The Philippines

Leyte-Bohol Interconnection Project

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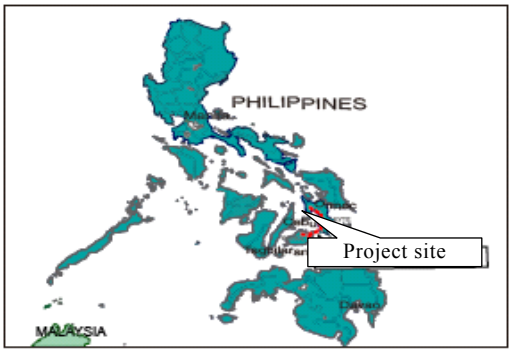
Field Survey: November 2006, February 2007

1. Project Profile and Japan's ODA Loan



Map of project area

Ubay Substation

1.1 Background

After overcoming the power shortage crisis, the Philippines still required the construction and expansion of power generation, transmission and substation facilities as further increase in the power demand was expected with the economic growth. In the Philippines, a plan was underway to connect the major islands by transmission lines to form a nationwide grid, aiming at ensuring reliable power supply and controlling the power generation capacity through the efficient use of emergency power. As of 1995, most of the main interconnection lines were completed or under construction. The Leyte-Bohol route and the Leyte-Mindanao route were the only main routes that were left unconnected.

The power supply in Bohol Island as of 1996 was approximately 30 MW which generated mainly by small-size hydroelectric power generation and diesel power generation. The capacity of the hydroelectric power plant was small and power generation was unstable because it depends on precipitation. However, diesel power generation frequently stopped due to the aging of the plant. As more companies were expected to start their operations in Bohol, power demand was predicted to exceed 50 MW after 1998. In order to cope with an increase in power demand, securing stable power supply became an urgent task.

1.2 Objective

The project objective was to cope with the increase in power demand in Bohol Island and to ensure stable power supply by constructing a submarine cable and other transmission lines between the islands of Leyte and Bohol which interconnect Bohol Island to national power grids, thereby contributing to the economic development of the island.

1.3 Borrower/Executing Agency

National Power Corporation of the Philippines (guaranteed by the Government of the Republic of the Philippines)[1]

1.4 Outline of Loan Agreement

Loan Amount / Loan Disbursed Amount	8,086 million yen / 7,698 million yen
Exchange of Notes / Loan Agreement	March 1997 / March 1997
Terms and Conditions -Interest Rate -Repayment Period (Grace Period) -Procurement	 2.7% (2.3% for the consultant services) 30 years (10 years) General untied
Final Disbursement Date	July 2004
Main Contractors	Kanematsu Corporation, Nissho Iwai Corporation, Xian Electric Import/Export Co. Ltd (China), Zhejiang Electric Transmission & Distribution Engineering Corporation (China)
Consultant Services	Electric Power Development, Co., Ltd. (J-Power)
Feasibility Study (F/S), etc.	1996 National Power Corporation of the Philippines 1996 SAPROF

2. Evaluation Result

2.1 Relevance

2.1.1 Relevance at the time of appraisal

At the time of appraisal of this project, infrastructure development was listed among

[1] In the Philippines, division and privatization of the power sector has been underway since the Energy Power Industry Reform Act (EPIRA), which took effect in June 2001. Under this act, transfer of the assets and liabilities of the National Power Corporation (NPC) that had engaged in power generation and power transmission until then to the Power Sector Assets and Liabilities Management Corporation (PSALM) has been in progress since July 2001. The power transmission business is succeeded by TRANSCO (established in 2001 and starting operation independently in March 2003), which is affiliated with PSALM. Under EPIRA, TRANSCO held several bids for the concession contract (25 years) with private companies for the operation and management of the power transmission business. However, no private company has been selected yet.

the five priority areas in the Medium-Term Philippine Development Plan (1993–1998). The plan set objectives to meet the energy demand necessary for regional development and promote the diversification of power sources in order to ensure stable power supply at the minimum cost. The Power Development Plan (1996–2005) included a plan to build an integrated grid connecting Luzon, Visayas, and Mindanao and, for that purpose, a series of projects to connect the main islands was designed. The construction of transmission lines between Leyte and Bohol was one of the major interconnection projects in Visayas. This project was aimed at transmitting electricity from a geothermal power plant in Leyte to Bohol Island by constructing transmission lines between Leyte and Bohol. Therefore, this project was consistent with the aforementioned national and sector policy and considered highly relevant.

