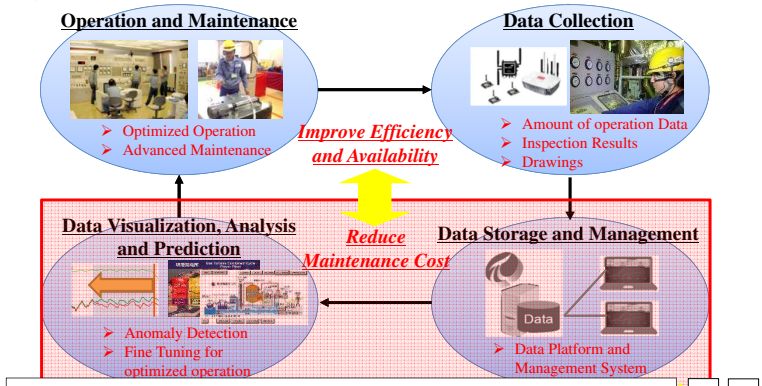
		1 Year			
		1st Q	2nd Q	3rd Q	4th Q
Activity	In Japan				
	In Egypt	Baseline Survey		1st Follow-up Survey	2nd Follow-up Survey
(1) RBM Introduction (Implementation Support)					
(2) Improving Analytic Capability (Capacity Building)			Preparing the training program / Training of participants in Japan		
Documents: 1. Progress Report (Interim Report) 2. Project Completion Report (Final Report)			Progress Report		Final Report

Reference

KANSAI's Technical Proposal: Digitalization

KANSAI's Technical Proposal: Digitalization

Digitalization for Power Generation

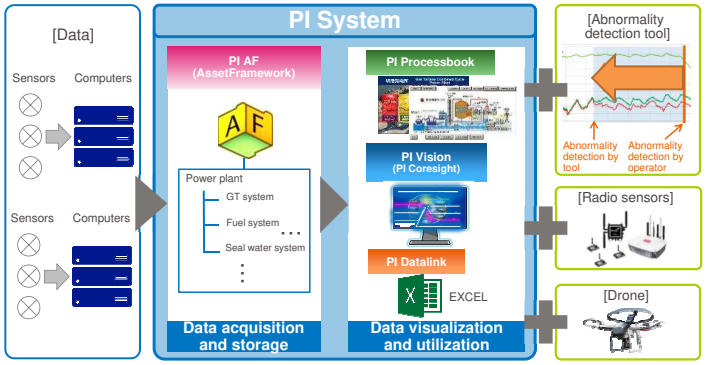


KANSAI can help Egypt to digitalize O&M in TPPs through introducing PI System. 56 ~ 62

✓ Digitalization accelerate optimization of O&M in TPPs through effects such as improvement of efficiency, availability and work productivity and technical transfer with ease.

KANSAI's Technical Proposal: Digitalization

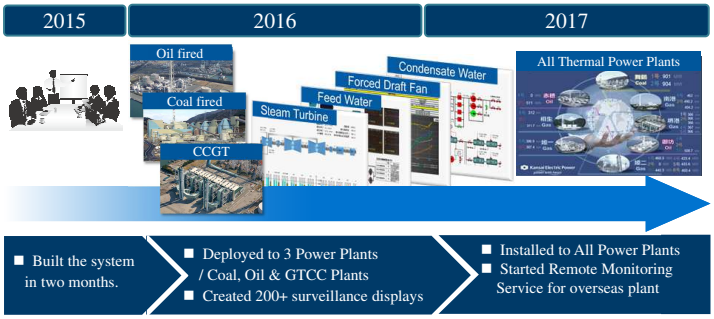
About PI System: World Standard Data Management System used in various industries



✓ Capable of collecting, storing and easily visualizing a large amount of O&M data in TPPs
✓ Offers high extendibility with new sensors, analysis tools, etc.

