Jamshoro Thermal Power Station Project

Report Date: March 1999

1 Project Summary and Japan's ODA Loan

This project aimed to build one heavy oil-burning thermal generator with a capacity of 250MW on the outskirts of Jamshoro, which is located on the west bank of the Indus, 160km northeast of Karachi. The generator was built to meet rapidly growing electricity demand, mainly around Hyderabad.
The ODA loan covered the entire foreign currency portion of the project cost.

Borrower	President of Islamic Republic of Pakistan
Executing Agency	Pakistan Water and Power Development Agency (WAPDA)
Loan Amount	¥21,736 million
Loan Disbursed Amount	¥20,987 million
Date of Exchange of Notes	November 1983
Date of Loan Agreement	February 1984
Final Disbursement Date	December 1993

2 Analysis and Evaluation

(1) Project Scope

Minor alterations were made to suit conditions in the field, but the major facilities were installed as planned. The increased use of consulting services was due to the prolonged implemetation schedule.

(2) Implementation Schedule

The transfer of the plant took place in April 1990, approximately 27 months later than planned at the time of the appraisal. Furthermore, the construction of appurtenant works (warehouses, heavy oil tanks, maintenance wing) and the procurement of equipment and materials for maintenance were not completed in time for the transfer of the plant. The project was not totally completed until January 1994, six years later than planned.

The breakdown of the delay in the plant construction is 22 months before the start of construction and five months during construction. The pre-construction delay consisted of 15 months for bidding preparation and 19 months for bidding evaluation and contract procedures, both of which were unusually time-consuming. Furthermore, the latter delay stage was due to alterations in working procedures caused by the inexperience of local civil works contractors, flooding of the River Indus,

damage to delivered equipment in transit within the country, labor shortage due to nocturnal curfew orders and other difficulties. The delay in the start of construction of the appurtenant facilities was largely due to delays in making contracts with local contractors.

(3) Project Cost

It was agreed that ODA loan should cover approximately 70% of the foreign currency portion of the project cost as Phase I. As a result of the tenders offered, the contracted cost for the entire project was within the ODA loan for Phase 1. Therefore the planned Phase 2 loan was not carried out. Due to the implementation schedule delays, inflation and increased unit costs for civil works, the local currency portion of the project cost increased in the areas of taxation, interest during construction, consulting services and other aspects. Due to the reduced foreign currency portion of the project cost and the steep fall in the value of the Rupee against the Yen, the total Yen-based project cost was lower than planned.

Comparison of Original Plan and Actual

Item	Plan	Actual
1.Project Scope		
i) Construction of the main work of the Project		
・Boiler	Steam pressure : 171.4 / 134kg / cm^2 ×1	As planned
・Turbine	Capacity : 250 MW ×1	
・Generator	Capacity : 294 KVA ×1	
・Transformer	Capacity : 300 MVA ×1	
・Control system	1 unit	
・Heavy oil tank	Storage capacity 600 kl ×3	
・Other related equipment	Switchgear, cooling device, water treatment equipment, communications, fire fighting facilities, flue gas chimney etc.	
ii) Civil works	Fundamental/main buildings, service wire, housing area etc.	
iii) Consulting services	148.5 M/M	211.4 M/M
2.Implementation Schedule		
(Start of construction to Completion of construction)	March 1985 to January 1988 (34 months)	January 1987 to January 1994 (84 months)
3.Project Cost		
Foreign currency	¥30,713 million	¥20,987 million
(ODA loan portion)	(¥21,736 million)	(¥20,987 million)
Local currency	Rp. 1,931 million	Rp. 3,363 million
Total	¥66,444 million	¥41,871 million
Exchange Rate	Rp.1 = ¥18.5, 1983	Rp.1 = ¥6.21 (average between 1987 and 1993)

(4) Project Implementation Scheme

Executing agency was Pakistan Water and Power Development Agency (WAPDA). For this project, WAPDA divided the power station construction into six contract packages, which were ordered separately. WAPDA was unable to run the tendering process and the implementation management in parallel, and the implementation schedule (particularly the construction of appurtenant facilities) was severely delayed as a result. The reasons for the delay include some acts of god, but considering the level of its own management ability, WAPDA needed to look for ways of making the management work simpler and faster, by opting for a full turnkey solution for the construction, or at least by cutting down the number of contracts.

(5) Operations and Maintenance

Jamshoro Thermal Power Station includes the No.1 generator built under this project, and three others (each 210MW × 3 = 630MW). It operates as a power station with a total capacity of 880MW. In March 1999, 1,472 people worked at the power station, of whom 368 worked at the No.1 generator built under this project. No.1 generator began operation in April 1990, and by June 1998 it had generated 9,649GWh in over 57,000 hours of operation.

