Democratic Socialist Republic of Sri Lanka

Ex-Post Evaluation of Japanese ODA Loan Project
"Power Sector Restructuring Project"

External Evaluator:
Tomoko Tamura, Kaihatsu Management Consulting Inc.

0. Summary

The objective of this project was to enable the CEB (Ceylon Electricity Board) to supply electricity generated by the Kerawalapitiya Combined Cycle Power Station to the consumers in a stable manner, by constructing a transmission line between the power station and the Kotugoda substation, switchyards and other facilities, thereby contributing to meet the increasing electricity demand of the country. The objective of the project was in line with the Sri Lankan development policy to realize a stable electricity supply by utilizing private sector investment and constructing thermal power stations. The project was necessary to meet the increasing demand for electricity; therefore, the relevance of the project is high.

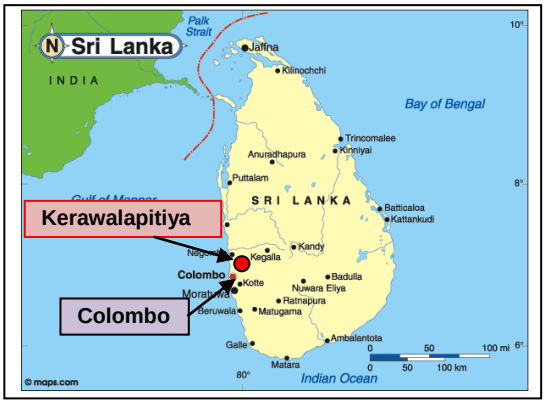
The transmission line, the switchyards and the other facilities constructed by the project are utilized well. The objective of the project, which was to transmit electricity generated by the Kerawalapitiya Combined Cycle Power Station, and contributing to a stable electricity supply of the country, has been achieved. The status of electricity supply in Sri Lanka has been improved in recent years as a result of electricity-related projects, including this project. Therefore, the effectiveness of the project is high.

Although the project cost was within the plan, the project period was significantly exceeded; therefore efficiency of the project is fair.

There is no particular problem with regard to the institutional and the technical aspects of the operation and maintenance of the transmission line, the switchyards and the other facilities constructed by the project. However, there is a concern about the financial situation of the CEB, which is the owner of the facilities. The financial status of the CEB has been in deficit apart from in 2010 and it is still not certain that the CEB would settle its financial deficit in near future. Therefore, sustainability of the project effect is fair.

In light of the above, this project is evaluated to be satisfactory.

1. Project Description



Project Location

Kerawalapitiya- Kotugoda Transmission line

1.1 Background

Demand for electricity in Sri Lanka increased annually by around 8 per cent on average at the time this project was planned. However, there was no stable electricity generation at that time, because around 60 per cent of the source of generation was traditional hydroelectric power, which was dependent on rainfall. Due to delays in building new power plants to meet the growing demand, planned power cuts were necessary in 1996, 2001 and 2002, whenever the capacity of hydroelectric power generation was low because of droughts. The Sri Lankan government wanted a change in order to have a balanced source of generation and to meet middle - and long-term electricity demand. It aimed to expand the facilities for electricity supply, and invited private sector investment for thermal power generation.

A large-scale coal power station was planned for construction in the middle of the 2000s; however, commencement of the construction was delayed for a long time due to various reasons. This led to concern that the country would experience a serious shortage in supply of electricity in the late 2000s. To avoid this situation, a combined cycle power station was planned for urgent construction at Kerawalapitiya with private sector investment. This project was planned to enable the CEB to transmit electricity generated by this combined cycle power station, by constructing a transmission line between the power station and the existing substation, switchyards and other facilities.

1.2 Project Outline

The objective of this project was to enable the CEB to supply electricity generated by the Kerawalapitiya Combined Cycle Power Station[1] in a stable manner by constructing a transmission line between the power station and the Kotugoda substation, switchyards and other facilities in Gampaha district, which is located north of Colombo district; thereby contributing to meet the increasing electricity demand of the country.

[1] The power station has an installed capacity of 300 MW, and was constructed and operated by an IPP (Independent Power Producer).

Loan Approved Amount/Disbursed Amount	2,938 million yen/2,873 million yen
Exchange of Notes Date/Loan Agreement Signing Date	March 2003/March 2003
Terms and Conditions	Interest Rate: 2.2% Repayment Period: 30 years (Grace Period: 10 years) Conditions for Procurement: General untied
Borrower/Executing Agency	Guarantor: Government of Sri Lanka/ Ceylon Electricity Board
Final Disbursement Date	May 2010
Main Contractor (Over 1 billion yen)	Siemens AG (Germany)/ KEC International Ltd. (India)
Main Consultant (Over 100 million yen)	Lahmeyer International GMBH (Germany)・Nippon Koei (Japan)(JV)
Feasibility Studies, etc.	"The Study on Construction of Kerawalapitiya Combined-Cycle Power Plant Project" JICA, 1997-1999
Related Projects (if any)	None

2. Outline of the Evaluation Study

2.1 External Evaluator

Tomoko Tamura, Kaihatsu Management Consulting Inc.