KANSAI's Technical Proposal: Digitalization

O&M Enhancement by Digitalization (Overview of PI System Installation)



✓ KAISAI is the first Japanese power generation company to introduce PI System (world standard data management system)
✓ Have track records of providing dizitalization service to other companies utilizing PI System

KANSAI's Technical Proposal: Digitalization

O&M Enhancement by Digitalization (Use example at our Power Plant)

✓ Monitor parameters relevant to the lifetime of equipment and estimate the remaining lifetime for a proper maintenance plan

KANSAI's Technical Proposal: Digitalization

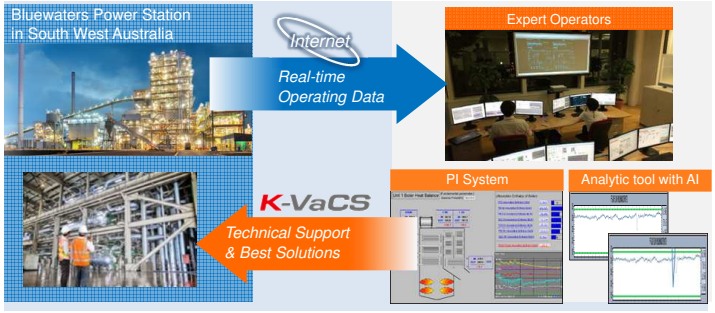
O&M Enhancement by Digitalization (Cost Savings at our Power Plant)

Item	Description
Plant Performance Improvement	Monitoring of GT Intake Air Filter Differential Pressure
	GT Performance Monitoring (Fine-tuning of IGV setting)
	Monitoring of Economizer Inlet Water Temperature
	Monitoring of Fuel Gas Heater Outlet Gas Temperature
Unplanned Down Time Reduction	Monitoring of Circulation Water Pump
	Monitoring of IGV
Maintenance Cost Reduction	Equipment Remaining Life Management
Quality Improvement	Automation of Performance Test Record Collection

✓ Estimate approx. **3 Million USD** / year cost savings at our CCGT Power Station

KANSAI's Technical Proposal: Digitalization

O&M Enhancement by Digital Transformation (Remote Monitoring Sevrice)



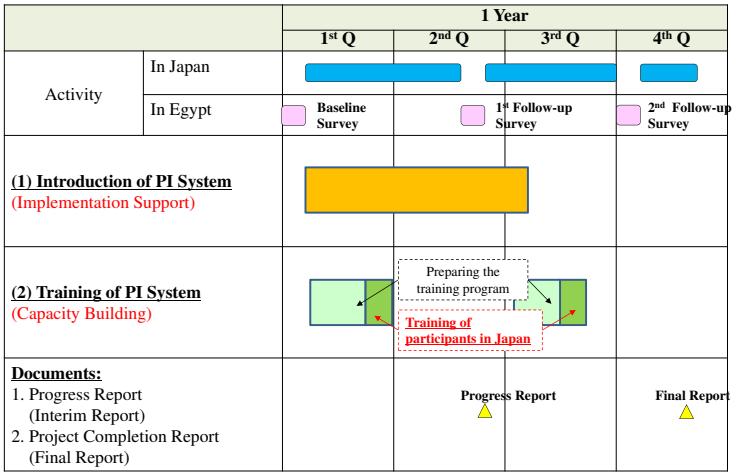
✓ Our early anomaly detection system not only detects and reports signs of an anomaly using AI, but we can propose overall solutions from the business owner's perspective that includes procedures designed by our experts

KANSAI's Technical Proposal

- ✓ At the request of MoERE/EEHC, KANSAI can offer **digitalization solution service package** as the next phase (after this project).
- ✓ And we'd like to clarify **potential needs of technical support** (not limited to capacity building) through discussion with counterparts in this follow-up survey.

No.	Item	Beneficiaries	Number of Participants	Duration
(1)	**O&M Enhancement by introducing PI System** (Implementation Support)	Engineer/Technician (Maintenance) and Operator	40	1 year
(2)	**Training of PI System** (Capacity Building)			

KANSAI's Technical Proposal



Minutes of Meeting

Project	Capacity Building and Strengthening of Thermal Power Generation Operation & Maintenance in Egypt (the 2nd follow-up survey by JICA expert)
Title	2nd survey in West Delta EPC
Date	25th June 2019
Time	11:30 - 14:30
Place	West Delta EPC Conference Rooms
Attendees	See Attachment "attendance list (West Delta EPC : Mgt / Eng / Tech)"