Fiscal Year	89/90	90/91	91/92	92/93	93/94	94/95	95/96	96/97	97/98
Operation Hours	3,407	6,949	8,071	7,889	6,929	7,669	7,400	4,073	3,742
Generating Volume (GWh)	597	1,035	1,394	1,535	1,249	1,351	1,244	620	624

The generator should be overhauled (stripped down, inspected and repaired) after five years or 35,000 hours in operation (reached in 1994/95), but it has not been overhauled, due to shortages of spare parts and funding, moves towards privatization and other factors. Therefore, as the table above clearly shows, the generator's working status has been deteriorating since 1996/97. Its working hours peaked at 8,071 hours in 1991/92, but declined to 4,073 in 1996/97 and 3,742 in 1997/98. The pattern for generating volume has been similar, peaking in 1992/93 at 1,535GWh and declining to 620GWh in 1996/97 and 624GWh in 1997/98.

The worsening operational performance of the generator can apparently be attributed to the following causes:

-Impurities in the heavy oil fuel clog the air afterheater, disabling heat recovery from the boiler flue gas and reducing combustion efficiency.

-Steam leaks from the boiler tubes when it works at high output, and therefore the generator is unable to run at maximum output.

Since 1996/97, operation of the generator has been suspended in summer, except for emergency times, because the volume of hydroelectric power generation is greater. Winter, when the amount of hydroelectric generation declines, is the only time the generator is in continuous operation. The equipment to monitor the operation of the generator, which was installed as part of this project, has been out of order since 1996. Therefore it is impossible to read operational status from the displays or calculate operation records on line. The monitoring equipment should be repaired and improved before any serious analytical study or repair is made.

(6) Environmental Considerations

At the time of appraisal for this project, there were no emission standards in Pakistan, but the emission values measured from smoke discharge in 1995 recorded 3,143mg/m^3 of SO2, which exceeds the national emission standard of 400mg/m^3. The standard was introduced in 1993 and toughened in 1996. For NOx, the 1995 value was 1,000mg/m^3 (as NO^2), which was also above the standard of 400mg/m^3. However, SO2 and NOx in the atmosphere, when calculated according to the US EPA Screen Model (which assumes that the surface concentrations will be most increased within 1km of the emission source) come to maxima, averaged over the year, of 68 µg/m3 for SO2 and 16.06 µg/m^3 of NOx. According to those results, SO2 is somewhat over the environmental standard of 50µg/m^3 and NOx is well under the standard of 100µg/m^3. Furthermore, as there are no residential areas or equivalent facilities within 1km of the source, there appears to be little risk of environmental problems caused by smoke emissions from this project.

The portable analyzers introduced under this project became unusable in 1996 due to lack of spare parts, and consequently monitoring of SOx, NOx and suspended particulate matters is not continuous. A suitable environmental monitoring system must be set up, including resumed measurement. At present no environmental pollution countermeasures are compulsorily enforced at Jamshoro Thermal Power Station, but anti-pollution measures should be strengthened considerably in readiness for future restrictions. These measures should include switching to higher-quality fuel and better combustion management (enhanced thermal efficiency).

Water from the power station is discharged directly to the river without treatment, but the results of the water quality analysis carried out every month pass national environmental standards. On the other hand, greywater from the workers' housing is reused for irrigation without treatment or analysis. No problem has been indicated under current environmental standards, but swift action should be taken in the event that standards are revised in future and necessitate countermeasures.

The processing of residual oil does not pose any imminent danger of soil contamination, but it should be made clear whether the method used now has any impact on the soil, and countermeasures should be considered if necessary.

[Reference]

Privatization plans for the Jamshoro Thermal Power Station

In 1992 the Pakistani government petitioned the Japanese government for the addition of a 350MW heavy oil and gas generator to the Jamshoro Thermal Power Station. At the time, the Pakistani government promised that the power station would not be privatized, and JBIC conducted a Special Assistance for Project Formation. However, in 1994 the participation of private companies in electrical power projects was permitted and the Pakistani government changed its policy, deciding not to make any further expansions to state-owned power stations. The petition for an additional generator was formally withdrawn.

The Pakistani government has organized all the power stations under WAPDA management into three state-owned enterprises, Genco 1, 2 and 3 and it has announced its plan to privatize those enterprises. Jamshoro Thermal Power Station was reorganized into Genco 2 in September 1997. However, at present there are no firm schedules for privatization.

(7) Project Effects and Impacts

(i)This project generated 9,649GWh between FY 1989/90 and FY 1997/98. This was equivalent to approximately 4% of the

total amount of power generated in Pakistan over that period.
(ii)This project created approximately 400 jobs, with a further 175,000 people employed during the construction period. It has also provided opportunities for personnel training for WAPDA workers.

3 Lessons Learned

For large and complex projects such as the construction of a large power station, the executing agency should make an overall evaluation of its own management ability and implement the project with a number of contracts it can realistically manage. It is very important that the JBIC should consider the scale of the project and the ability of the executing agency and give it advice as to the right number of contracts.
The procurement and construction for this project were divided into six lots (contracts), but the executing agency found it difficult to manage all the lots (contracts) simultaneously, risking implementation schedule delays. If the project was carried out with fewer contracts, or as a full turnkey solution, the coordination and management of construction and procurement operations would have been more efficient and most of the delays would have been avoided.

Main Entrance of the Jamshoro Thermal Power Station

A View of the Jamshoro Thermal Power Station showing Boiler and Turbine Building in the Background

A View of the Jamshoro Thermal Power Station ,Cooling Tower on the Left.