2.2 Duration of Evaluation Study

Duration of the Study: September 2012 - July 2013

Duration of the Field Study: November 5 - December 8, 2012; March 21- March 27, 2013

3. Results of the Evaluation (Rating: B[2])

3.1 Relevance (Rating: ③[3])

3.1.1 Relevance with the Development Plan of Sri Lanka

To meet increasing electricity demand and to achieve stable electricity supply with the aim of realizing socio-economic development of the country, was an important task in *"Power Sector Policy Directions (1997)"*, which was the national policy of power at the time of project planning. At that time, the Government of Sri Lanka emphasised thermal power generation as a main source of

[2] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[3] ③: High, ② Fair, ① Low

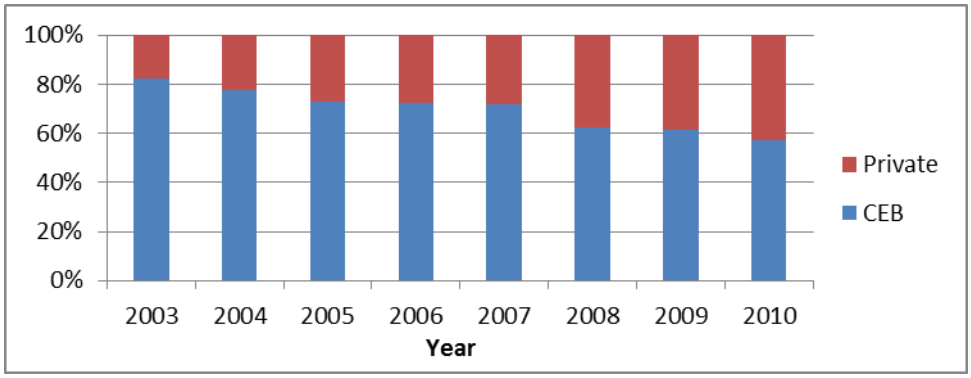
electricity for the future. It was because there was little opportunity to develop a new large-scale hydroelectric power station, as power stations had already been constructed in most of the suitable places in the country, and also because electricity generation by hydroelectric power was not stable as it was depended on amount of rainfall. Power generation by private sector investment was prioritized in the above-mentioned policy, as there was a long delay in the development of power stations by public investment at that time. Kerawalapitiya Combined Cycle Power Station, which was a thermal power station by a private sector investment, was to realize this policy.

A stable supply of electricity was still one of the most important national tasks for the Sri Lankan Government at the time of the ex-post evaluation, and *"National Energy Policy & Strategies of Sri Lanka"* (2008) emphasises the development of thermal power generation in future. As Table 1 shows, it is expected that the share of thermal power generation would be 62 per cent in 2015. As a result of promotion of private sector investment in power generation, the proportion of generation capacity of power stations owned by the private sector has currently increased to more than 40 per cent of the total generation capacity of the country, as shown in Figure 1.

Table 1 Electric Energy Supplied to the grid as a Share of the Total

Year	Conventional hydroelectric	Thermal		Minimum from non-conventional renewable energy
		Maximum from oil	Coal	
1995	94%	6%	0%	-
2000	45%	54%	0%	1%
2005	36%	61%	0%	3%
2010	42%	31%	20%	7%
2015	28%	8%	54%	10%

Source：National Energy Policy & Strategies of Sri Lanka, 2008.



Source: Sri Lanka Energy Balance, Sri Lanka Sustainable Energy Authority (http://www.info.energy.gov.lk)

Figure 1　Capacity of Power Stations by Ownership

Stable electricity supply was an important task for Sri Lanka at the time of planning, as well as at the ex-post evaluation of the project. The project purpose, which was to enable the CEB to transmit the electricity generated by the Kerawalapitiya Combined Cycle Power Station, with the aim of

achieving stable electricity supply, was highly relevant with the national policy of the country.

3.1.2 Relevance with the Development Needs of Sri Lanka

At the time of project planning, there were frequent power cuts, and unstable power supply caused serious disturbances to the daily life of people in the country as well as to investments. For example, there was a nationwide scheduled power cut up to a maximum of eight hours per day from June 2001 to May 2002. This caused serious disturbance to socio-economic activities all over the country.

Future demand for electricity was projected to increase further due to economic development and progress in rural electrification. Continuous expansion of generation capacity to meet the increasing demand was one of the first priorities for the country. In these circumstances, the project was important and urgent, in order to avoid the large-scale electricity shortage that was anticipated as a result of the delay in commissioning the Norochcholai Thermal Power Station (scheduled for 2004).

Continuous expansion of capacity of electricity generation and the transmission network, in order to meet the increasing demand and to realize stable electricity supply, is still a priority need of the country at the time of the ex-post evaluation. As shown in Table 2, gross electricity generation, peak demand, electricity sales, electrification rate and electricity consumption per head have been increasing in the country in recent years. Demand for electricity is projected to increase further in future, as the government is actively expanding the transmission network to the Northern Province of the country. The Province was affected by the conflicts for nearly 30 years until 2009 and during that period, access to public services was limited.

