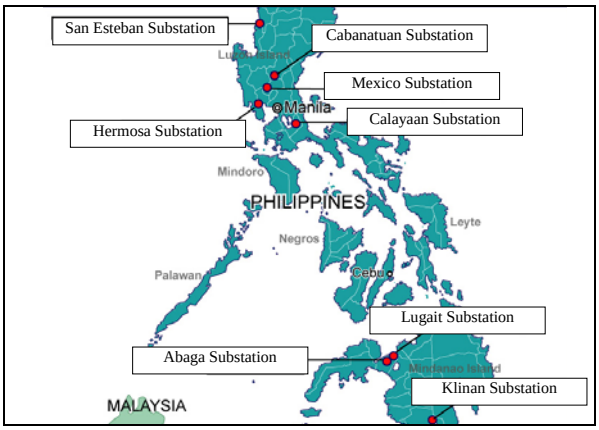
The Philippines

Improvement in Power Grid Project

Field Survey: July 2003

1. Project Profile and Japan's ODA Loan



Project Site

50MVA transformer installed at San Esteban Substation

1.1 Background

The power supply system in the Philippines is divided into 3 grids: Luzon, Visayas and Mindanao. The Luzon grid, which covers Metro Manila, has the largest demand accounting for 70% of total power demand in the Philippines. The Mindanao grid covers the second largest area after the Luzon grid. The power demand in its service area was predicted to increase during 1996-2000 by 16.8% on an annual average, the highest increase rate among 3 grids.

After new power plants driven by gas turbine, etc. started operations, the Luzon grid emerged from a power crisis at the end of 1993. From 1994 through the first half of 1995, it has maintained a reserve capacity of more than 300MW on average, which was enough to meet the power demand at that time. After that, construction of large base-load thermal power plants such as the No.2 Unit of the Calaca Coal-Fired Power Plant (300 MW) and Pagbilao Coal-Fired Power Plant (700MW) was planned. Also, for the Mindanao grid, Midanao I Geothermal Power Plant (108 MW) and Zamboanga Diesel Power Plant (112 MW) were constructed. Thus, steady progress in power source development was expected for the Luzon and Mindanao grids.

As for transmission and transformation facilities, aside from the plan to connect the Visayas grid to the Luzon grid, sufficient efforts, such as the construction of transmission lines and construction and extension of substations and the existing facilities, had not been made to improve the grid system so a capacity shortage was expected.

1.2 Objectives

This project aimed to install additional transformers at substations at the Luzon grid and the Mindanao grid operated by National Power Corporation where the load on the transformer was predicted to exceed its capacity by 1998 in order to cope with the increase in power demand.

1.3 Output

Procurement and installation of transformers and associated equipment at the following 8 substations within the Luzon grid and Mindanao grid

Substation	Work Content
Luzon Grid (5 substations)	
Mexico	Installation of an additional 230/ 69 kV- 100 MVA transformer
San Esteban	Installation of an additional 115/ 69 kV- 20 MVA transformer
Batangas	Installation of an additional 230/ 69 kV- 100 MVA transformer
Cabanatuan	Installation of an additional 230/ 69 kV- 50 MVA transformer
Bataan	Installation of an additional 230/ 69 kV- 50 MVA transformer
Mindanao Grid (3 substations)	
Maria Cristina	Installation of an additional 138/ 69 kV- 100 MVA transformer
Tacurong	Installation of an additional 138/ 69 kV- 50 MVA transformer
Aurora	Installation of an additional 138/ 69 kV- 50 MVA transformer

1.4 Borrower/Executing Agency

The Philippine National Power Corporation (NPC)/ NPC (guaranteed by the Government of the Republic of the Philippines)

1.5 Outline of Loan Agreement

Loan Amount / Loan Disbursed Amount	2,224 million yen / 1,366 million yen
Exchange of Notes / Loan Agreement	July 1995 / August 1995
Terms and Conditions - Interest Rate - Repayment Period (Grace Period) - Procurement	 2.7 % 30 years (10 years) General untied
Final Disbursement Date	December 2000

2. Results and Evaluation

2.1 Relevance

2.1.1 Relevance of Project Plan at Appraisal Time

At the time of appraisal, National Power Corporation (NPC) was pushing forward construction of power generation, transmission and transformation facilities based on the Power Development Plan (PDP) established in 1995 in response to the increase in power demand in the Luzon and Mindanao grids. The Plan mentioned substations including the 5 substations of the Luzon grid and 3 substations of the Mindanao grid covered by this project as those that needed capacity expansion by 1998 in order to deal with the increase in demand. Therefore, the objectives of this plan were consistent with the government's development policy and relevant at that time.

2.1.2 Relevance of Project Plan at Evaluation

The Philippine Energy Plan (2004-2013) stipulates the need for capacity expansion of substations along with extension of transmission lines to meet the increase in power demand. According to the estimate of the demand

for electricity made by the Department of Energy [*1] based on the GDP growth rates predicted by the National Economic Development Authority (NEDA), power demand will increase by 6.1% a year on average for 10 years from 2002 to 2011. In order to cope with this demand increase, it says, additional power generation capacity of 12,375 MW, extension of transmission lines by 10,106 cct-km, and installation of additional transformers with a total capacity of 18,345 MVA are necessary. Considering this situation, the objectives of this project are still relevant today.

2.2 Efficiency

2.2.1 Output

This project planned to install transformers at 5 substations in the Luzon grid and 3 substations in the Mindanao grid. Transformers were actually installed at the planned number of substations, though those that were to be installed at 5 among 8 designated substations were installed at different substations (including those under construction). The reason for the change for each of these 5 stations is shown in Table 1. In the case of the Batangas and Maria Cristina Substations, power demand in the Philippines in general did not grow as predicted[*2] due to the economic slowdown in the Philippines caused by the Asian currency crisis in 1997 and because the actual demand turned out to be smaller than predicted at appraisal due to the shutdown of a factory that was a major power user. Bataan Substation was needed less because the thermal power plant stopped operations due to facility deterioration, which pushed up power generation costs and made it difficult to satisfy the standards under the Clean Air Act. In the case of the Tacurong and Aurora Substations, additional transformers were installed in 1998 and 2000, respectively, with NPC's own funds. As a result, the transformers to be installed at these substations under the project were installed at neighboring substations that needed additional transformers.

