Chapter 1 Outline of Follow-up Study

1.1 Background

(1) JICA had conducted the development study "The study on Evaluation of Environmental Impact of Thermal Power Plants in Islamic Republic of Iran" from 1996 to 1999.

As a result of the study, JICA had proposed several measures to improve the environmental situation based on the measurements of air pollution and the evaluation of it in the area of Tabriz and Esfahan Power Plants and the vicinities within 20 kilometers from each power plant.

(2) In association with the study mentioned above, the Government of Islamic Republic of Iran had requested a Feasibility Study titled "The Study of Improvement of Environmental Aspects of Tabriz and Esfahan Power Plants" to the Government of Japan.

(3) JICA has decided to conduct the study as a Follow-up Study because the study items requested by Iran are mainly environmental protection measures proposed in the former study (above Item (1)), in addition to a couple of new study item.

1.2 Purpose of Follow-up Study

The purpose of this study is to examine and confirm the following items through getting information from MOE and executing inspection trips to the actual field spots, and to make several suggestions regarding the results of this study in terms of improvements of current problems.

(1) Suggested items in the M/P study

a. Maintenance and Management of Power Plants
b. Improvement of Steam Turbine Efficiency
c. Environmental Control Organization in MOE
d. Plant Operator Training
e. Stack Gas Monitoring
f. Fuel Oil Balance Study
g. SPM Monitoring and Source Identification
h. Improvement of Simulation Model

(2) Additionally requested study items in the Feasibility Study

a. Improvement of Cooling System

b. Improvement of Wastewater Treatment Systems

1.3 JICA Team

	Name	Role	Belonging to	Duration in Iran
1	Masato Koie	Leader	JICA Headquarters	Nov. 14 - 24
2	Masami Kido	Study Planner	JICA Headquarters	Nov. 14 - 24
3	Masaaki Noguchi	Environmental Control	Suuri Keikaku Co.	Nov. 14 - Dec.11
4	Tomoichi Kojima	Power Plant Facility	Tokyo Elec. Power Envir. Eng. Corp.	Nov. 14 - Dec.11
5	Atsuko Kuroki	Interpreter	Japan Intern. Coop. Center	Nov. 14 - Dec.11

1.4 Study Schedule

Table 1.1 on the next page shows daily schedule of the Study.

1.5 General Execution Plans of Study

(1) Recommended Items in the Mater Plan Study (M/P)

The Master Plan Study recommended 8 items as listed in Table 1.2. The JICA Team confirmed MOE's actions taken for these items in the previous years.

(2) Requested Items in the Feasibility Study (F/S)

The following 5 items were requested in the Feasibility Study in 2000. Among them, 3 items were the same titles in the recommendation in the M/P Study. The JICA Team heard from MOE their actions taken previously and reasons of the requests for all 5 items. Subsequently, the JICA Team visited and studied in the targeted Power Plants.

1) Improvement of Steam Turbine Efficiency
2) Fuel Oil Balance Study
3) Improvement of Simulation Models
4) Improvement of Cooling System
5) Improvement of Wastewater Treatment System

The Follow-up Study concentrated in environmental control matters, as the M/P Study was to formulate frames of environmental impact assessment procedures and to recommend mitigation plans of power plants.