Table 2 National Status of Electricity Supply of Sri Lanka

Item \ Year	2006	2007	2008	2009	2010	2011
Installed Capacity (MW)	2,434	2,444	2,645	2,684	2,818	3,141
Gross electricity generation (GWh)	9,389	9,814	9,901	9,882	10,714	11,528
Growth rate of gross electricity generation (%)	7.1%	4.5%	0.9%	-0.2%	8.4%	7.6%
Peak demand (MW)	1,893	1,842	1,922	1,868	1,955	2,163
Growth rate of peak demand (%)	8.3%	-2.7%	4.3%	-2.8%	4.7%	10.6%
Electricity sales[4] (GWh)	7,766	8,169	8,350	8,372	10,023	n/a
Electrification rate (%)	78	80	83	85	88	91
Average electricity consumption per head per year (kW)	394	414	416	413	449	480

Source: Sri Lanka Energy Balance, Sri Lanka Sustainable Energy Authority (http://www.info.energy.gov.lk)
Note :

- Electricity demand did not increase in 2008 and 2009 due to the economic recession and escalation of the conflict in the country. Peak demand reduced slightly in some years because the data does not show exact peak demand. It does not include information on small hydroelectric generation (mini hydro) by the private sector in the hilly area of the country.
- Electricity sales is the total amount of sales by the CEB and Lanka Electricity Company (LECO) to end-use customers.

Most of the power stations operated by IPPs in the country have low installed capacity, ranging from 20 MW to 100 MW. The installed capacity of the Kerawalapitiya Combined Cycle Power Station is 300 MW; this is the largest IPP power station, being almost 33 per cent of the total installed capacity of all IPP power stations. The power station is mainly utilized when capacity of the power stations owned by the CEB, most of which are hydroelectric power stations, is not sufficient to meet electricity demand due to drought or other reasons. In this context, the transmission line and other facilities constructed by the project play an important role for stable supply of electricity in the country.[5]

The development of power sources and expansion of transmission and distribution facilities have been priority needs of the country, both at the time of project planning and the ex-post evaluation. It is necessary to meet the increasing electricity demand, electrification rate and electricity consumption per head. Given this, the relevance of the project with the development needs of the country is high.

3.1.3 Relevance with Japan's Official Development Assistance (ODA) Policy

The project was in line with the Overseas Economic Cooperation Policy (2002-2004) of Japan International Cooperation Agency (JICA), which emphasised developing economic infrastructure in Sri Lanka at the time of planning the project. Enhancing the capacity of electricity supply was also an important area of cooperation in JICA's plan of ODA loans for Sri Lanka at that time. Therefore, the

[4] Amount of electricity sold to consumers.
[5] Generation capacity of the Kerawalapitiya Combined Cycle Power station is around 9.5 percent of the total generation capacity of the country.

relevance of the project with Japan's ODA policy was high at the time of planning of the project.

In conclusion, the project has been highly relevant with the country's development plan, development needs, as well as Japan's ODA policy; therefore its relevance is high.

3.2 Effectiveness[6] (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

As Table 3 shows, the capacity utilization factor of the transmission line was almost as planned, and reliability of the transmission line was very high. There was no planned or forced outage apart from in 2010, when the line did not function for a short time as it needed to be connected with the gas turbine of the Kerawalapitiya Combined Cycle Power Station.

The external evaluator found that the rate of transmission loss[7] from Kerawalapitiya to Kotugoda could not be calculated, because electricity power was not measured and recorded accurately at the Kotugoda end. The rate of transmission loss estimated based on the rated performance of the equipment of the line is 0.32 per cent.

Table 3 Operation and Effect Indicators of the Project

Item	Year	2009	2010	2011	2012
	Years after completion of the power station	-	One year	Two years	Three years
(1) Capacity utilization factor (%)[8]	Plan	-	28	28	28
	Actual	18.2	28.9	28.9	28.9
(2) Planned outage (hours/year)	Actual	0	0	0	0
(3) Forced outage (hours/year)	Actual	0	27	0	0
(4) Electricity supply at the sending end (GWh)	Plan	-	1,957	2,153	920[9]
	Actual	403	547	1,152	1,536

Source：JICA documents and data submitted by CEB

The facility constructed by the project was to enable the CEB to transmit electricity generated by the Kerawalapitiya Combined Cycle Power Station, as mentioned above. The generation and transmission of electricity started in 2009 using a temporary connection to the transmission network, when part of the generation facility of the power station was commissioned. In 2010, the originally-planned connection was established between the power station and the transmission network. Power generation was suspended for two and a half months while the connection was established during 2010. In 2011, the power station became functional at its full capacity.

The amount of electricity supply at the sending end was 1,152 GWh in 2011 and 1,536 GWh in

[6] Sub-rating for Effectiveness is to be put with consideration of Impact.

[7] Rate of transmission loss is the energy which is lost in the transmission of electricity from the supply source to a substation against the total energy and calculated as "(Energy sent – Energy received)/ Energy Sent x 100".

[8] Capacity Utilization Factor (%) = Maximum power transferred/total capacity of the line x 100

[9] At the time of planning this project, the Norochcholai Thermal Power Station was scheduled to be commissioned three years after completing construction of the Kerawalapitiya Combined Cycle Power Station (anticipated as 2008). The target for electricity supply at the sending end of the transmission line of the project after three years of completion was reduced as the Norochcholai thermal power station would greatly increase electricity supply, and there would be less need for electricity from the Kerawalapitiya combined cycle power station.