There was no major change in the equipment procured, except for a slight change in the capacity of 2 out of 8 transformers and a small increase in associated equipment such as disconnecting switches[*3] and circuit breakers[*4] (see "Comparison of Original and Actual Scope" at the end of this report).

Table 1: Reason for the Change in 5 Substations Where Transformers Were Installed

Plan	Actual	Reason for Change
Batangas	Hermosa	Installation at Batangas Substation became unnecessary because power demand in the neighborhood was smaller than expected. At the Hermosa Substation, the existing transformer was destroyed by fire and a substitute transformer was urgently needed.
Bataan	Calayaan	As Bataan Thermal Power Plant stopped operations in 2000, installation at Bataan Substation became less necessary. Calayaan needed an additional transformer from the viewpoint of stabilizing the grid.
Maria Cristina	Abaga	As a large steelworks, the major user of Maria Cristina, was shut down and power demand declined, there was no need to install an additional transformer. The neighboring Abaga Substation needed an additional transformer to meet the increase in demand.

[1] Philippine Energy Plan (PEP) made by the Department of Energy in 2001

[2] At the appraisal time, the growth rate of peak power demand in the Luzon and Mindanao grids for 1996-2000 was predicted to be 12.0 % and 16.8%, respectively (data source: NPC Power Source Development Plan 1995), while the actual growth rate was 6.6% for the Luzon grid and 3.4% for the Mindanao grid. In the NPC Power Source Development Plan 1995, the transformer capacity of the Luzon and Mindanao grid was to be increased to 26,793MVA and 3,573MVA, respectively, by 2000, but the actual capacity is 21,936MVA and 2,963MVA, respectively, due to smaller demand growth.

[3] A disconnecting switch is operated without electricity passing through it, and is used to isolate a transmission or distribution line, transformer or circuit breaker from the circuit for inspection or repair.

[4] A circuit breaker is a switch that shuts down ordinary electricity to stop power supply and automatically shut off extraordinary electrical current in the event of an accident.

Tacurong	Klinan	As the demand on Tacurong Substation increased during the delayed project period, NPC installed a transformer in 2000 with its own funds. The neighboring Klinan Substation needed an additional transformer because it did not have enough capacity to meet the demand and was overloaded.
Aurora	Lugait	As the capacity of the existing transformer of Aurora Substation became insufficient, NPC installed a transformer with its own funds. The neighboring Lugait Substation needed an additional transformer to meet the increase in demand.

2.2.2 Project Period

Procurement of equipment with the ODA loan has been completed at all 8 substations covered by the projects. At first, the project was to be completed in December 1998 but the loan period was extended to December 2000 due to the delay in project implementation. However, Hermosa was the only substation where the new transformer started working within the extended period. As of the field survey in July 2003, installation work was in the preparation or implementation stage at 3 substations (Abaga, Lugait and Cabanatuan). The new transformer at Cabanatuan Substation started working in April 2004 and those at Abaga Substation and Lugait Substation are scheduled to start operating in January 2005 and November 2004, respectively.

The delay in the schedule is mainly caused by the following reasons: 1) design documents, bidding documents and computer data were lost in the fire at NPC headquarters in December 1996; 2) approval for implementation of the project and construction was delayed due to the delay in paperwork at NPC, which was busy preparing for the division and privatization of NPC and the establishment of TRANSCO; 3) it took time to obtain approval for the change in target substations and detailed designing; and 4) it took a long time to acquire land in Lugait and Cabanatuan.

2.2.3 Project Cost

The approved amount of the ODA loan was 2,224 million yen, all of which was to finance the foreign currency portion to cover the purchase of equipment including transformers. The actual disbursed amount was 1,366 million yen, or 61.4% of the approved amount in spite of the fact that a slightly larger quantity of equipment with larger specifications than planned were purchased. This substantial reduction in the project cost is attributable to an efficient bidding process, etc. The cost of civil engineering work required for the installation of equipment is to be borne by the Philippine side. As of December 29, 2000, when the loan disbursement ended, this work cost 110 million yen (totaling 1,476 million yen, including the foreign currency portion) as against the estimated 464 million yen（totaling 2,688 million yen, including the foreign currency portion）at appraisal, though some of the finishing work is still under way.

2.3 Effectiveness

2.3.1 Functions of Substations and Significance of Installation of Additional Transformers

The functions of substations and the significance of the installation of additional transformers are not obvious to everyone. Before reporting the effects of this project, we will briefly explain these matters.

Electric power generated at a power plant is sent to users via high-voltage transmission line, transmission substation, transmission line, distribution substation, and distribution line (pole mounted transformer) (Fig.1). The higher the voltage, the lower the transmission losses. Electric power generated at a power plant is transmitted close to the users' places while kept at as high a voltage as possible, and then the voltage is reduced by the transformer at the substation. The substation plays a pivotal role in transmitting electric power efficiently.

Its functions are to distribute electric power and adjust voltage. Therefore, even though a sufficient amount of electricity is generated and the voltage at the generating end is stable, if the transformer at the substation is insufficient in capacity or voltage adjusting ability, it might result in stoppage of power supply to users (outage) or unstable voltage. When demand is predicted to exceed the capacity of the transformer, measures such as rotation outages[*5] (scheduled outages) need to be taken to prevent malfunctioning of the power supply system. In order to prevent such situation from occurring and to stabilize power supply, each substation needs to be equipped with transformers with sufficient capacity.