Table 1.1 Field Study Schedule

	Date in 2002		Time	Description	Stay
1	Nov./14	Th.	15:30 24:30	Depart: Tokyo (IR801) via Beijing Arrival: Tehran	 Tehran
2	Nov./15	Fr.		Preparation	Tehran
3	Nov./16	Sa.		Discussion with MOE	Tehran
4	Nov./17	Su.		Visit: Embassy of Japan Discussion with MOE	Tehran
5	Nov./18	Mo.		Discussion with MOE	Tehran
6	Nov./19	Tu.	17:30	Move to Esfahan (IR329)	Esfahan
7	Nov./20	We.		Visit: Esfahan Power Plant	Esfahan
8	Nov./21	Th.		Ditto	Esfahan
9	Nov./22	Fr.	21:30	Move to Tehran (IR252)	Tehran
10	Nov./23	Sa.		Discussion with MOE	Tehran
11	Nov./24	Su.	 21:50	Discussion with MOE Report to Embassy of Japan Two member depart: Tehran (IR800)	Tehran
12	Nov./25	Mo.	12:55 15:45	Two member arrival: Tokyo Move to Tabriz (IR445)	 Tabriz
13	Nov./26	Tu.		Visit: Tabriz Power Plant	Tabriz
14	Nov./27	We.		Visit: Tabriz Power Plant	Tabriz
15	Nov./28	Th.		Study: Collected information	Tabriz
16	Nov./29	Fr.		Study: Collected information	Tabriz
17	Nov./30	Sa.		Visit: Tabriz Power Plant	Tabriz
18	Dec./1	Su.		Visit: Tabriz Power Plant	Tabriz
19	Dec./2	Mo.	8:00 13:30	Move to Tehran (IR446) Move to Esfahan (IR315)	 Esfahan
20	Dec./3	Tu.		Visit: Esfahan Power Plant	Esfahan
21	Dec./4	We.		Visit: Esfahan Power Plant	Esfahan
22	Dec./5	Th.		Study: Collected information	Esfahan
23	Dec./6	Fr.		Study: Collected information	Esfahan
24	Dec./7	Sa.	16:00	Move to Tehran (IR222)	Tehran
25	Dec./8	Su.		Discussion with MOE	Tehran
26	Dec./9	Mo.		Discussion with MOE	Tehran
27	Dec./10	Tu.		Discussion with MOE	Tehran
28	Dec./11	We.	 19:55	Report to Embassy of Japan Depart: Tehran (IR800) via Beijing	
29	Dec./12	Th.	12:55	Arrival: Tokyo	

The following 1) to 5) were execution plans for the 5 study items requested in the Feasibility Study. (Note: the plans were prepared before the inception of the Follow-up Study)

1) Improvement of Steam Turbine Efficiency

The M/P Study recommended replacing diaphragm packing (labyrinth packing) and shaft packing of the high pressure (HP) and intermediate pressure turbines, and also rotating blades (rotors) of the HP turbine. The total estimated cost was US$ 5,000,000.

"No progress in Tabriz and contracted with the Esfahan Technical University for improvement of turbine efficiency" were the information given from the Iran side (May 14, 2002).

The JICA Team will hear from MOE reasons of the proposal of this item and discuss with power plants their actions taken for the improvement of turbine efficiencies up.

2) Fuel Oil Balance Study

MOE had adopted a general policy that all power plants using fuel oil should convert to natural gas as fuel for power generation in future. The JICA Team of the Master Plan Study gave its anxiety for fuel oil surplus in Iran as one of recommendations to be further investigated by a) having a study committee, b) estimating possible domestically consumed amounts of fuel oil, c) finding economical way of sulfur removal from fuel oil including in power plants, d) assuming future trends of fuel oil export markets, etc.

According to the reply from the Iran side, the Esfahan Power Plant consumed 9,240,000 m^3 of natural gas in 2000, and the Tabriz Plant would consume the similar amount in 2003.

The JICA Team will discuss with MOE and study conclusions of the conversation between MOE and related organizations. As this study can not be solved by MOE only, opinions of other organizations, such as Ministry of Oil, are most interested.

3) Improvement of Simulation Models

The regional simulation models of the Master Plan Study were formulated with lack of information on stationary and mobile sources other than power plants. The models have to be refined in cooperation with related organizations in the regions if it is

required to establish more accurate models to investigate the pollution mechanisms in the regions. However, the related technologies of refining were already transferred to the then counterpart team. The team will be able to do if additional data is presented.

The JICA Team will discuss with MOE on this item about MOE's action since the Master Plan Study has recommended. If other related organizations have shown MOE their necessity to have such simulation models, the JICA Team may discuss with the organizations on this topic.