2012, while the targets were 2,153 GWh and 920 GWh respectively. It is difficult to evaluate the level of utilization of the transmission line by yearly amount of electricity supplied from the power station. The amount varies, because the power station was intended to supplement capacity at power stations owned by the CEB when they were unable to meet demand. On average, the amount of electricity supply at the sending end for the two years was 1,344 GWh. This was fairly satisfactory, being 87 per cent of the planned figure.

The power station can use liquefied natural gas (LNG) or fuel oil as the source of generation. The maximum amount of energy it can generate each year is more than 2,000 GWh when using LNG, and 1,600 GWh when using fuel oil. The power station is using low sulpha fuel oil at the moment. The amount of electricity supplied at the sending end in 2012 was almost the same as the maximum amount when using fuel oil. From this data, it is clear that the power station has been utilized up to its maximum capacity when the need arose: and therefore, the transmission line constructed by the project was also utilized well.

It is clear that the transmission line has high reliability and is contributing to stable electricity supply to consumers, as there was almost no planned or forced outage.

3.2.2 Qualitative Effects

The transmission line, the switchyards and the other facilities, which were constructed by the project, are part of the national grid and contributed to the entire electricity system of the country. They do not provide any effect on electricity supply to a particular area.

As for demand and supply of electricity in the country, peak demand, electricity sales, electrification rate and electricity consumption per head have all been increasing, as shown in Table 2. However, the demand for electricity, including peak demand, has almost been fulfilled in recent years; and there was no long-term or nationwide planned power cut after May 2002. This was a result of continuous increase in capacity of electricity supply in the country, which was achieved through the implementation of various generation and transmission projects, including this project.

3.3 Impact

3.3.1 Intended Impacts

At the time of the project appraisal, there was no specific impact expected as a result of the project.

3.3.2 Other Impacts

Some of the towers for the transmission line had to be constructed in a marshy area, as there are a lot of wetlands in the project site. The project constructed access roads to these towers, and removed them after construction was completed in accordance with the environmental approval. This was to protect the natural environment of the wetlands. No negative impact was observed resulting from implementation of the project, due to the environmental protection measure mentioned above.

The project constructed a transmission line between the power station and the Kotugoda Substation. The project added a 220 kV switchyard to Kotugoda Substation, which was needed for connecting the

transmission line. The CEB purchased some privately-owned land adjoining the substation, as there was a need to expand the land of the substation. The purchase was conducted in a legal manner, and there was no issue raised by the owner of the land. There was no involuntary resettlement conducted under the project.

This project has largely achieved its objectives; therefore its effectiveness is high.

3.4 Efficiency (Rating: ②)

3.4.1 Project Outputs

Table 4 shows the planned and actual outputs of the project. All the outputs were achieved almost as planned.

Table 4 Planned and Actual Outputs of the Project

Planned	Actual
(1) Construction of 220 kV Gas Insulated Switchyard for Kerawalapitiya Combined Cycle Power Station	Almost as planned except the change of the length of 220 kV cable from 30 m to 120 m.
(2) Addition of a 220 kV switchyard to the existing 132 kV grid substation at Kotugoda	As planned.
(3) Augmentation of Kotugoda-Biyagama 220 kV transmission line at Biyagama end.	As planned.
(4) Construction of Kerawalapitiya–Kotugoda 220 kV transmission line (18 km, double circuit)	As planned.
(5) Consulting services	

Item	Plan	Actual
International Consultants	65.5 MM	58.5 MM
Local Consultants	35.0 MM	34.3 MM