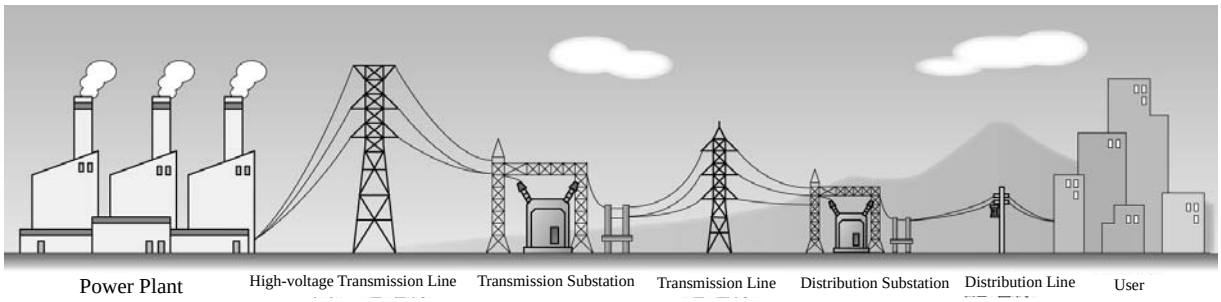


Fig.1 Electric Power Facilities and Flow of Electric Power

Substations are classified into two categories: transmission substations that deal with high-voltage electricity and distribution substations that reduce voltage to the level suitable for distribution lines. The transformers procured under this project are those that reduce voltage from 250kV- 115kV to 69kV and were installed at transmission substations. After the voltage is reduced by these transformers, electric power is transmitted to Electric Cooperatives[*6], private distributors and large-scale users such as factories via transmission lines.

If the transformer is overloaded, it would result in shortened service life of equipment, increased transformation losses and lower voltage in the service area. Moreover, if overload continues, a power outage might occur in the vicinity and the transformer might break down. Therefore, the National Transmission Corporation (TRANSCO) sets the permissible availability factor[*7]of transformers at 80％ to ensure stability of the grid and considering the possibility of emergency stoppage of transformers at neighboring substations.

2.3.2 Handling of Increase in Power Demand at Each Substation

This project was to install additional transformers and associated equipment such as circuit breakers at 5 transmission substations within the Luzon grid and 3 transmission substations within the Mindanao grid (see Fig. 2 and Fig. 3 for locations).

At 4 substations in Mexico, San Esteban, Hermosa and Klinan among 5 substations where installation work has been completed, the capacity utilization ratio of the existing transformers exceeded the permissible level of 80% before the start of the project. In particular, the transformers at Mexico and San Esteban were overloaded and caused problems in supplying electricity. After the installation of additional transformers under this project, the load on the existing transformers has been reduced at these 4 substations and stable power supply realized.

---

[5] Rotation outages: outages that are caused in each region in rotation to ease power shortage in order to prevent wide-area outage and minimizing damage

[6] Electric Cooperatives: cooperatives founded in each region with the aim of promoting rural electrification in the Philippines under the support and guidance of the National Electrification Administration (NEA)

[7] Availability factor: the rate of peak-time load to the rated capacity of the transformer

Fig.2: Five Target Substations in Luzon Island

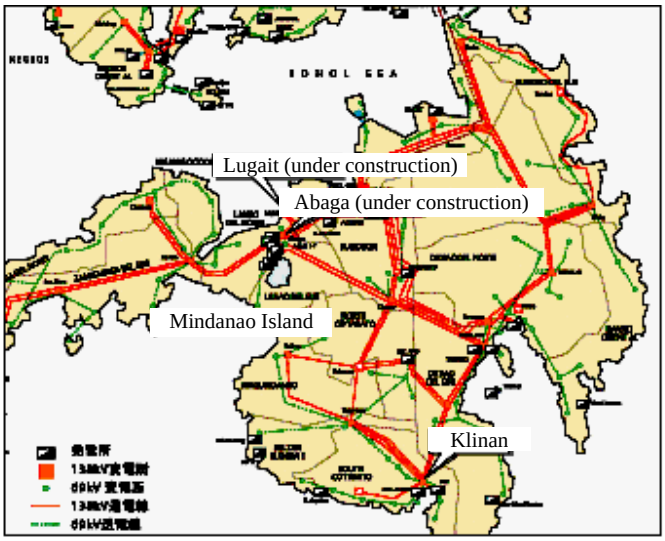


Fig.3: Three Target Substations in Mindanao Island

In the case of Calayaan Substation, the new transformer was installed to improve the stability of grid operation. Its capacity utilization ratio at present is as low as a little over 10%. In the future, part of the load on Caliraya Substation, whose capacity utilization ratio is over 70% (as of July 2003), will be transferred to Calayaan Substation. Increase in the capacity utilization ratio is also expected when the resort development plan in the vicinity is completed.

In this section, we examine the effects of this project in detail in the cases of 3 substations at Mexico, San Esteban, and Hermosa, which were subject to the field survey for this evaluation.

a) Mexico Substation

Mexico Substation reduces the voltage of power received from the Luzon grid from 230kV to 69kV with the transformer and supplies (sells) electricity to 2 private distributors; Angeles Electric Corporation (AEC) and Clark Electric Development Corporation (CEDC), and 2 electric cooperatives of SAFELAPCO and ELECO, while directly supplying electricity to several factories.

