EX-POST PROJECT EVALUATION 2012: PACKAGE III-4 (ARMENIA, ROMANIA, EGYPT)

AUGUST 2013

JAPAN INTERNATIONAL COOPERATION AGENCY

SANSHU ENGINEERING CONSULTANT

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Preface

Ex-post evaluation of ODA projects has been in place since 1975 and since then the coverage of evaluation has expanded. Japan's ODA charter revised in 2003 shows Japan's commitment to ODA evaluation, clearly stating under the section "Enhancement of Evaluation" that in order to measure, analyze and objectively evaluate the outcome of ODA, third-party evaluations conducted by experts will be enhanced.

This volume shows the results of the ex-post evaluation of ODA Loan projects that were mainly completed in fiscal year 2010, and Technical Cooperation projects and Grant Aid projects, most of which project cost exceeds 1 billion JPY, that were mainly completed in fiscal year 2009. The ex-post evaluation was entrusted to external evaluators to ensure objective analysis of the projects' effects and to draw lessons and recommendations to be utilized in similar projects.

The lessons and recommendations drawn from these evaluations will be shared with JICA's stakeholders in order to improve the quality of ODA projects.

Lastly, deep appreciation is given to those who have cooperated and supported the creation of this volume of evaluations.

August 2013
Masato Watanabe
Vice President
Japan International Cooperation Agency (JICA)

Disclaimer

This volume of evaluations, the English translation of the original Japanese version, shows the result of objective ex-post evaluations made by external evaluators. The views and recommendations herein do not necessarily reflect the official views and opinions of JICA. JICA is not responsible for the accuracy of English translation, and the Japanese version shall prevail in the event of any inconsistency with the English version.

Minor amendments may be made when the contents of this volume is posted on JICA's website.

JICA's comments may be added at the end of each report when the views held by the operations departments do not match those of the external evaluator.

Armenia

Ex-Post Evaluation of Japanese ODA Loan Project

Electricity Transmission and Distribution Project

External Evaluator: Yasuhiro Kawabata, Sanshu Engineering Consultant

0. Summary

The project objectives were to enhance stability and reliability of electricity supply, reduce technical losses in the electricity transmission network and increase tariff collection rates by rehabilitating the transmission and distribution network and installing meters for consumers in Armenia, thereby contributing to improve the international trade balance through strengthening the financial condition of transmission and distribution enterprises, and using the energy resources more effectively. The project has been highly relevant to the development plans and needs of Armenia, as well as Japan's ODA policies. Regarding enhancement of stability and reliability of electricity supply, reduction of technical losses in the electricity transmission network and increase of tariff collection rates, which are the project's objectives, since the project has largely achieved its objectives, its effectiveness and impact are high. Even though the project's outputs changed substantially from the original plan, changes made are considered reasonable. Although the project cost was within the plan, the project period was significantly longer than planned. Therefore, the efficiency of the project is fair. Since some problems have been observed in terms of financial condition, therefore sustainability of the project effect is fair.

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

1. Project Description

Projection Location

Rehabilitated Echmiatsin Substation

1.1 Background

As the Armenian power sector had been developed as part of Pan-Caucasian[1] networks since the old Soviet era, the power generating capacity had an excess capacity against the country's demand. However, the electricity supply in 1993 dropped to the level of 40% of that in 1988 due to closure of Metzamor Nuclear Power Plant damaged by the earthquake occurred in December 1988, destruction of gas pipelines traversing the country because of conflict in Georgia, and reduction of the operational rate of thermal power plants due to increase of imported fuel price. Because of the power crisis occurred during 1993 – 1995, which arose from the above mentioned reasons, Armenia was forced to recommission the nuclear power plant, which was questionable in terms of safety. Because of recommission of a nuclear power plant (in December 1995) and lower electricity demand due to the economic recession, electricity has been supplied for 24 hours a day since 1996.

However, most of thermal plants, which were constructed between 1963 and 1976, had been deteriorated because of lack of proper maintenance since 1980's. Because of insufficient maintenance for a long time, and concentration of electricity consumption exceeding the facility capacity into a short period when supply was limited, transmission and distribution systems had been remarkably deteriorated causing burnout of transformers and meltdown of cables, resulting in voltage drop and unsecure supply. Under these circumstances, the Armenian government tackled the reform of the power sector, and split the old Armenergo, which has been a monopoly in the power sector, into generation, transmission and distribution parts and established an independent Energy Commission, which was responsible for licensing and tariff setting.