2.1.2 Relevance at the time of appraisal

At the time of evaluation, the Medium-Term Philippine Development Plan (2004–2010) stressed the fight against poverty as the main issue and focused on the promotion of economic development and creation of employment opportunities. In the electric power sector, "supplying electricity and water regularly to every part of the country" was listed among the 10-point legacy agenda of President Arroyo. In order to ensure stable power supply, to promote the reform in the electric power sector, and to move toward self-sufficiency of electricity, the aforementioned plan sets the objectives to improve and expand transmission facilities of National Transmission Corporation (TRANSCO). The Transmission Development Plan (2005–2014) developed a long-term objective of building an integrated grid covering the entire country and high priority is placed on the construction and extension of transmission lines connecting main islands. Thus, this project is consistent with the above-described national and sector policy and has been relevant since the time of the appraisal.

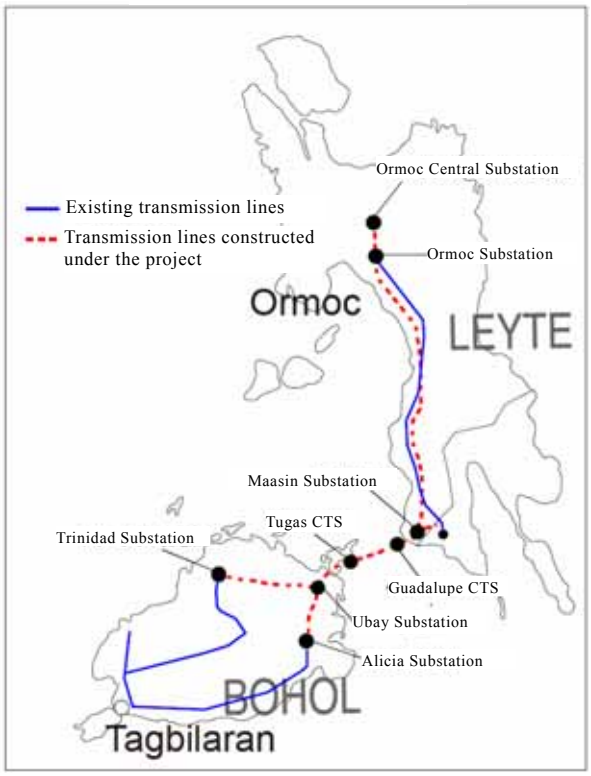
2.2 Efficiency

2.2.1 Outputs

This project was implemented in two stages as planned at the time of appraisal. In Stage I, by the construction of a submarine cable between Leyte and Bohol and that of related transmission lines and substation facilities on both banks, the grids in Leyte and Bohol were connected to each other by 69-kV lines. In Stage II, related transmission lines and substation facilities were constructed in order to raise the voltage of the Leyte-Bohol submarine cable to 138 kV. The transmission lines and substations constructed or expanded under this project are shown in Figure 1.

The project was implemented almost as planned. The transmission line between Leyte and Bohol was constructed as planned. The overhead transmission lines between the two islands were also constructed almost as planned, apart from some changes such as the reduction in length as a result of the survey of the actual sites. As for the substation facilities, the number of outlets from substations was increased from 13 (planned) to 16 (actual) for the more effective utilization of power grids, and the number of capacitors also increased from 6 units (planned) to 19 units (actual) in order to increase the transmission voltage and reduce power loss (see "Comparison of Original and Actual Scope").

Figure 1: Project Site



2.2.2 Project period

The project period was planned to last 49 months from March 1997 to April 2001. As mentioned above, the project was implemented in two stages. At the completion of Stage I, the transmission lines between Leyte and Bohol started transmission of electricity at the voltage of 69 kV in February 2001. In Stage II, the voltage was raised and 138-kV power supply started in August 2004. It took 90 months from the signing of the loan agreement (March 1997) to start the 138-kV power supply via the submarine cable between Leyte and Bohol (August 2004). As a result, the length of the actual project period was 184% of the planned. The delay was mainly due to the time taken for the bidding procedure in each of Stage I and Stage II.