Record of Discussions

NO	ITEM DETAILS
1.	**Introduction**
1.1	This meeting was convened with the objective to discuss the below agenda point: 1) Presentation of JICA Capacity building O&M "Overview of Draft Final Report"(Management) 2) Discussion about potential needs of technical support as the next phase(Management) 3) Hearing the answers of Kansai's questionnaire, JICA's questionnaire and APs activities (Engineers/Technicians) 4) Discussion about the Issue Analysis of O&M at TPPs. (Engineers/Technicians) 5) Additional lectures: Tool Box Meeting (TBM) 6) Others (if any)
2.	**Overview of Draft Final Report(Management)**
2.1	JICA expert (KANSAI) made the presentation on "Overview Of Final Report (Draft)", containing "Project Summary", "O&M Training in Japan", "Issue Analysis in O&M at TPPs" and "Potential Needs Of Technical Support As The Next Phase" 1) JICA expert (KANSAI) explained the reason why we focused on mechanical maintenance, and management understood the reason, and also showed interest in electrical maintenance. 2) Management explained that usual O&M manuals are available, but that special manuals cannot be obtained from manufacturers. JICA expert explained the importance to negotiate with the manufacturers. 3) Management understood the importance of O&M for equipment not covered by LTSA, such as ST, HRSG and BOP, and showed interest in especially Risk-Based-Maintenance (RBM).

NO	ITEM DETAILS
3.	**Interview and discussion with JICA-trained engineers and technicians**
	1) Hearing the answers of Kansai's questionnaire, JICA's questionnaire and APs activities (E) They disseminated their knowledge to their colleagues by utilizing JICA experts' materials. JICA expert received their activity report and pictures. (T) They disseminated their knowledge to their colleagues by utilizing JICA experts' materials. JICA expert asked them to send their activity report and pictures. 2) Discussion about the Issue Analysis of O&M at TPPs. (Sidi Krir) (E) Their manuals and documents are stored in each sections. And there are no management system and librarian. Kansai recommended that their manuals are managed in one big library, where they can revise to the latest and manage lending. (E) Their skills and knowledge are evaluated only by experience periods. They asked us for KANSAI's skill evaluation system because they want to estimate their own skill level. (E) They can share failures, troubles and incidents in other TPPs through Chief Engineers. But it would take much times and they cannot grasp the details. JICA experts explained KANSAI's information sharing system (*) and they have some concerns. *After the incidents, TPP will reports the phenomenon and causes to HQ and HQ will share them to related TPPs. All personnel can access the information on the web. (T) Technicians suggested that having a regular meeting of engineers and technicians is necessary to share the situation on the equipment, work detail and attention point for safety work. 3) Additional lectures: Tool Box Meeting (TBM) JICA expert made the explanations on above technical issue briefly. The participants could understand the necessity and importance of pre-work meeting called "TBM" to ensure the safety, and shared material of ACC (Air-Cooled Condenser) with JICA-trained engineers.

Capacity Building for Operation & Maintenance of Thermal Power Plant
in Arab Republic of Egypt

WDEPC Meeting with Management Attendance List

Date: 25 / Jun / 2019

Time: 11 : 50 - 13 : 30

Place: Conference room

No.	Name	Position	Company	Signature
1	Ahmed Shawky Shoma	Head of sector	WDEPC	
2	Alaa Abdel Sattar Mahmoud	G.M	WDEPC.	
3	Khaled Mohamed farag	Boiler G.M	WDEPC	
4	Hiroki Hirohata	General Manager	Kansai	
5	Akira Kozaki	Manager	Kansai	
6				
7				
8				
9				
10				

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Capacity Building for Operation & Maintenance of Thermal Power Plant
in Arab Republic of Egypt