Photo: Newly installed transformer

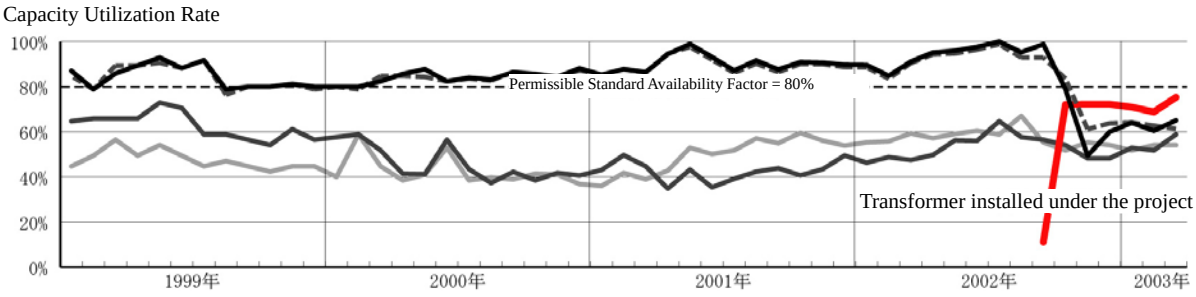
Before the project started, there were 5 transformers (capacity: 100MVA×5), of which one was broken and four were working. In order to supply electricity to AEC and CEDC, which provide electricity to the Clark Special Economic Zone and households and factories in the neighboring areas, and SFELAPCO, which provides electricity to a part of Pampanga Province, the load on 2 transformers was increasing. Fig. 4 presents changes in the availability factor rate of 230/69kV transformers at Mexico Substation. As it shows, the capacity utilization rate of 2 transformers had been exceeding the permissible standard of 80% set by NPC since around 1998 and it exceeded 100% in the summer of 2001 and 2002, causing overloading. Mexico Substation reduced power supply to AEC by up to 14MW in an effort to prevent accidents that could be caused by overloaded transformers.[*8]

Under the project, a 100MVA transformer (Photo 1) and associated equipment were installed in October 2002. At the same time, part of the load on the 2 overloaded transformers was transferred to the new transformer. As a

[8] In response to the cut in power supply from Hermosa Substation, AEC put to operation the power generation equipment (total capacity: 27.5MW, usually not operating) owned by affiliate Angeles Power Inc. to meet user demand.

result, as shown in Fig. 4, capacity utilization ratio of those 2 transformers was reduced to 50-65% and the cut in power supply to AEC was discontinued.

In the service area of Mexico Substation, a large-scale shopping mall is now being developed and had partially opened in 2001. Also, as the former US Clark Air Base was converted to a Special Economic Zone, demand for electricity is increasing. Thus, power demand in this area is expected to continue increasing.

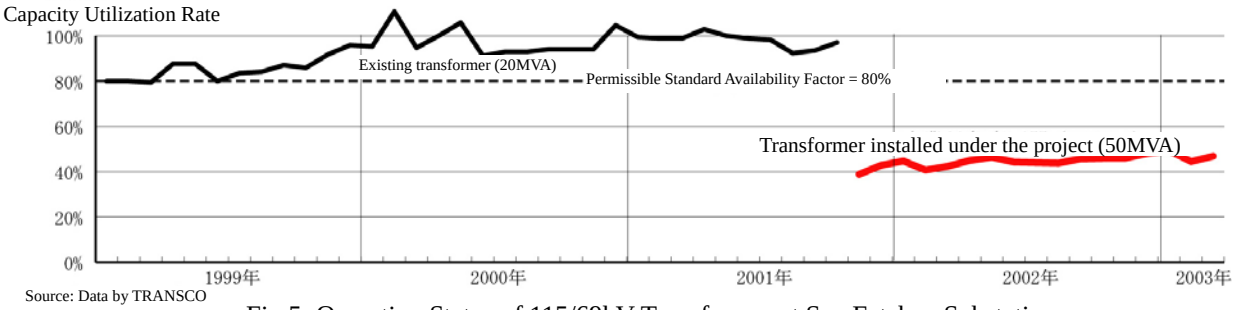


Source: Data by TRANSCO

Fig. 4: Operation Status of 230/69 kV Transformers at Mexico Substation

b) San Esteban Substation

At San Esteban Substation, a 115kV/69kV transformer with a capacity of 50MVA and associated equipment were installed in November 2001 under the project. Before that, in terms of 115kV/69kV transformer the substation had only one with a capacity of 20 MVA. The capacity utilization of this transformer had been exceeding the permissible standard of 80% since 1999 as show in Fig. 5, and was overloaded frequently in 2000 and after.



Source: Data by TRANSCO

Fig.5: Operation Status of 115/69kV Transformer at San Esteban Substation

San Esteban Substation supplies electricity to 2 electric cooperatives (ABRECO, ISECO) only and it has no contract with large-scale users such as factories. In peak hours in late afternoon when the existing transformer was overloaded, the transmission voltage of electricity supplied to ABRECO and ISECO was unstable. According to a technician at ABRECO whom we interviewed, because of unstable voltage provided from San Esteban Substation mainly in peak hours, users in ABRECO's distribution area were affected by instantaneous voltage drops[*9] and voltage fluctuations.

The transformer with a capacity of 50 MVA installed under the project was to replace the existing 20MVA transformer[*10]that often experienced overload and has been working in good condition at the availability factor of 40-50% (Fig.5). As a result, instability of power supply in ABRECO's distribution area has been rectified.

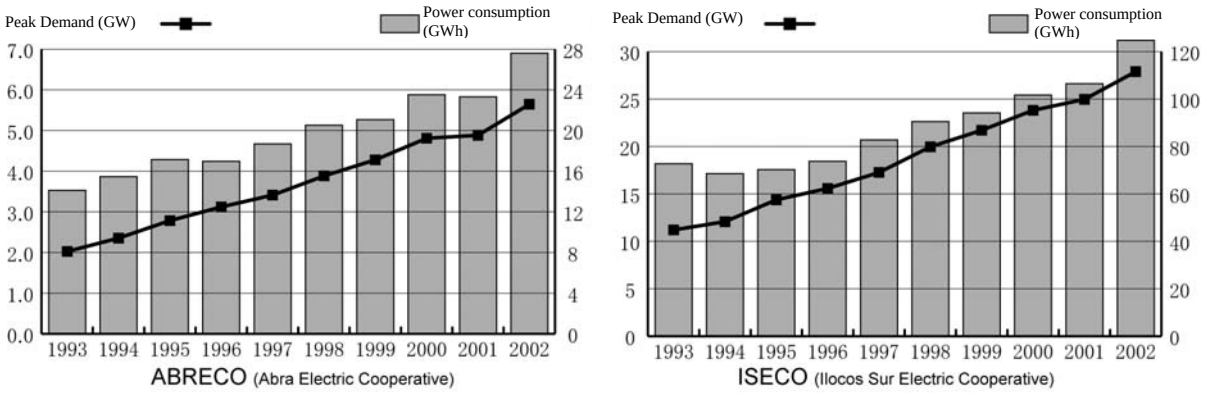
Among two electric cooperatives that receive electricity from San Esteban Substation, ISECO has several