2.2.3 Project cost

The cost of the project was estimated at 9,382 million yen (foreign currency portion: 8,086 million yen). The actual project cost was 7,918.54 million yen (foreign currency portion: 7,698.85 million yen)[2], the amount which was less than initially estimated. In

[2] As sufficient data was not collected concerning a part of the local currency portion of the cost that should be included in the actual cost, the amount of such part is not included in the actual cost. However, considering that the excluded part occupied a very small part of the planned cost, it is presumed that the actual cost would be less than the estimate even if the unaccounted expenditure were taken into account.

comparison of the foreign currency portion alone, the actual amount was almost as planned, or 95.2% of the estimation.

2.3 Effectiveness

2.3.1 Evaluation criteria

This project is to meet a future increase in the demand for electricity and to achieve stable supply of electricity by the construction of transmission lines between Leyte Island and Bohol Island. On the assessment of the Effectiveness, both “achieving stabile supply of electricity” and "coping with an increase in electricity demand" were major considerations but "utilization of transmission facilities" was evaluated either. After being implemented, the project contributed to the more stable supply of electricity to beneficiaries and to a decrease in frequency/hours of forced outage. Furthermore, the project increases electricity supply in Bohol Island which would cope with future increase of electricity demand. As the demand for electric power in Bohol Island does not grow as forecasted, the transmission facilities under the project had not used as planned. However, the transmission facilities satisfies approximately 80% of the electricity demand supply in Bohol Island and, therefore, achieve both stabile supply of electricity and meeting an increase in electricity demand.

2.3.2 Stable power supply to Bohol Island

Table 1 and Table 2 below show the utilization rate[3] of transmission lines and substation facilities constructed under this project. They have been working almost fully throughout the year and are considered to contribute to the stabilization of the power supply.

Table 1: Availability Factors of Transmission Lines Constructed in the Project

(%)

Transmission lines	01	02	03	04	05	06
Ormoc Central Substation －Ormoc Substation	99.51	99.41	99.84	99.99	99.56	99.78
Ormoc Central Substation －Maasin Substation	---	---	---	92.82	95.30	98.79
Maasin Substation －Guadalupe CTS	97.69	95.57	96.99	95.67	99.88	99.72
Guadalupe CTS －Tugas CTS	97.69	95.57	96.99	95.67	99.88	99.72
Tugas CTS －Ubay Substation	97.69	95.57	96.99	95.67	99.88	99.72
Ubay Substation －Trinidad Substation	98.38	99.01	96.08	91.54	99.52	99.23

[3] Availability factor = (total hours of the period - outage hours) / total hours of the period

Ubay Substation －Alicia Substation	98.44	99.18	96.70	91.04	99.96	99.50
Ubay Substation －C.P. Garcia	98.44	99.18	96.70	91.04	99.96	99.50

Table 2: Availability Factors of Substation Facilities Constructed in the Project

(%)

Substation facilities	01	02	03	04	05	06
Ormoc Central Substation 138/69 kV, 50 MVA	99.99	99.98	99.98	98.36	99.82	99.99
Maasin Substation 138/69 kV, 30 MVA	99.98	100	99.95	100	99.99	99.99
Ubay Substation 69/13.8 kV, 5 MVA	99.32	99.85	99.87	99.73	99.86	99.63
Ubay Substation 138/69 kV, 100 MVA	---	---	---	99.82	99.90	99.57

Source: TRANSCO

Figure 2: Annual Forced Outage Duration and Times per User

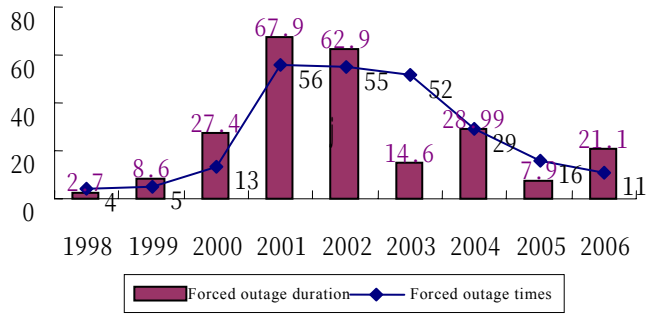
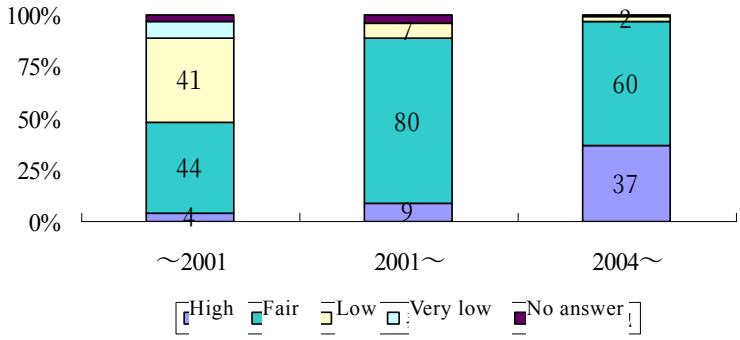