Source: JICA documents and data submitted by CEB
Note: MM = Man Months

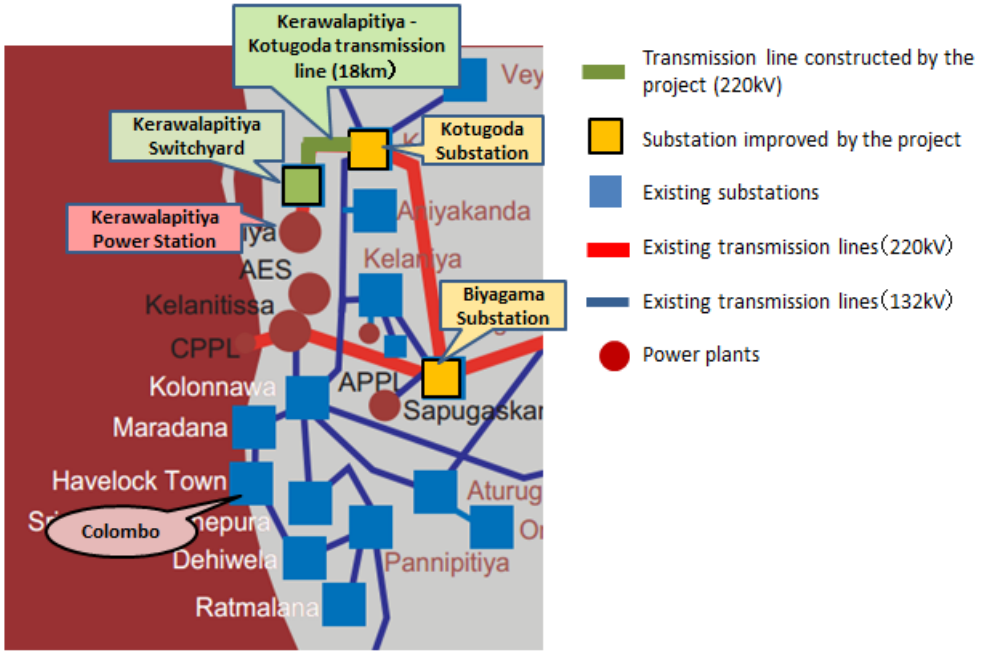


Figure 2 Location of the Facilities Constructed by the Project

One of the minor changes made was to increase the length of the 220 kV cable from 30 m to 120 m due to the temporary installation of 220 kV Air Insulated Switchgear (AIS) for the power station. Starting of construction of the power station was delayed for a long time due to the delay in finalizing an investor, as mentioned earlier. However, once a company had been selected, the construction was conducted with great urgency as a priority issue for the country, to avoid a large-scale power cut. It was decided to divide the construction of the power station into two phases in order to start generation as soon as possible. As a result, the power station for the first phase became able to be commissioned by 2009. The power station needed to be connected with the transmission line constructed by the project; however, there was no possibility for the project to complete the construction of the gas insulated switchyard by 2009. Therefore, the CEB installed a second-hand AIS as a temporary measure, and made the connection available. As a consequence, it was necessary to increase the length of the 220 kV cable for the installation of the AIS (Figure 3).

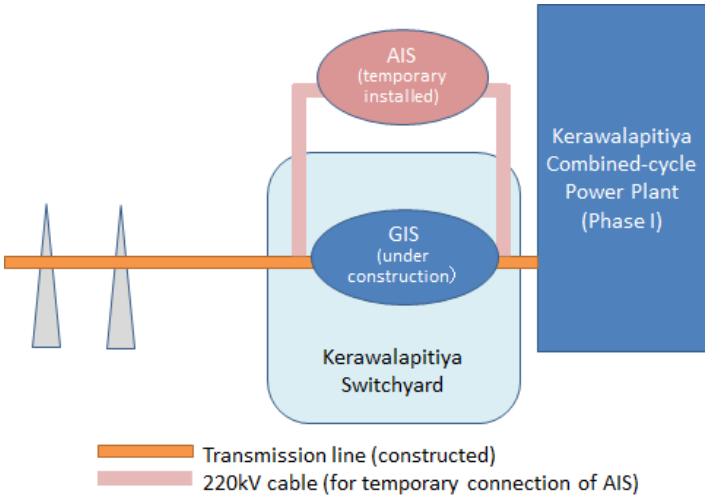


Figure 3 Extension of 220kV cable for temporary AIS

The other minor change was a decrease in assignment of international consultants. This was a result of the consultants adjusting their working period in accordance with the long delay of the implementation of the project.

3.4.2 Project Inputs

3.4.2.1 Project Cost

The planned cost of the project was JPY 3,917 million, including an ODA loan of JPY 2,938 million, and consisting of JPY 2,789 million in foreign currency and JPY 1,128 million in local currency. The actual cost was JPY 3,805 million, including an ODA loan of JPY 2,870 million and consisting of JPY 2,217 million in foreign currency and JPY 1,588 million in local currency. The project cost was slightly lower than planned (97 per cent of the original plan).

Table 5 Planned and Actual Project Cost

Unit：Million Japanese Yen

Item	Foreign currency		Domestic currency			Total	
	Total	ODA loan	Total	ODA loan	Expenses of Government of Sri Lanka	Total	ODA loan
Plan	2,789	2,789	1,128	149	979	3,917	2,938
Actual	2,217	2,217	1,588	653	935	3,805	2,870
Difference	-572	-572	460	504	-44	-112	-68
Difference (%)	-21%	-21%	41%	338%	-5%	-3%	-2%

Source：JICA document and data submitted by CEB

3.4.2.2 Project Period

The project period was planned as 42 months, from April 2003 to October 2006. The project started as planned, but was only completed in August 2009. The project period was 76 months, which was significantly longer than the plan (181 per cent of the original plan). The main reason for the delay was that the tender and procurement process for the main contractor of this project was suspended for two years, in accordance with the prior agreement between the JICA and the CEB at the time of project appraisal,[10] as the IPP of the power station had not been finalized by that time (see Table 6).

It was an appropriate decision for the CEB to suspend the tender and procurement process of the project because of the delay in the construction of the power station, as the ultimate objective of the project was to transmit the power generated by the power station.

Table 6 Plan and Actual Schedule of the Project

Item	2003	2004	2005	2006	2007	2008	2009
1. Signing of Loan Agreement							
2. Selection of consultants							
3. Selection of contractors							
4. Designing and civil works							

plan actual

Source: Illustrated by the external evaluator with the information in the project completion report.

3.4.3 Results of Calculations of Internal Rates of Return (IRR)

Re-calculation of Financial Internal Rate of Return (FIRR) was not conducted due to the fact that the information needed for the re-calculation, including the unit price of purchasing and sale of electricity at both ends of the transmission line at the time of the project appraisal and their actual values throughout the operational period, were not available.