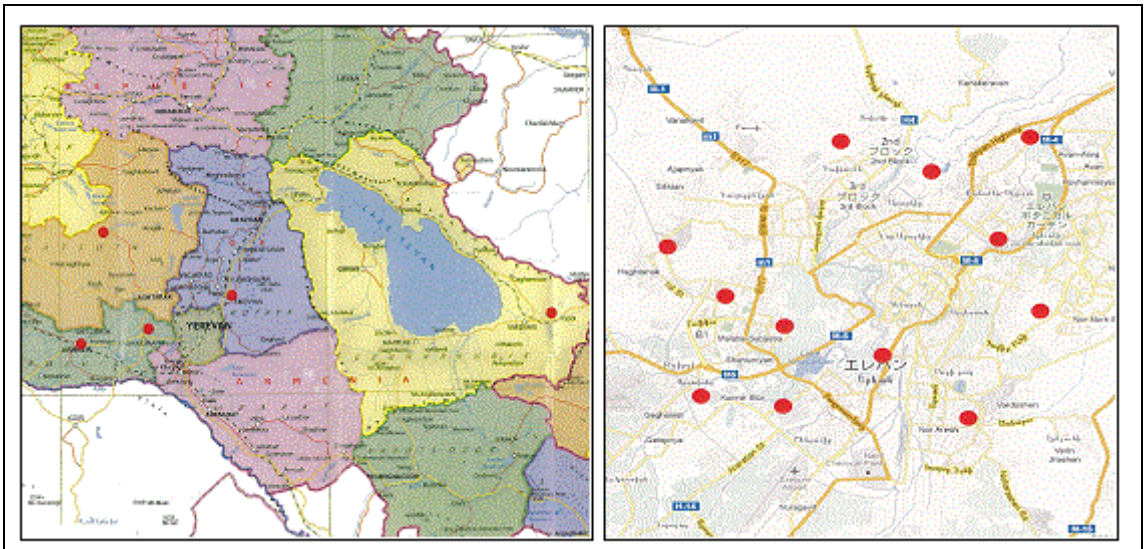
As mentioned above, the losses in the electricity supply system in Armenia were substantial due to aging of facilities and lack of proper maintenance. Thus, the government defined that together with new construction and rehabilitation of power plants, rehabilitation of the transmission and distribution system was the most priority project in the National Development Plans.

At the appraisal stage (in 1999), other aid agencies including international institutions had provided assistance to the Armenian power sector. Rehabilitation of existing plants, which were urgently needed to be implemented, had been assisted by the World Bank (WB) and German Reconstruction Credit Institute (KfW). Rehabilitation of a thermal plant (Hrazdan Thermal Plant Unit No.5), which would have been a replacement of a nuclear plant was originally planned to be completed with the funds from European Bank for Reconstruction and Development (EBRD) by end 1999.

[1] Region surrounded by Black Sea and Caspian Sea in the midst of Europe, Asia and Middle East.

1.2 Project Outline

The project objectives were to enhance stability and reliability of electricity supply, reduce technical losses in the electricity transmission network and increase tariff collection rates by rehabilitating the transmission and distribution network and installing meters for consumers in Armenia, thereby contribute to improve the international trade balance through strengthening the financial condition of transmission and distribution enterprises, and using the energy resources more effectively. The location of the project site is shown in Figure 1.



Note: Location of substations (110kV) rehabilitated under the project. The left map shows those in the Yerevan suburbs (5 sites), while the right map shows those in Yerevan district (12 sites). The project sites are located in the vicinity of Yerevan.

Figure 1: Location of Project Site

Loan Approved Amount/ Disbursed Amount	5,399 million yen/5,368 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	December 1998/February 1999
Terms and Conditions	For civil work and procurement: Interest Rate: 1.80%, Repayment Period: 30 years (Grace Period:10 years) Conditions for Procurement: General untied For Consulting services: Interest Rate: 0.75% Repayment Period: 40 years (Grace Period: 10 years) Conditions for Procurement: Bilateral tied
Borrower / Executing Agency(ies)	Government of Armenia /Energy Investment Project Implementation Office[2] (during project implementation)
Final Disbursement Date	October 2010 (originally October 20, 2005)

[2] Energy Investment Project Implementation Office was an executing agency during the implementation stage. However, it was abolished due to the institutional reform in the energy sector in 2011.

Main Contractor (Over 1 billion yen)	ABB AB (Sweden)/ Eltel Networks Corporation (Finland) (JV), Heilongjiang No.1 Thermal Power Construction Corporation (China)
Main Consultant (Over 100 million yen)	Nippon Koei/TEPCO
Feasibility Studies, etc.	Feasibility Study by World Bank PHRD, USAID and EU (1996)
Related Projects	Cofinancing with World Bank / USAID

2. Outline of the Evaluation Study

2.1 External Evaluator

Yasuhiro Kawabata, Sanshu Engineering Consultant

2.2 Duration of Evaluation Study

Duration of the Study: September 2012 – August 2013

Duration of the Field Study: November 24 – December 9, 2012 and March 3 – 22, 2013

2.3 Constraints during the Evaluation Study

(1) The project was cofinanced by JICA, US Agency for International Development (USAID), and the World Bank (WB), and consisted of all the components financed by three institutions. Thus, the evaluation was made on all the components funded by three agencies based on the DAC's five evaluation criteria in principle. Since examination of the effectiveness and impact of the project could not be made on each component funded by three agencies, all the components implemented by three institutions were assessed as one package. However, regarding the efficiency and sustainability, the analysis and assessment was made only on the project components funded by JICA.