Figure 2 shows the annual forced outage hours and frequency per user in Bohol Island. After the completion of Stage I of the project (2001), power supply from the geothermal power plant in Leyte Island to Bohol Island started. In Stage I (2001–2004), however, as a 69-kV transmission line used wooden poles in Leyte Island, the outage hours and frequency in Bohol Island temporary increased as these poles were damaged by natural disasters such as typhoon. Since 2004, the outage hours and frequency have been decreasing. The electricity supply to Bohol Island has been improved and stabilized because iron pylons were implemented in 138-kV transmission lines in Leyte Island with the completion of Stage II (2004).

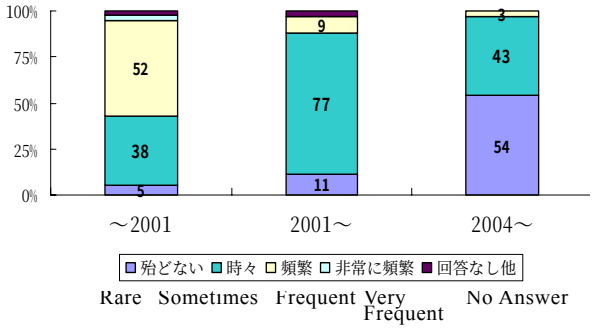
For this ex-post evaluation, evaluators conducted a beneficiary survey on the power supply by interviewing companies located in Bohol Island. In the beneficiary survey, the power supply situation was divided to three periods: "Before the completion of Stage I (–2001)", "After the completion of Stage I (2001–)", and "After the completion of Stage II (2004–)". According to the results, the number of respondents who said outage frequency has decreased and the voltage has been stabilized after the project was implemented as shown in Figures 3–5, evidencing that the reliability of power supply has improved.

Figure 3: Reliability of Power Supply



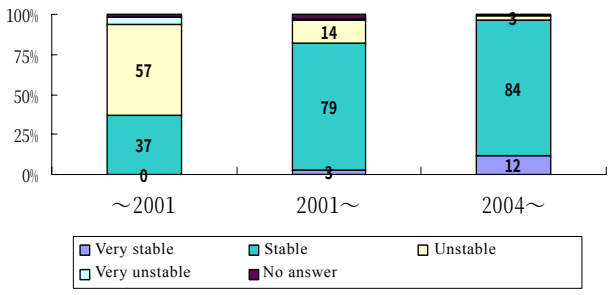
Source: TRANSCO

Figure 4: Outage Frequency



Source: Beneficiary Survey

Figure 5: Voltage Stability



2.3.3 Supply for power demand in Bohol Island

The power supply[4] to Bohol Island under the project is shown in Table 3 below. As of one year from the project completion, the actual power supply from Leyte to Bohol (171.7 GWh for 2005) fell short of the volume estimated at the time of planning (254 GWh). The actual power demand was weaker than predicted at the time of appraisal.[5] However, if 69-kV transmission lines had been constructed, the transmission capacity would have been insufficient and stable power supply to meet the present demand would not have been realized. Therefore, the construction of 138-kV transmission lines is not considered to be an overinvestment. According to the interview with the electric distributors in Bohol Island, they can now adequately deal with the peak demand with the power supply from Leyte Island, which was previously impossible. Also, restrictions on power usage which were placed before the implementation of project have been eliminated. Thus, in Bohol Island, power supply is sufficient to meet the demand.

As shown in Table 4 below, the total power supply in Bohol Island substantially increased from 1995 before the project was implemented. Given that the volume of power supply under this project accounts for approximately 80% of the total power supply (as of 2005), this project presumably plays an vital role in the supply of electric power in order to meet the demand in Bohol Island.

Table 3: Net Electric Energy Production

(unit: GWh)

	2004	2005	2006 (Jan.–Sep.)
Transformer at Ubay Substation	61.4	171.7	151.4

Source: TRANSCO

[4] Power supply from the transformer (100 MVA) at Ubay Substation constructed under the project
[5] Another reason is that several large-scale projects that were expected to be carried out at the time of planning were not realized.