WDEPC Hearing from participant Attendance List

Date: 25 / 6 / 2019

Time: 11 : 30 - 14 : 30

Place: WDEPC

No.	Name	Position	Company	Signature
1	Abd EL-Moneim Aly Ahmed	Mech.Eng	WDEPCo. sidi krir power plant	
2	Farag ELsayed Ibrahim	operation engineer	WDEPCo. sidi krir Power	Farag
3	Essam Attia Nagib	Maintanance Engineer	sidi Krir P.P WDEPCo.	Essam
4	Tamer Farouk Aly Hassan	operation engineer	sidi Krir P.P WDEPCo.	Tamer
5	Mohamed Abd mohamed		SidiKrir PP WDEPCo	Mohamed
6	Mohamed Abd ELMotaleb	T. m.	sidikrir	
7	Mohamed omer, Youssif	T. m.	sidikrir	
8	Mohamed Mostafa Mohamed	T. m.	sidikrir	
9	Mohamed Ibrahem.	T. m.	sidikrir	
10	Ashraf abd ELAziz	T. m.	Sidikrir	

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21th Jun. 2019

WDEPC Hearing first participant Attendance List

No.	Name	Position	Company	Signature
11	Haruaki Furukawa	Electric Engr.	KANSAI	古川晴朗
12	Yuki Obe	C&I Eng	KANSAI	大部 祐貴
13	Yoshihiro Doi	Mech. Eng	Kansai	Yoshihiro

JICA

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Minutes of Meeting

Project	Capacity Building and Strengthening of Thermal Power Generation Operation & Maintenance in Egypt (the 2nd follow-up survey by JICA expert)
Title	2nd survey in Middle Delta EPC
Date	26th June 2019
Time	11:00 - 14:30
Place	Middle Delta EPC Conference Rooms
Attendees	See Attachment "attendance list (Middle Delta EPC : Mgt / Eng / Tech)"

Record of Discussions

NO	ITEM DETAILS
1.	**Introduction**
1.1	This meeting was convened with the objective to discuss the below agenda point: 1) Presentation of JICA Capacity building O&M "Overview of Draft Final Report"(Management) 2) Discussion about potential needs of technical support as the next phase(Management) 3) Hearing the answers of Kansai's questionnaire, JICA's questionnaire and APs activities (Engineers/Technicians) 4) Discussion about the Issue Analysis of O&M at TPPs. (Engineers/Technicians) 5) Additional lectures: Air Cooled Condenser (ACC) & Tool Box Meeting (TBM) 6) Others (if any)
2.	**Overview of Draft Final Report(Management)**
2.1	JICA expert (KANSAI) made the presentation on "Overview Of Final Report (Draft)", containing "Project Summary", "O&M Training in Japan", "Issue Analysis in O&M at TPPs" and "Potential Needs Of Technical Support As The Next Phase" 1) Management understood the impact on O&M in TPPs in case of frequent start-up and shut-down. JICA expert explained some specific equipment that will be influenced by the change of operation, such as boiler tubes and outer-casing.

NO	ITEM DETAILS
3.	**Interview and discussion with JICA-trained engineers and technicians**
	1) Hearing the answers of Kansai's questionnaire, JICA's questionnaire and APs activities (E) They disseminated their knowledge to their colleagues by utilizing JICA experts' materials. JICA expert received their activity reports (Action Plans) and asked them to send pictures. Their APs shows they implemented their dissemination in small group periodically and constantly. JICA expert admired their activity and asked their bosses to support their APs. (T) They disseminated their knowledge to their colleagues by utilizing JICA experts' materials. JICA expert asked them to send their activity report (Action Plans) and pictures. (T) Technicians talked that management's cooperation for the implementation of the Action Plan would be better. The reason is that technicians were too busy to teach many trainees in the form of lectures. And JICA expert asked their bosses to support their APs. 2) Discussion about the Issue Analysis of O&M at TPPs. (E) They can share failures, troubles and incidents in other TPPs through Chief Engineers. But it would take much times and they cannot grasp the details. (E) They can share the information related to each maintenance work through computerized system at every TPP in MDEPCO. 3) Additional lectures: Tool Box Meeting (TBM) 3) Additional lectures: Air Cooled Condenser (ACC) & Tool Box Meeting (TBM) JICA expert (Kansai) made the explanations on above technical issues briefly. The participants could obtain the knowledge of structure and careful points on Air cooled Condenser And they could understand the necessity and importance of pre-work meeting called "TBM" to ensure the safety.