Although the project cost was within the plan, the project period was significantly exceeded;

[10] Based on lessons learned from earlier projects, it was agreed between the two parties that the procurement of a contractor of the project should start after finalization of the IPP for the power station, so that the schedule for this project and that of the power station could proceed in parallel.

therefore efficiency of the project is fair.

3.5 Sustainability (Rating: ②)

3.5.1 Institutional Aspects of Operation and Maintenance

The CEB was the executing agency of the project and the owner of the transmission line and other facilities constructed by the project. It is the statutory body established by the CEB Act approved by parliament in 1969. The CEB has strategic business units (SBUs), including generation, transmission and bulk supply, distribution and supply, centralized services and projects. There are eight such SBUs, as there are four area-wise distribution units. Power stations owned by CEB generated around 57 per cent of the total electricity generated in the country in 2011. The CEB had 4,700,000 customers, 16,192 employees, and total annual sales income was LKR 132,300 million as of 2011.[11]

The Colombo Region of the Transmission Unit of the CEB is in charge of operation and maintenance of the transmission line and the facilities in the substations constructed by the project. After completion of the project, the CEB recruited new staff for Kotugoda Substation and assigned several staff members to Kerawalapitiya Switchyard by transferring them from other substations.[12] The necessary number of staff for operation and maintenance of the facilities have been assigned, and there are no vacancies or double duties for the approved posts. Staff of the unit conducts all the operation and maintenance, and no work has been outsourced. Responsibilities are clearly assigned to each staff member, and there is no issue with regard to institutional aspects of the operation and maintenance of the facility.

3.5.2 Technical Aspects of Operation and Maintenance

During the implementation period of the project, a series of domestic and overseas practical training courses were conducted by the contractor of the project for CEB staff on operation and maintenance of GIS, and safety precautions of other facilities for transmission. The Additional General Manager and other staff of the Transmission Unit of CEB mentioned that the training courses were useful, and they were still using things they learned during the training. All the staff who participated in the training courses are engaged in operation and maintenance of the facilities constructed by the project. They carried out technology transfer to newly-recruited staff through on-the-job training. The staff members are using maintenance manuals of the facilities, which were provided by the manufacturer, for day-to-day work.

The staff members assigned for the facilities are mainly mid-career engineers and technicians, who have 15 to 20 years of experience in a similar kind of work and have sufficient skill for the operation and maintenance of the assigned facility. There is no new skill required for operation and maintenance

[11] Source: Statistical Digest, 2011, CEB.

[12] Sixteen staff members were planned to be assigned to Kerawalapitiya Switchyard and Kotugoda Substations at the time of project planning. In addition to the planned numbers of staff, one more electrical superintendent (operation and maintenance) and four maintenance staff have currently been assigned. Planned and actual number of staff for the transmission line is eight.

of the facilities, as there are similar transmission and substation facility of CEB in other places. There is no problem about technical aspects of operation and maintenance for the facility at present.

3.5.3 Financial Aspects of Operation and Maintenance

CEB has a SBU system as mentioned above and each unit has its own budget, and the Additional General Managers are responsible for allocation of the budget within the unit. Each unit has a Deputy Finance Manager, who is in charge of the financial matters of the units. Staff of the units are not fixed, but transferred as necessary.

Among the eight SBUs, six units, namely, generation, transmission and four distribution units, obtained operation licences from the Public Utilities Commission of Sri Lanka (PUCSL). There is a plan to make the units, that have licences, more independent. As a first step, from January 2011 invoices were issued by the generation unit and the transmission unit for the transaction of the electricity. The CEB had submitted the details of the transaction to the PUCS.

In this way, the SBUs have a certain level of independence with regard to decision making on budget, investment, and operation of the facilities; however, they are still not in a position to administrate their financial matters independently.

Table 7 shows the latest three years of budget allocation and expenditure of the Transmission Unit of CEB, which is in charge of operation and maintenance of the facilities constructed by the project. There was no problem with the amount of budget, as it is sufficient to cover the cost of operation and maintenance of the existing facilities, which include those constructed by the project, expansion of the transmission network, payment of salaries and spare parts with amounts increased to cover inflation. As shown in the table, expenditure in 2011 exceeded the budget allocation due to settlement of an unpaid amount of increased salary of the staff. The shortage was subsidized by the corporate account and reimbursed later.[13]

Table 7 Budget Allocation and Actual Expenditure of the Transmission Unit of CEB[14]

Unit: LKR Million

Year	2009	2010	2011
Budget allocation	67,481	94,479	85,193
Actual expenditure	66,389	65,640	89,039