Table 4: Changes in Power Supply in Bohol Province

(unit: GWh)

1995	2001	2002	2003	2004	2005	2006
88	143.0	160.4	166.4	192.8	221.6	193.4

Source: TRANSCO, NPC

2.3.4 Financial Internal Rate of Return (FIRR)

For the calculation of FIRR of this project, the increase in the income from electric power consignment was used as the benefit, the investment cost and operation and maintenance expenses were used as the costs, and the project life was assumed to be 30 years. As a result, FIRR was calculated at 4.31%.

2.3.4 Recalculation of economic internal rate of return (EIRR)

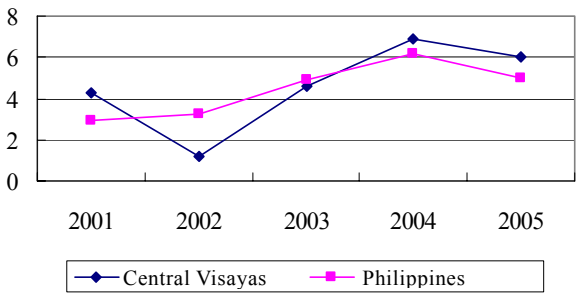
EIRR was recalculated at 28.67% (at the time of appraisal it was 15%) based on the cost of the project and the increase in the operation and maintenance expenses resulted from the project as the total cost and the increase in electricity rates[6] as the benefit, assuming the project life is 30 years. The increase from the appraisal time is mainly attributable to the increase in the consumers' willingness to pay.

2.4 Impact

2.4.1 Contribution to economic development

The gross domestic product (GDP) of the Philippines has grown steady at 5–6% since 2003. The gross regional product of Central Visayas[7] where Bohol Province is located achieved a growth rate higher than that of the Philippines's GDP in 2004 and 2005 consecutively (Figure 6).

Figure 6: Changes in GDP and GRP



Investment in Bohol Province has been increasing steadily since 2002 and the amount of new employment has also been increasing substantially (Table 5). Since Bohol Province gives importance to the promotion of eco-culture tourism and agro-industry, the

[6] The electricity rates used for the calculation of EIRR are based on the willingness of users to pay.
[7] Central Visayas consists of Negros Oriental, Cebu, Bohol, etc. As GRP data is not available only for Bohol Province, the GRP data for Central Visayas was used.

number of passenger arrivals has been increasing steadily with the development of the tourism industry in the province (Table 6). According to the interview to the Bohol Provincial Government and Bohol Investment Promotion Center, this project was very timely as the tourism boom began in 2001. According to an interview with a resort hotel, stable power supply contributes to the stable operation of air-conditioners and other electric equipments and results in the improvement of services for tourists. Thus, stable power supply presumably supports the tourism boom by improving the business environment in the tourism industry.

Table 5: Changes in Investment in Bohol Province

	2002	2003	2004	2005	2006
Number of registered cases	1,497	2,300	3,342	4,531	5,422
Rate of increase from the previous year	17.00%	53.64%	45.30%	35.58%	19.66%
Amount (unit: billion pesos)	1.129	1.796	2.331	2.971	4.045
Rate of increase from the previous year	8.20%	59.08%	29.79%	27.46%	36.15%
Number of newly employed persons (unit: person)	1,497	2,300	3,342	4,531	5,422
Rate of increase from the previous year	5.56%	53.64%	45.30%	35.58%	19.66%

Source: Bohol Investment Promotion Center

Table 6: Passenger Arrivals in Bohol Province

(unit: thousand persons)

2000	2001	2002	2003	2004	2005	2006
85.4	95.3	132.9	247.8	313.5	393.9	415.5

Source: Bohol Tourism Office

As mentioned above, power consumption in Bohol Island as a whole increased substantially. By user category (Table 7)[8], power consumption in the commercial sector in Tagbilaran, the capital of the province, increased 2.3 fold from that of pre-project period was implemented. Also in other areas than Tagbilaran, the total power consumption of the commercial and industrial sectors marked a 2.4-fold increase approximately. The power supply under this project, which accounts for approximately 80% of the total power supply in Bohol Island, plays a vital role in power supply of the island. Therefore, this project presumably contributes to the improvement of the business environment in Bohol

[8] Changes in power consumption by customer category of three distribution companies located in Bohol Province

Island and support economic growth of the province by an increase in power supply of the island. In the beneficiary survey, more than 70% of the surveyed companies answered that the business conditions "substantially improved" or "improved" as a result of the project (table 8), showing that the project contributes to the improvement of business environment. For this project, the number of beneficiaries is estimated to be approximately 960,000[9], approximately 80% of the population of Bohol Island (approximately 1.25 million).