Capacity Building for Operation & Maintenance of Thermal Power Plant
in Arab Republic of Egypt

Management Meeting with MDEPC Attendance List

Date: 26 / June / 2019

Time: 11 : 40 - 12 : 40

Place: Conference room

No.	Name	Position	Company	Signature
1	Adel Abd ElAziz	Head of production sectors	MDEPC	
2	Tarek Ibrahim hassan	Head Sector of Talkha P.P	MDEPC	
3	Mahmoud. s Phaleby	Head Sector. ATF	MDEPC	
4	Hiroki Hiralata	General Manager	Kansai	
5	Akira Kozakai	Manager	Kansai	
6				
7				
8				
9				
10				

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Capacity Building for Operation & Maintenance of Thermal Power Plant
in Arab Republic of Egypt

MDEPC Hearing with Eg. & Tec. Attendance List

Date: 26 / Jun / 2019

Time: 11 : 30 - 14 : 30

Place: MDEPC

No.	Name	Position	Company	Signature
1	Ibrahim osman	Mech. Engineer	MDEPC	
2	El shaha Abd Alla Abd ElHafiz	Mech Tech.	MDEPC	
3	Mohmed Hellal Anany	Mech Tech.	MDEPC	
4	Ahmed Arkri	Mech.	MDEPC	
5	Ibtahim Mohamed	operation engineer	MDEPC	
6	Ayman Saad Azer Saad	operation manager	MDEPC	
7	Alighanem Ali Byome	operation Tech	MDEPC	
8	Ali Abu zeid Mousa	mech Tech	MDEPC	
9	Yuki Obe	C&I Eng.	KANSAI	
10	Hanaaki Furukawa	Elec. Eng.	KANSAI	

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MP EPC Hearing from Eng & Tech **Attendance List**

No.	Name	Position	Company	Signature
11	Yoshihiro DOI	Mech. Eng.	Kansai	Yoshihiro Doi

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Minutes of Meeting

Project	Capacity Building and Strengthening of Thermal Power Generation Operation & Maintenance in Egypt (the 2nd follow-up survey by JICA expert)
Title	2nd survey in Upper Egypt EPC
Date	27th June 2019
Time	10:50 - 15:00
Place	Upper Egypt EPC Conference Rooms
Attendees	See Attachment "attendance list (Upper Egypt EPC : Mgt / Eng / Tech)"

Record of Discussions

NO	ITEM DETAILS
1.	**Introduction**
1.1	This meeting was convened with the objective to discuss the below agenda point: 1) Presentation of JICA Capacity building O&M "Overview of Draft Final Report"(Management) 2) Discussion about potential needs of technical support as the next phase(Management) 3) Hearing the answers of Kansai's questionnaire, JICA's questionnaire and APs activities (Engineers/Technicians) 4) Discussion about the Issue Analysis of O&M at TPPs. (Engineers/Technicians) 5) Additional lectures: Air Cooled Condenser (ACC) & Tool Box Meeting (TBM) 6) Others (if any)
2.	**Overview of Draft Final Report(Management)**
2.1	JICA expert (KANSAI) made the presentation on "Overview Of Final Report (Draft)", containing "Project Summary", "O&M Training in Japan", "Issue Analysis in O&M at TPPs" etc. 1) Management understood that Egypt has progressive increase of reserve margin at present. JICA expert explained that in general it is difficult to predict the power demand accurately.

NO	ITEM DETAILS
3.	**Interview and discussion with JICA-trained engineers and technicians**
	1) Hearing the answers of Kansai's questionnaire, JICA's questionnaire and APs activities (E/T) They disseminated their knowledge to their colleagues by utilizing JICA experts' materials. JICA expert received their activity reports (Action Plans) and activity pictures (PowerPoint). Their APs shows they implemented their dissemination in small group practically, periodically and constantly. JICA expert admired their activity and asked their bosses to support their APs. (E) Engineers implemented some APs even though they were busy because of the overhaul work. And they told that the vibration and HRSG problem were especially useful because these were directly related to their facing troubles. (T) Technicians talked that management's cooperation for the implementation of the Action Plan would be better. The reason is that technicians were busy to teach many trainees in the form of lectures, and there are few opportunities for education because they are limited when there is actual work. And JICA expert asked their bosses to support their APs. 2) Discussion about the Issue Analysis of O&M at TPPs. (E) They can share failures, troubles and incidents in other TPPs through Chief Engineers. But it would take much times and they cannot grasp the details. (E) They can share the information related to each maintenance work through computerized system at every TPP in UEEPCO. (E) They have the evaluation system of piping thickness. After measuring the piping thickness, they evaluate the remaining life assessment. That shows they have some technique level to grasp the condition of equipment. (E) They have all manuals of each equipment, but some manuals do not include enough information such as assemble and disassemble procedure. In such case, work quality is dependent on the personnel skills of workers. (T) Some maintenance personnel are not skilled enough. In the background, JICA Experts think the reason that transferred technicians are not hired with the necessary skills for maintenance work of the power plant and that they have to gain experience through work rather than training. (T) The know-how obtained during work is reflected in the work procedure.