[9] Instantaneous voltage drops cause troubles such as failure of computer control equipment of factories, etc.

[10] This transformer is disconnected from the gird when the new one was installed. It is planned to be transferee to the neighboring Bantay Substation in 2004.

supply sources whereas ABRECO receives power only from Esteban Substation. Fig. 6 presents changes in peak demand and power consumption of both cooperatives. It shows that the peak demand and power consumption of ABRECO, which does not have another supply source than San Esteban Substation, increased little in 2000 and 2001, when the transformer was frequently overloaded. After that, a notable increase was observed in 2002, when the new transformer installed under the project started working.

It seems to indicate that the power demand that had been restricted because the existing transformer was not capable of meeting demand surfaced after the new transformer was installed under the project.

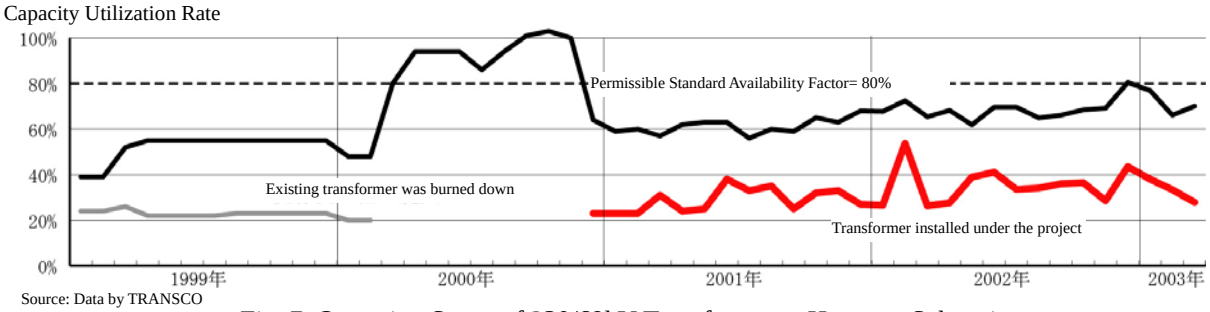


Source: Data by National Electrification Administration (NEA)

Fig. 6: Changes in Peak Demand and Electricity Consumption of ABRECO and ISECO

c) Hermosa Substation

Hermosa Substation had 2 transformers with a capacity of 100MVA, of which one was burned in a fire in February 2000. Although Hermosa Substation managed to prevent outage and rotation outages by transferring part of the load to the neighboring Bataan Substation, the capacity utilization rate of the existing transformer increased from 50% before the fire to exceed 80%, as shown in Fig.7. In September 2000, it went into overload. If that condition had continued, it would have caused problems in power supply.



Source: Data by TRANSCO

Fig. 7: Operation Status of 230/69kV Transformer at Hermosa Substation

Given such circumstances, NPC hurriedly decided to install the 100MVA transformer and associated equipment that were to be installed at Batangas Substation under the project at Hermosa Substation instead, and the Japanese side gave its consent. Installation work was completed in November of the same year, and as shown in Fig. 7, overload of the existing transformer was eliminated.

Hermosa Substation provides electricity to 6 distributors including Subic Bay Metropolitan Authority (SBMA), which distributes electricity to Subic Special Economic & Free Port Zone and also directly sells electricity to 17 large-scale users such as factories. As these users' demand is increasing sharply, the availability factor of the existing transformer is approaching 80% again. The substation is planning to reduce this rate by connecting the feeder that is currently connected to the existing transformer to the new transformer, which is operated at an availability factor of 30-40%, and utilize the new transformer effectively.

2.3.3 Stabilization of Power Supply

a) Improvement of stability of transmission voltage at Mexico Substation

At Mexico Substation, the tap changer (a device to regulate transmission voltage at a certain level) of the existing transformer was out of order, causing fluctuations of the voltage on 69kV transmission lines from 64 to 74kV and instantaneous voltage drops. Therefore, complaints were received from distributors and large-scale users who receive electricity directly from the substation. In the large-scale shopping mall near Mexico Substation, for example, problems happened such as the flickering of lights or TV screens and computer breakdown caused by instantaneous voltage drops.

After a transformer equipped with a tap changer was installed under the project, voltage has been maintained at a proper level and no complaints have been made by customers who receive electricity via the new transformer.

Photo 2: Inside the shopping mall

b) Improvement of flexibility of grid operations around San Esteban Substation

For San Esteban Substation, a 115/69kV transformer and associated equipment such as disconnecting switch and circuit breaker were procured. Using the existing 69 kV transmission line, San Esteban Substation is connected to Bantay Substation and a disconnecting switch procured under the project is installed. Thus, it became possible to transfer the demand of either substation to the other during inspections or in the event of trouble. As a result, regular inspections and problems of one substation affects users minimally. Also, a 69 kV circuit breaker was installed at the neighboring Bauan Substation to minimize outages in the service area during regular inspections or in the event of trouble.