4) Improvement of Cooling System

During the M/P Study, the JICA Team noticed the condensate clouds formulated by the steam from cooling towers. However, there was no concern from both power plants. Other than the clouds, the JICA Team has no notice of problems on the cooling system.

The JICA Team will hear from MOE the necessity of cooling system improvement. Subsequently the Team will visit and study situations in the plants. The Team will present its ideas to improve the situations if possible.

5) Improvement of Wastewater Treatment System

The JICA Team will hear from MOE its proposed reasons of this study item. Subsequently the Team will visit and study situations in the plants. The Team will present its ideas to improve the situations if possible.

(3) Inception

As concerned in Article (1) and (2) the above, this Follow-up Study was started after confirmation of reasons of requests, existences of problems, items to be studied in both power plants.

Table 1.2 Lists of Recommendation in M/P and Requested in F/S

No.	Recommended in M/P	Purposes	MOE	T	E	No.	Sub-items	Problems found during M/P	Remarks
1	Maintenance & Management of Power Plant	Improvement of power generation efficiency and prevention of air pollution	○	○	○	1-1	Holding vacuum of condense at design value	Turbine efficiency was lowered due to higher vacuum of 20 mmHg than designed	
				○	○	1-2	Management of stack gas temperature	200℃ against designed 170℃ made higher heat loss and lower heat efficiency.	
				○	○	1-3	Control of O_2 % at exit of economizer	Not functioning O_2 analyser on control panel	
				○	○	1-4	Realization of air heater efficiency	High O_2 % at exit of air heater （12%? 17%）	
				○	○	1-5	Maintenance of operational instrument	Lack of reliability of panel and field instruments	
2	Improvement of Turbine Eff.	To improve 2% efficiency by replacing rotor & packings in [TJU2	○	○		2-1	Replacement of high press rotor and packings in Tabriz U2	Generation efficiency was too low at 33%.	US$5,000,000
3	Environmental Control Organization in MOE	Capacity-up of Environmental Department in MOE and installment of Department in each power plants	○	○	○	3-1	MOE	Too many to solve now and future	
						3-2	Each power plant	No organization of environmental control in power plant	
4	Plant Operator Training	More understanding of pollution causes and contermeasures in engineers and operators of power plants	○	○		4-1	Education at school, and a demonstration plant	Lack of appropriate references, besides 'Energy and Environment' made by MOE	US$ 96,500 for monitoring analysers of a demonstration plant
								Lack of educational plant	
5	Stack Gas Monitoring	Periodical monitoring to accumulate data of emissions with boiler operating conditions.	○	○	○	5-1	Regular monitoring at each power plant	No reliable monitored data	
6	Fuel Oil Balance Study	To find feasible ways to solve excess fuel oil issue caused by gas conversion in power plants	○			6-1	(as given in the purposes)	Various studies are needed.	For 4 years
7	SPM Monitoring and Source Identification	To plan to reduce excess SPM in Esfahan	○			7-1	CMB analyses after monitoring in Esfahan area	SPM is possibly high in Esfahan at 260μg/m^3 of daily average.	US$510,000 for 3 years
8	Improvement of Simulation Model	To establish comprehensive control plans	○			8-1	Input of more accurate local data of emission sources for more accurate model construction	Lack of data on emission sources other than power plants	US$250,000 and 30 man-months

	Additionally Requested by F/S						Statuses in 2000	Remarks
9	Improvement of Cooling System	Confirmation of current statuses, cause of the request, etc.	○	○		9-1	Condensate clouds in winter	
					○	9-2	ditto	
10	Improvement of Wastewater System	ditto	○	○		10-1	T: discharge to river without treatment	
					○	10-2	E: discharge to river after neutralization	

（Note）No.2,6,8 are requested in F/S in 2000.
MOE：Ministry of Energy, T: Tabriz Power Plant E: Esfahan Power Plant (P/P)
○ : Needed cooperation with other official agencies for implementation