Table 7: Changes in Power Consumption by User Category in Bohol

(unit: GWh)

Capital Tagbilaran

	1996	2005	Index 1996 as 100
Household	10.8 (36%)	25.8 (40%)	238.8
Commercial	13.7 (45%)	31.2 (48%)	227.7
Others	5.7 (19%)	7.3 (11%)	128.0
Total	30.2 (100%)	64.3 (100%)	212.9

Source: Government of Bohol Province

Other areas than Tagbilaran

	1996	2005	Index 1996 as 100	
Household	25.8 (56%)	67.1 (58%)	260.0	
Commercial	8.0 (18%)	28.0 (24%)	350.0	Total 237.5
Industrial	8.5 (18%)	11.2 (10%)	131.7	
Others	3.7 (8%)	8.5 (7%)	229.7	
Total	46.0 (100%)	114.8 (100%)	249.5	

Source: Data by Bohol I Electric Cooperative, Inc. and Bohol II Electric Cooperative, Inc.

Table 8: Contribution of the Project to the Improvement of Business Conditions

	Rate
Substantially improved	24%
Improved	50%
Somewhat improved	22%
No impact	2%
No answer	2%

Source: Beneficiary Survey

2.4.2 Contribution to poverty reduction

The poverty rate in Bohol Province[10] decreased sharply from 50.2% in 2000 to 29.2% in 2003. In those three years, the poverty rate decreased by 21 percentage points,

[9] Estimated from the volume of power supply under this project and power supply per capita in Bohol Island

[10] The poverty line in Bohol Province (costs of food and other basic needs) was 9,762 pesos per capita (2000) and 10,032 pesos per capita (2003). The national poverty line was 11,458 pesos (2000) and 12,309 pesos (2003).

achieving the second largest decrease in the country. It seems that various factors contributed to poverty reduction in Bohol Province. The improvement of business environment brought by this project is considered as one.

Table 9: Changes in Poverty Rate (national average and in Bohol Province)

	2000	2003	Decrease
Bohol Province	50.2%	29.2%	21.0%
National Average	27.5%	24.4%	3.1%

Source: Philippine National Statistical Coordination Board

2.4.3 Others

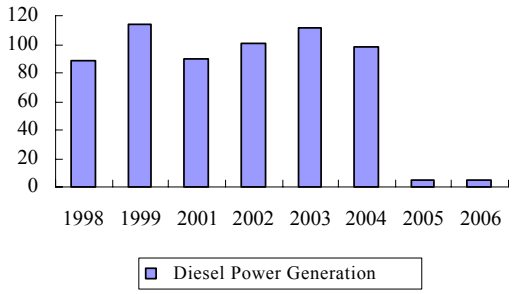
2.4.3.1 Environmental Impact

Prior to the implementation of this project, an Environment Compliance Certificate (ECC) has been obtained. During and after the implementation of project, monitoring was conducted in compliance with the content of the ECC. In accordance with ECC, TRANSCO paid 2.5 million pesos for forestation in alternate area (planting 48,000 tree seedlings) in return of deforestation for the construction of transmission lines. Thus, the requirements of the ECC are satisfied and no specific problem has been reported.

After the project was implemented, diesel power generation in Bohol Island substantially decreased (Figure 7), indicating that the project helped reduce environmental load in the island.

Figure 7: Operation of Diesel Power Generation[1)]

(unit: GWh)



Source: TRANSCO
Note1): Data for 2000 is not available.

2.4.3.2 Land acquisition and resident relocation

For the implementation of project, land acquisition was carried out and monetary compensation was provided to 382 households and 109 building owners. Procedures of land acquisition and compensation follow the law.

2.5 Sustainability

2.5.1 Executing agency

2.5.1.1 Technical capacity

TRANSCO regularly conducts in-house technical training. There are some exceptional cases in which foreign manufactures are asked to deal with mechanical troubles. In general, however, experienced employees performed the operation and maintenance of the facilities of this project. Therefore, there seems to be no specific problems in technical capacity.