Photo 3: Installed Circuit Breaker

2.3.4 Recalculation of Internal Rate of Return

The internal rate of return of this project was not calculated at appraisal because it is difficult to measure its impact in monetary value. Consequently, recalculation was not made for evaluation this time.

2.4 Impact

2.4.1 Impact on Factories in the Neighborhood

This project was aimed at stabilizing power supply by installing additional transformers before overload of transformers occurs and affects supply of electricity. The expected effects, such as “no problem occurring in power supply” or that “the condition of electricity is improving,” are not so visible. The beneficiary companies that we interviewed for this evaluation told us that there has been no problem with power supply since the project, that restrictions on factory operation were removed because rotation outages became unnecessary, and that failure of factory lines have decreased thanks to the reduction in sudden outages, indicating that stabilized power supply helped achieve smoother operation of factories.

■ Interview with a company that receives electricity from Klinan Substation (Cargill Philippines Inc.)

Photo 4: Cargill Philippines Inc.

Cargill Philippines Inc. is a coconut oil and copra cake (feed) manufacturer headquartered in the United States. The factory started operations in 1991. It has about 150 employees. All of the coconut oil produced here (410tons a day) are exported to Europe. As for copra cake (200tons a day), 30% are sold in the Philippines and 50% are exported to Vietnam. The remaining 20% are exported to other countries including China and Japan.

Electricity charges make up approximately 30% of production costs. The maximum power demand is 2.6MW and monthly power consumption is 1.3GWh. Although the factory has a private generator, it is not usually used because of the high cost of diesel oil fuel and small rated capacity (1.5MW). The factory receives 69kV electricity from Klinan Substation via the distributor SOCOTECO. As it is located at the end of the grid, it was affected by frequent outages and unstable voltage (65～72kV). In the case of rotation outages, even though the operation is restricted, the factory can prepare for outages by suspending machinery, etc. whereas in sudden outages, the shaft and gearbox of the pressing machine for coconut oil are damaged and a lot of money and time is needed to repair them. In the production line for copra cake, the machine gets jammed with copra and production is suspended to remove it. Stable power supply is indispensable for the operation of the factory. The manager of the factory told us in the interview that the frequency of outages has decreased remarkably.

2.4.2 Environmental Impact

The installed transformers and associated equipment do not emit any pollutants. For the implementation of this project, the Environmental Management Bureau of the Department of Environment and Natural Resources issued a certificate for exemption from the requirement to obtain Environmental Compliance Certificate (ECC) in October 1994. Throughout the implementation of the project, any work that might cause environmental pollution has not been carried out.

2.4.3 Resident Relocation and Land Acquisition

In the project site of Lugait Substation, 5 residences/buildings needed to be relocated. Compensation negotiations were conducted and it was agreed to pay compensation by the second quarter of 2004.

As for land acquisition, agricultural land was acquired as the sites for installing equipment at the substations of Lugait and Cabanatuan. At 6 other substations, equipment was installed within the premises of the existing substations and therefore land acquisition was unnecessary.

2.5 Sustainability

2.5.1 Executing Agency

(1) Technical Capacity

Currently, load dispatching instructions for the whole electric system are managed by the System Operations Group (SOG) of TRANSCO. SOG operates the National Control Center (NCC) at the headquarters of TRANSCO in Manila, which covers high-voltage transmission grids in the country and five Area Control Centers for medium and low-voltage grids. All the target substations of this project are under the control of NCC and are operated according to instructions from NCC. Individual operations are carried out by operational groups at each substation following the manual made by the suppliers of the equipment as well as the operation procedures established by TRANSCO. Each substation has 4 operation groups that work in three shifts.

Maintenance of substations is performed by Luzon, Visayas / Mindanao Operation and Maintenance Groups,

and each group consists of regional offices and Power System Management Department. Routine inspection is carried out by engineers assigned to each substation and periodic inspection is performed with the cooperation of the Power System Management Department of each region. Small-scale rehabilitation and extension work is performed by the department in charge of construction at TRANSCO headquarters, while large-scale works or works involving civil engineering are contracted out to private companies.

(2) Organization

As of the appraisal, the operation and maintenance of substations and related facilities were performed by the National Power Corporation (NPC), which was responsible for power generation and transmission all over the Philippines. In the Philippines, users were charged the second highest electricity rates in Asia after Japan. Despite that, the financial condition of NPC was ever deteriorating due to inefficient operations, disadvantageous contracts with independent power producers (IPPs), and the influence of the Asian currency crisis.

With a view to lowering electricity rates and improving the operational efficiency of the electric power sector, the Philippine Government enacted the Electric Power Industry Reform Act (EPIRA) in June 2001. In order to realize "introduction of competition in the power generation sector through the creation of an electricity wholesale market," which is one of the main pillars of the act, EPIRA clearly provides for the division and privatization of NPC. It was decided to sell the power generation facilities of NPC to private companies.[11] Also, it was decided that transmission facilities, including the target substations of this project, would be placed under the control of the National Transmission Corporation (TRANSCO) which was to be established.

The newly established TRANSCO owns transmission facilities all over the Philippines and is responsible for operation and maintenance of such facilities, power transmission development planning, and construction of power transmission facilities. In the future, operation and maintenance of high and ultra-high-voltage power transmission facilities,[*12] including the equipment installed under the project, are to be performed by a qualified private company under a 25-year concession agreement[*13] and the company will also be responsible for improvement and expansion of facilities.

Basically all employees of the transmission section of NPC were transferred to TRANSCO, which had 3,714 employees as of August 2003. TRANSCO is planning to reduce the number of employees to around 200 through transfer to the company that wins the concession agreement, change of occupation and retirement.

The competitive bidding to select a contractor for the operation and maintenance of power transmission facilities was conducted in July 2003. However, as there was only one company that met the screening requirements, the conditions for competitive bidding set by Privatization Bidding and Awards Committee (PBAC), which says "there must be at least 2 bidders", was not satisfied and therefore the bidding failed. Rebidding was scheduled for September or October 2003, but it has not been implemented yet.