	3) Additional lectures: TBM (Tool Box Meeting) & ACC (Air Cooled Condenser) JICA expert made the explanations on above technical issues briefly. The participants could understand the necessity and importance of pre-work meeting called "TBM" to ensure the safety. And JICA expert hand the ground design of the ACC to engineer with brief explanation.

Capacity Building for Operation & Maintenance of Thermal Power Plant
in Arab Republic of Egypt

Management Meeting with UEEPC Attendance List

Date: 27 / June / 2019

Time: 10 : 50 - 11 : 40

Place: Conference room

No.	Name	Position	Company	Signature
1	Sayed M. Abdelkareem	Head sector	UEEPC	Sayed
2	Hikaru TAKAHASHI	Representative	JICA	
3	Hiroki Hirahata	General Manager	KANSAI	
4	Akira Kozakai	Manager	KANSAI	
5				
6				
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10				

Capacity Building for Operation & Maintenance of Thermal Power Plant
in Arab Republic of Egypt

Meeting with Eng. & Tec. Attendance List

Date: 27 / Jun / 2019

Time: 11 : 00 - 14 : 30

Place: UEEPC

No.	Name	Position	Company	Signature
1	Walid Mohamed Mahmoud	operation Technician	UEEPC	Walid
2	Ahmed Mohamed Abdelmonem	Maintenance Engineer	UEEPC	Ahmed
3	mohamed Korny mohamed	maintenance Engineer	UEEPC	mohamed
4	Khaled sayed mohamed	maintenance Technician	UEEPC	Khaled
5	SAYED ALI Mahmoud	ISAYED	UEEPC	S.A.D
6	Wael abdelrazak Sayed	Boiler Eng.	UEEPC	Wael
7	Mohamed HOSNY	Mech, Turbine general manager	UEEPC	M. HOSNY
8	samir Ayesh	Boiler Mic	UEEPC	samir.
9	Haruaki Furukawa	Elec. Eng.	KANSAI	古川晴彰
10	Yuki Obe	C&I Eng.	KANSAI	大戸祐貴

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Meeting with Eng. & Tec. Attendance List

No.	Name	Position	Company	Signature
11	Yoshihiro Doi	Mech. Eng	Kansai	Yoshihiro Doi

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Minutes of Meeting

Project	Capacity Building and Strengthening of Thermal Power Generation Operation & Maintenance in Egypt (the 2nd follow-up survey by JICA expert)
Title	2nd survey in Cairo EPC
Date	1st July 2019
Time	10:00 – 11:30 (Cairo EPC), 12:00 – 15:30 (Cairo North TPP)
Place	Cairo EPC Conference Room, Cario North TPP Conference Room
Attendees	See Attachment "attendance list (Cariro EPC : Mgt / Eng / Tech)"

Record of Discussions

NO	ITEM DETAILS
1.	**Introduction**
1.1	This meeting was convened with the objective to discuss the below agenda point: 1) Presentation of JICA Capacity building O&M "Overview of Draft Final Report"(Management) 2) Discussion about potential needs of technical support as the next phase(Management) 3) Hearing the answers of Kansai's questionnaire, JICA's questionnaire and APs activities (Engineers/Technicians) 4) Discussion about the Issue Analysis of O&M at TPPs. (Engineers/Technicians) 5) Additional lectures: Air Cooled Condenser (ACC) & Tool Box Meeting (TBM) 6) Others (if any)
2.	**Overview of Draft Final Report(Management)**
2.1	JICA expert (KANSAI) made the presentation on "Overview Of Final Report (Draft)", containing "Project Summary", "O&M Training in Japan", "Issue Analysis in O&M at TPPs" etc. 1) Management told that at present thermal efficiency was not deteriorated. JICA expert explained that they will face the issue in the near future due to the change of operation of TPPs, and management understood the situation. 2) Management told that most troubles occurred in TPPs are I&C related, but understood that mechanical maintenance had greater impact than other maintenance such as electronic and I&C.