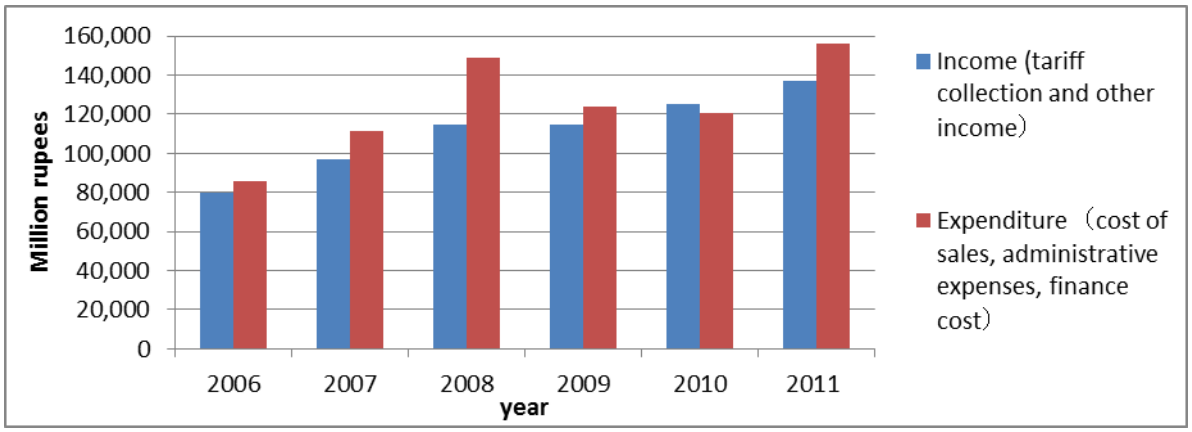
Source: CEB

The financial status of the CEB has been in deficit apart from in 2010, when it was in surplus for the first time for 10 years. In 2010, the CEB was able to utilize hydroelectric power stations at maximum as there was adequate rainfall, and their generation cost is significantly lower. As shown in the table,

[13] The financial status of the CEB has been in deficit as shown in Figure 4. However, the budget for operation and maintenance has been secured, and was not reduced as a result of the deficit. The deficit of the CEB is held mainly as unpaid invoices to the Ceylon Petroleum Cooperation. The financial status of the CEB should not negatively influence the operation and maintenance of the facilities developed by the project in future, either, as no such influence was observed in the past.

[14] The budget and expenditure shown in the table include the cost of personnel, materials, accommodation, transport and communication and others, finance cost, depreciation and a part of generation costs.

the amount of deficit was around LKR 19,300 million in 2011, because, due to drought, the CEB was heavily dependent on thermal generation using diesel and fuel oil. The amount of deficit in 2012 was around LKR 61,200 million, according to tentative estimates made by the CEB.



Source：Annual report, CEB

Figure 4 Financial Situation of CEB

There were electricity tariff revisions in February 2007 and March 2008. A new tariff methodology was introduced in 2011 in accordance with the Electricity Act of 2009, so that the tariff would be revised in relation to costs. According to the Act, the CEB shall submit the cost of generation, transmission, etc. to the PUCSL[15]. The PUCSL shall review the costs and approve the proposal, after adjustment. The tariff was expected to be revised according to the above-mentioned methodology, to cover costs; however, the amount of increase introduced by the tariff revision in January 2011 was limited. There was no tariff revision in 2012, but only re-introduction of the fuel adjustment charge. These are results of political decisions, including the intention not to increase the economic burden on low-income households. As a result, the costs of the CEB, such as generation, transmission and distribution, still exceed the tariff. Therefore the financial deficit will continue to increase when there is a drought, because generation by diesel and fuel oil will be needed more and they are more expensive[16].

When the financial status of the CEB was significantly deteriorated, the government used to make an arrangement to pay the unsettled invoices of the Ceylon Petroleum Corporation to the CEB, so that the amount of deficit of the CEB would not became larger. However, this was an ad hoc arrangement, and it has not fundamentally improved the financial situation of the CEB.

After two years, the PUCSL has introduced a tariff revision in May 2013. However, once again the tariff was not revised to reflect costs sufficiently in order not to increase the economic burden on the

[15] Public Utility Commission of Sri Lanka

[16] The CEB reported that the total cost of generation of the CEB, including the cost of power purchase from IPPs, which was LKR 106,904 million, occupied 70 per cent of the total operation cost, including personnel and materials, which was LKR 151,532 million in 2011. The average unit cost of generation by hydroelectric generation was LKR 12.39/KWh, while that of by diesel and fuel oil were LKR80-83/KWh and LKR40-52/KWh. CEB estimated the unit cost of generation by coal as LKR5.5/KWh (source: JICA documents).

low-income households. Therefore, it is still not certain that the financial deficit of the CEB will be cleared in 2013, although, according to the CEB, the financial status of the CEB was in a favourable position as of July 2013, due to increase in hydro power generation as the country had sufficient amount of rainfall during the first half of the year.

The CEB has been making an effort to improve operational efficiency. As the following table shows, transmission and distribution losses have decreased year by year. For the first time in Sri Lanka, in 2011 a large-scale coal power station of 300 MW was commissioned at Norochcholai in Puttalam District. Stage II of this power station is currently under construction, and the first and the second units of stage II are planned to be commissioned in late September 2013 and middle of 2014 respectively. If this plan is realized, expenses of the CEB will be greatly reduced, as the shortage in capacity of hydroelectric generation would be filled by coal power generation, which is much cheaper than the diesel power generation by IPP. There is a plan to construct another large scale coal power station of 500 MW in Trincomalee district. The generation cost of the CEB will be further reduced in future if the construction is implemented as scheduled.