---

[11] The Philippine Government divided major power plants in 6 groups and transferred them to 6 generating companies (GENCOs) that are 100% owned by the Power Sector Assets and Liabilities Management Corporation (PSALM), a government corporation. Since the end of 2003, the government has been trying to sell GENCOs to private companies in vain. Currently it is considering changing this policy and having PSALM sell each power plant separately.

[12] High and ultra-high-voltage transmission facilities mean transmission lines of 230kV or higher for Luzon Island, 69kV or higher for Visayas, and 138kV or higher for Mindanao. The 115kV grid of San Esteban-Curimao-Laoag grid in northern Luzon is also included in this category and is subject to concession agreement. Other low-voltage transmission facilities (Sub-Transmission)are planned to be sold to distributors satisfying certain requirements.

[13] When the agreement expires, it may be extended for up to 25 years if the company's performance is excellent.

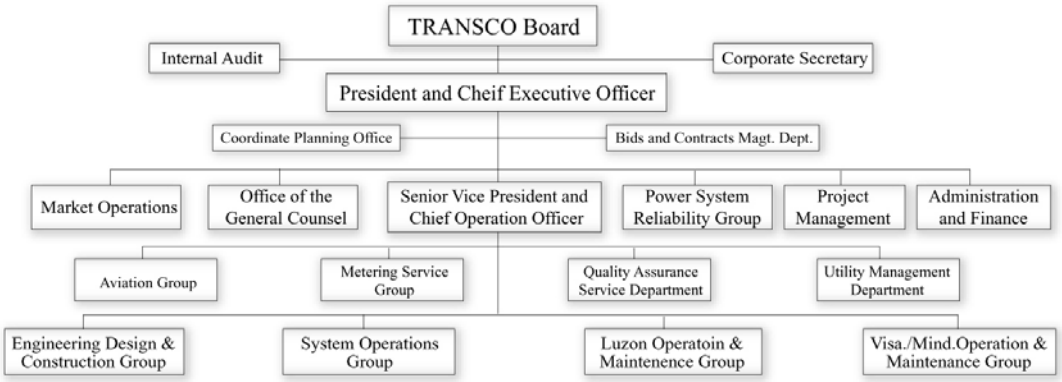


Fig. 8 Organization Chart of TRANSCO

(3) Financial Status

As of the end of 2002, TRANCSO's total assets were 125.9 billion pesos (current assets: 7.6 billion pesos; fixed assets: 117.7 billion pesos, other assets: 0.6 billion pesos), liabilities were 0.2 pesos, and equity capital was 123.8 billion pesos. Liabilities held by NPC were all transferred to the Power Sector Assets and Liabilities Management Corporation (PSALM), a government corporation, in accordance with EPIRA[*14] and therefore TRANSCO had no liabilities when it was founded. As of the end of 2002, TRANSCO had no fixed liabilities. All the liabilities are composed of current liabilities. As shown in Table 2, an extremely high current ratio indicates it has no problem with short-term debt repayment.

TRANSCO's revenue sources are power transmission and delivery fees, of which unit rates are determined by the Energy Regulatory Commission (ERC)[*15]. As shown in Table 2, TRANSCO recorded ordinary profit for both FY2001 and FY2002. It proves that adequate profit is generated with the power transmission and delivery rates set by ERC in September 2002. No problem is found in financial indicators at present.

[14] All of the NPC's power generation facilities and liabilities were transferred to PSALM. PSALM received bridge financing from the Department of Finance and plans to repay all debts within 25 years with the income from the sale of power generation facilities, income from hydroelectric power plants it owns, and the funds collected as an additional charge on electricity (Universal Charge).

[15] The Energy Regulatory Commission (ERC) is an independent regulatory commission established under EPIRA. It is responsible for promoting competition in the electric power industry after organizational reform, encouraging market development, securing consumers options, and establishing penal regulations on the abuse of market control.

Table 2: TRANSCO Profit and Loss Statement and Major Financial Indicators

（Unit: million pesos）

Item	2001	2002
Operating Income	12,792	22,281
Operating Expenses	7,730	8,472
Operating Profit	5,062	13,809
Non-operating Profit	162	100
Non-operating Expenses	138	171
Ordinary Income	5,086	13,738

Indicator	2001	2002
Operating Income to Net Sales Ratio	39.8%	61.7%
Ordinary Income to Total Assets Ratio	4.4%	10.9%
Receivables Turnover	6.97 times	10.98 times
Current Ratio	274%	376%
Fixed Assets to Long-term Capital Ratio	95.1%	98.3%

Source: Data by TRANSCO

2.5.2 Operation and Maintenance Status

There is no problem with the operation and maintenance status of the equipment installed under the project.

3. Feedback

3.1 Lessons Learned

None

3.2 Recommendations

(To the executing agency) Installation of transformers needs to be completed quickly.

At the substations where installation has not been completed (especially Lugait Substation, which is overloaded), it is desired that installation to be completed quickly.