NO	ITEM DETAILS
3.	**Interview and discussion with JICA-trained engineers and technicians**
	1) Hearing the answers of Kansai's questionnaire, JICA's questionnaire and APs activities (E/T) They disseminated their knowledge to their colleagues by utilizing JICA experts' materials. JICA expert received their activity reports (Action Plans) and activity pictures (PowerPoint). Their APs shows they implemented their dissemination in small group practically, periodically and constantly. JICA expert admired their activity and asked their bosses to support their APs. (T) They told that operation team and maintenance team started to communicate with each other after the training program in Japan, and that it helped them to enhance their knowledge and skills of operation and maintenance. (T) They started training for safety, and the effect is that they were able to complete two overhaul works without any accidents and injuries. 2) Discussion about the Issue Analysis of O&M at TPPs. (E) They can share failures, troubles and incidents in other TPPs through Chief Engineers. But it would take much times and they cannot grasp the details. (E) They can partially plan, manage and evaluate the planned maintenance, but mostly dependent on manufacturers. (E) They sometimes evaluate and change the maintenance standards regarding the equipment not covered by LTSA. 3) Additional lectures: TBM (Tool Box Meeting) & ACC (Air Cooled Condenser) JICA expert made the explanations on above technical issues briefly. The participants could understand the necessity and importance of pre-work meeting called "TBM" to ensure the safety. And JICA expert hand the ground design of the ACC to engineer with brief explanation.

Capacity Building for Operation & Maintenance of Thermal Power Plant
in Arab Republic of Egypt

Meeting with CEPC Attendance List

Date: 1st / July / 2019

Time: 10 : 20 - 11 : 20

Place: CEPC Office

No.	Name	Position	Company	Signature
1	Tarek Abd El Hamid	Chairman	CEPC	
2	Badr Mohamed Alaa Eldeen	Tech. Affairs Head Section	CEPC	
3				
4	Yoshihiro Doi	Mech Eng.	Kansai	
5	Haruaki Furukawa	Elec. Eng.	KANSAI	古川晴彰
6	Yuki Obe	C&I Eng.	Kansai	大戸裕貴
7	Akira Kozakai	Mech Eng.	KANSAI	小堺 彰
8	Hiroki Hiraketa	General Manager	KANSAI	平下田 弘樹
9				
10				

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Capacity Building for Operation & Maintenance of Thermal Power Plant
in Arab Republic of Egypt

Hearing from Participants Attendance List

Date: 1st / July / 2019

Time: 12 : 00 - 15 : 30

Place: Cairo North Power Station

No.	Name	Position	Company	Signature
1	Mahmoud Ali	Ope- Tec	CEPC	
2	AMR Mohamed hamed	Mech-Tec	CEPC	AMR
3	Hassan Awaad Hassan	Ope-Tec	CEPC	Hassan
4	Ayman Ibrahem Mohamed	Mech-Eng	CEPC	Ayman
5	Moustafa Esmat Ahmed	Mech.Eng	CEPC	M. Esmat.
6	Ahmed Hassan Fayad	Operation Engineer	CEPC	Ahmed
7	Mohamed saied ELsaid	Mech.Tec	CEPC	Shaheen
8	EMADABOELYAZEN	M.T	CEPC	EMAD
9	Yuki Obe	C&I Eng	Kansai	大戸裕貴
10	Akira Kozakai	Mech Eng	Kansai	小堺 彰

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Hearing from Participants **Attendance List**

No.	Name	Position	Company	Signature
11	Hanaki Furukawa	Elec. Eng.	KANSAI	
12	Hiroki Hirakata	General Manager	KANSAI	
13	Yoshihiro Doi	Mech. Eng	Kansai	