2.5.1.2 Operation and maintenance system

In the Philippines, division and privatization of the power sector has been underway since the Energy Power Industry Reform Act (EPIRA), which took effect in June 2001. Under this act, transfer of the assets and liabilities of the National Power Corporation (NPC), which had engaged in power generation and power transmission until that time, to the Power Sector Assets and Liabilities Management Corporation (PSALM) has been in progress since July 2001. The power transmission business is succeeded by TRANSCO (established in 2001 and starting operation independently in March 2003), which is affiliated with PSALM. Under EPIRA[11], TRANSCO held several bids for the concession contract (25 years) with private companies for the operation and management of the power transmission business. However, no private company has been selected yet[12].

As of 2005, TRANSCO had 3,630 employees. Operation and maintenance of the facilities covered by this project are performed by Visayas Regional O&M, District 2 (40 technical staff) and District 3 (48 technical staff).

2.5.1.3 Financial status

The financial status of TRANSCO is shown in Table 10 and 11 below. In 2005, the capital ratio exceeded 40%, which indicates an improvement in long-term financial stability. The current ratio and quick ratio have been maintained at a level that would not cause any problem in the payment of short-term debts. In conclusion, the financial status of TRANSCO is healthy.

Table 10: Profit and Loss Statement of TRANSCO

Table 11: Financial Ratios of TRANSCO

[11] EPIRA stipulated that TRANSCO shall be privatized through (1) sales, or (2) concession contract.

[12] The latest bidding for TRANSCO's concession contract was conducted in February 2007 and only one company made a bid. Rebidding is planned, though the schedule has not been decided as of the time of this survey (February 2007).

(unit: million pesos)

	2003	2004	2005
Net Utility Income	23,960	24,221	24,298
Net Operating Income	15,452	15,145	16,217
Net Income	15,388	15,071	16,174

Source: TRANSCO Annual Report

	2003	2004	2005
Net Income to Net Worth Ratio (%)	23.3	22.4	42.0
Current Ratio (times)	1.83	2.09	2.01
Quick Ratio (times)	1.02	0.88	1.04

Source: TRANSCO Annual Report

2.5.2 Operation and maintenance status

The facilities under this project are inspected regularly. During the site-survey, no malfunction was found in the facilities. Stable power supply had been maintained. For these reasons, there seem to be no specific maintenance problems.

3. Feedback

3.1 Lessons Learned

N.A.

3.2 Recommendations

N.A.

Comparison of Original and Actual Scope

Item	Plan	Actual
(1) Outputs		
	1.Constructin of a submarine cable (approx. 17 km, 138 kV) between the south bank of Leyte Island and the east bank of Bohol Island	As planned (17 km, 138 kV)
	2. Construction of related overhead transmission lines on the both banks (approx. 153 km, 138 kV; approx. 52 km, 69 kV, etc.)	Almost as planned (reduction in the length of 5 transmission lines, change from an overhead transmission line [2.5 km] to a submarine cable [1.5 km], etc.)
	3. Construction of related substation facilities on both banks	Almost as planned (Outlets: 13 → 16; capacitors: 6 units → 19 units)
(2) Project Period	Mar. 1997–Apr. 2001 (49 months)	Mar. 1997–Aug. 2004 (90 months)
Detailed design / bidding/ signing of contract	Nov. 1996–Oct. 1997 (I) Sep. 1998–Apr. 1999 (II) (detailed design / bidding procedure)	Dec. 1997–Feb. 1999 (I) Jan. 2001–Sep. 2002 (II) (detailed design / bidding procedure)
Construction of transmission and substation facilities	Nov. 1997–Apr. 2001	Jul. 1999–Jan. 2001 (I) Apr. 2003–May 2004 (II)
Consultanting services:	Nov. 1996–Apr. 2001	Mar. 1997–Jun. 2004
Start of power supply		Feb. 2001 (I) Aug. 2004 (II)
(3) Project Cost		
Foreign currency	8,086 million yen	7,698.85 million yen
Local currency	1,296 million yen (324 million pesos)	219.7 million yen (98.96 million pesos)
Total	9,382 million yen	7,918.54 million yen
ODA loan portion	8,086 million yen	7,698.85 million yen
Exchange rate	1 peso ＝ 4 yen (as of May 1996)	1 peso ＝ 2.2 yen (2000–2004 average)