Comparison of Original and Actual Scope

Item	Plan	Actual
I. Output		
(Luzon Grid)		
1. Mexico Substation		
- Transformer	- 100 MVA, 230/ 69/ 13.8 kV: 1 unit	- As planned
- Circuit breaker and other associated equipment	- 230kV: 2 units, 69kV: 3 units	- 230 kV: 1 unit, 69 kV: 4 units
2. San Esteban Substation		
- Transformer	- 20 MVA, 115/ 69/ 13.8 kV: 1 unit	- 50 MVA, 115/ 69/ 13.8 kV: 1 unit
- Circuit breaker and other associated equipment	- 115kV: 1 unit, 69 kV: 3 units	- 115kV: As planned, 69 kV: 1 unit
3. Batangas Substation		(Changed to Hermosa Substation)
- Transformer	- 100 MVA, 230/ 69/ 13.8 kV: 1 unit	- As planned
- Circuit breaker and other associated equipment	- 230kV: 2 units, 69kV: 3 units	- 230kV: 1 unit, 69 kV: 4 units
4. Bataan Substation		(Changed to Calayaan Substation)
- Transformer	- 50 MVA, 230/ 69/ 13.8 kV: 1 unit	- As planned
- Circuit breaker and other associated equipment	- 230kV: 2 units, 69kV: 3 units	- 230kV: 1 unit, 69 kV: As planned
5. Cabanatuan Substation		
- Transformer	- 50 MVA, 230/ 69/ 13.8 kV: 1 unit	- As planned
- Circuit breaker and other associated equipment	- 230kV: 1 unit, 69kV: 3 units	- 230kV: 4 units, 69 kV: 4 units
(Mindanao Grid)		(Changed to Abaga Substation)
6. Maria Cristina Substation		
- Transformer	- 100 MVA, 138/ 69/ 13.8 kV: 1 unit	- As planned
- Circuit breaker and other associated equipment	- 138kV: 4 units	- 138kV: As planned, 69 kV: 2 units
7. Tacurong Substation		(Changed to Klinan Substation)
- Transformer	- 50 MVA, 138/ 69/ 13.8 kV: 1 unit	- As planned
- Circuit breaker and other associated equipment	- 138kV: 3 units, 69kV: 1 unit	- 138kV: As planned, 69 kV: 2 units
8. Aurora Substation		(Changed to Lugait Substation)
- Transformer	- 50 MVA, 138/ 69/ 13.8 kV: 1 unit	- 75 MVA, 115/ 69/ 13.8 kV: 1 unit
- Circuit breaker and other associated equipment	- 138kV: 2 units, 69kV: 1 unit	- 138kV: As planned,69 kV: 2 units
II. Project Period		
Signing of Loan Agreement	Jul. 1995	Aug. 1995
Luzon Grid Substations(1-5)		
- Bidding/equipment procurement	Jun. 1996 – Dec. 1997	Jan. 1997 – Mar. 2001
- Bidding/installation work	Sep. 1997 0 Dec. 1998	Mar. 2000 – under implementation
Mindanao Grid Substations (6-8)		
- Bidding/equipment procurement	Jun. 1995 – Dec. 1996	Jan. 1997 – Mar. 2001
- Bidding/installation work	Mar. 1996 – Jun. 1997	Dec. 2000 – under implementation
III. Project Cost*		
Foreign Currency	2,224 million yen	1,366 million yen
Local Currency	464 million yen (113 million pesos)	110 million yen (44 million pesos)
Total	2,688 million yen	1,476 million yen
ODA Loan Portion	2,224 million yen	1,366 million yen

Exchange Rate	1 peso= 4.13 yen (January 1995)	1 peso= 2.50 yen

* The actual project cost is as of August 2003 for the foreign currency portion and as of December 2000 for the local currency portion.

Third Party Evaluator's Opinion on
Improvement in Power Grid Project

Ruperto P. Alonzo
Professor
University of the Philippines

Relevance

Of the eight designated substations for which the project was to procure and install additional transformers, five had to be installed in different locations. In two of these five cases, the reason was lower than predicted power demand due to (a) the economic slowdown occasioned by the 1997 Asian financial crisis, and (b) the overly optimistic load forecast contained in the Power Development Plan (PDP).

The wide difference between projected and actual electricity consumption was the result of both failing to meet GDP growth targets and assuming a very high income elasticities of demand for power. While the Asian financial crisis could not have been anticipated, the GDP growth targets were much higher than actual rates based on postwar historical experience. Similarly, the income elasticities of demand used in the projections (in the range of 1.53) were much higher than observed historical levels. This reviewer alerted the Department of Energy on this in mid-1993 (having been asked to review3 the draft PDP); the comments were referred to the National Power Corporation (NPC), but NPC stuck to its highly optimistic forecasts. The result was a significant expansion in power generating capacity, much of it through BOT contracts with Independent Power Producers (IPPs) under take-or-pay arrangements at high levelized prices, the effects of which continue to plague the sector up to now. By the latter half of the 1990s, many IPPs were operating below their expected capacity factors. Most analysts agree that some of the BOT projects should have been deferred or even cancelled.

The project nevertheless maintained its relevance because by the late 1990s, NPC's financial health was beginning to suffer, and the project offered relief with its very generous concessional terms. The project also allowed sufficient flexibility in the choice of location (with five of the eight original sites replaced, based on exigencies at the time). This would not have been easily arranged with other donor partners. The substantial cost saving with the project (appraisal vs. actual) similarly belies the perception of some high Philippine government officials that JBIC projects are generally expensive, over-designed, and supplier-driven.

Sustainability

The Evaluation Report documents vividly the project's effectiveness in enhancing the stability of power supply in the areas concerned and the corresponding positive impact of this improved reliability on consumers, particularly industrial users. A significant threat to the sustainability of project benefits, however, is NPC's deteriorating financial condition. In 2002 the return on rate base (RORB) was only 0.2%, way below the minimum 8% that NPC has committed in its loan covenants; the net income to net worth ratio was -43.7%; the debt-to-equity ratio was 95:5. The poor financial performance is partly due to a change in account conventions; starting in 2002 foreign exchange losses on loans and IPP obligations had to be booked immediately and in full, instead of being spread out over the remaining life of the obligations. But much is also due to NPC's inability to adjust tariffs to reflect actual costs.

The 2001 Electric Power Industry Reform Act (EPIRA) was initially expected to launch a sector reform program that would make the industry more competitive, with the private sector given a bigger role. NPC privatization, however, is suffering delays; even if the NPC assets were sold on time, there would remain some P200 billion in unpaid loans. There is also a problem with IPP contracts signed after 2000. It can only be hoped that all these issues get resolved soon, or the country will once again suffer a power crisis.