Table 8 Transmission and Distribution Losses of the CEB

Item/Year		2004	2005	2006	2007	2008	2009	2010
(1)	Total Sales (GWh)	6,667	7,255	7,832	8,276	8,417	8,441	9,268
(2)	Transmission & Distribution losses (GWh)	1,295	1,499	1,495	1,423	1,402	1,362	1,409
(3)	Total (GWh)	7,961	8,754	9,327	9,700	9,819	9,803	10,677
(4)	Transmission & Distribution losses (%) =(2)/(3)*100	16.3%	17.1%	16.0%	14.7%	14.3%	13.9%	13.2%

Source: Sri Lanka Energy Balance, Sri Lanka Sustainable Energy Authority

There is a concern with regard to the financial aspect of operation and maintenance, as it is still no certain that the CEB would overcome its deficit in future, although there are several positive factors in terms of reduction of the cost of generation and enhancing financial independence of the SBUs.

3.5.4 Current Status of Operation and Maintenance

Operation of the transmission line, the switchyards and the other facilities constructed by the project has been conducted without a problem. The operation is fully automatic and does not involve manual operation. The status of operation is monitored in the monitoring rooms. The periodic inspection of the major facilities has been conducted according to the schedule shown in Table 9. A detailed description of the inspection is written on the inspection cards attached to the facilities. Observations are recorded on the cards at the time of inspection, and instructions for necessary action are given to each section thereafter. Staff members of the substations conduct visual inspections every morning for the important items, such as gas leakage of the GIS. Equipment and spare parts procured by the project were being utilized without a problem.

Table 9 Schedule for Periodic Inspections

	Items	Frequency
1	GIS switchgear at Kerawalapitiya substation	Once in two years
2	Kerawalapitiya transmission line	Every year
3	132 kV oil circuit breaker	Every year
4	220 kV disconnector and earth switch	Every year
5	132 kV disconnector and earth switch	Every year
6	132 kV voltage transformer	Every year
7	132 kV current transformer	Every year
8	132 kV surge arrestor	Every year

Source: CEB

As described, there is no particular issue with regard to the institutional and technical aspects of the operation and maintenance of the facilities constructed by the project. However, there is a concern about the financial situation of the CEB, which owns the facilities and is responsible for operation and maintenance, as there is no clear prospect for them to overcome their deficit.

In this manner, several problems have been observed in terms of financial status of CEB, therefore sustainability of the project effect is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objective of this project was to enable the CEB (Ceylon Electricity Board) to supply electricity generated by the Kerawalapitiya Combined Cycle Power Station to the consumers in a stable manner, by constructing a transmission line between the power station and the Kotugoda substation, switchyards and other facilities, thereby contributing to meet the increasing electricity demand of the country. The objective of the project was in line with the Sri Lankan development policy to realize a stable electricity supply by utilizing private sector investment and constructing thermal power stations. The project was necessary to meet the increasing demand for electricity; therefore, the relevance of the project is high.

The transmission line, the switchyards and the other facilities constructed by the project are utilized well. The objective of the project, which was to transmit electricity generated by the Kerawalapitiya Combined Cycle Power Station, and contributing to a stable electricity supply of the country, has been achieved. The status of electricity supply in Sri Lanka has been improved in recent years as a result of electricity-related projects, including this project. Therefore, the effectiveness of the project is high.

Although the project cost was within the plan, the project period was significantly exceeded; therefore efficiency of the project is fair.

There is no particular problem with regard to the institutional and the technical aspects of the

operation and maintenance of the transmission line, the switchyards and the other facilities constructed by the project. However, there is a concern about the financial situation of the CEB, which is the owner of the facilities. The financial status of the CEB has been in deficit apart from in 2010 and it is still not certain that the CEB would settle its financial deficit in near future. Therefore, sustainability of the project effect is fair.

In light of the above, this project is evaluated to be satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

The PUCSL is expected to revise tariffs periodically and to ensure the new tariff methodology is implemented so that they reflect the costs, in accordance with the Electricity Act of 2009, and to improve the financial situation of CEB, while taking social effect on low-income households into consideration. At the same time, the CEB is expected to make further efforts to improve operational efficiency, by reducing transmission and distribution losses, etc.

4.2.2 Recommendations to JICA

None.

4.3 Lessons Learned

None.

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1.Project Outputs	(1) Construction of 220 kV Gas Insulated Switchyard for the Kerawalapitiya Combined Cycle Power Station (2) Addition of 220 kV Switchyard to the existing 132 kV Grid Substation at Kotugoda (3) Augmentation of Kotugoda-Biyagama 220 kV transmission line at Biyagama end (4) Construction of Kerawalapitiya - Kotugoda 220 kV transmission line (18 km, double circuit) (5) Consulting services	Almost as planned except the change of the length of 220 kV cable from 30 m to 120 m.
2.Project Period	April 2003 – October 2006 (42 months)	April 2004 – August 2009 (76 months)
3.Project Cost		
Amount paid in Foreign currency	2,789 million yen	2,217 million yen
Amount paid in Local currency	1,128 million yen (874 million Sri Lanka Rupees)	1,588 million yen (1,604 million Sri Lanka Rupees)
Total	3,917 million yen	3,805 million yen
Japanese ODA loan portion	2,938 million yen	2,870 million yen
Exchange rate	1 Sri Lanka Rupee = 1.29 yen (As of November 2002)	1 Sri Lanka Rupee = 0.99 yen (Average between December 2002 and December 2010)