(2) The project scope is rehabilitation of the existing facilities, it is difficult to clarify the details on the following: which facilities were how rehabilitated; and how much the estimated costs of each work item under the rehabilitation work were. Moreover, since the project scope to be funded by JICA was substantially revised during the implementation, it is not feasible to compare the originally planned output (or the output revised during the project implementation) with the actual output. Thus, basically comparison between the originally planned output and actual output accomplished on the JICA funded components was made.

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

3.1 Relevance (Rating: ③[4])

3.1.1 Relevance with the Development Plan of Armenia

The most priority agenda for the Armenian government at the appraisal stage (1999) was to have secure electricity supply at the reasonable tariff in order to assist in improving the country's economic competitiveness and the well-being of the population. Thus, the rehabilitation of transmission and distribution system, together with new construction and rehabilitation of power plants was considered to be the most priority projects in National Development Plans. At the same time, the Government proposed to privatize the power sector enterprises in order to strengthen the efficient use of energy resources while ensuring secure energy supply.

In 2004, the Armenia Government enacted the Law on Energy Saving and Renewable Energy, aiming at: 1) strengthening the economic and energy independency of the country; 2) enhancing the economic and energy security, and the safety level of energy systems; 3) establishing and developing the new industrial infrastructure and institutions/agencies to promote energy savings and renewable energy; and 4) reduction of adverse technical impacts to the environment and human health. After the law was enacted, the following relevant strategies and plans were developed: Energy Sector Development Strategies in Economic Development (2005), National Program on Energy Savings and Renewable Energy (2007), and National Energy Efficiency Action Plan (2010). The Action Plan proposes a set of relevant regulatory and institutional reforms and capacity building together with targets in quantitative terms to be achieved by 2020, which aimed at improving energy efficiency in each sector including residential buildings, public and private services, industry, agriculture, and transport.

At the appraisal (1999) and ex-post evaluation stages, the importance of secure electric supply was/is emphasized in order to enhance the efficient use of energy resources in the power sector. Thus, the project is highly relevant with development policies.

3.1.2 Relevance with the Development Needs of Armenia

As discussed in 1.1 Background, in early 1990s, the electricity supply had been substantially reduced. Even after that, the losses in the electricity supply system in Armenia were substantial due to aging of facilities and lack of proper maintenance, and thus, the government defined that together with new construction and rehabilitation of power plants, rehabilitation of the transmission and distribution system was the most priority project in the National Development Plans. Since then, the government had made efforts to increase power supply. At the appraisal

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

[4] ③: High, ② Fair, ① Low

time (1999), rehabilitation of existing plants, which were urgently needed to be done, had been implemented with financial assistance from the World Bank and German KfW. Rehabilitation of a thermal plant (Hrazdan Thermo Plant Unit No.5), which would have been a replacement of a nuclear plant was under preparation with the funds from European Bank for Reconstruction and Development (EBRD). It was expected that by implementation of rehabilitation projects funded by WB and KfW, and improvement of losses through the JICA project, the operational generation capacity to meet the peak demand would be expanded, resulting in a surplus until 2005, and that the needed generation capacity would be secured. Therefore, at the appraisal stage, in order to further reforms of the power sector and enhancement of quality, rehabilitation and modernization of the transmission and distribution system had to be quickly implemented with purposes to improve non-technical losses by enhancing secure electricity supply, reducing technical losses and increasing tariff collection rates.

The Armenian government issued the National Energy Efficiency Action Plan in 2010 by further expanding policies on energy saving, energy efficiency and renewable energy issued in 2007 and in 2008, and has made efforts to improve the energy savings and enhance efficiency. The System Control and Data Acquisition (SCADA), which was introduced under the project aims at helping use the generated electricity effectively and efficiently. However, SCADA can moreover optimize the operation of generation, transmission and distribution more comprehensively. Through rehabilitation and modernization of the transmission and distribution facilities under the project, enhancement of secure electricity supply and improvement of technical losses has been achieved, and the project has contributed to enhance the energy savings and efficiency, which is the government's primary objective. Thus, the project is highly relevant to development needs as well even at the ex-post evaluation stage.

3.1.3 Relevance with Japan's ODA Policy

In the Mid-Term Strategy for Overseas Economic Cooperation Operations (December 1999), the following agendas were defined as the priority assistance targets in the Caucasian region: rehabilitation of deteriorated social infrastructure, which was caused by lack of maintenance from the old Soviet era; countermeasures for environmental problems; development of social infrastructure needed for the self-supporting economic development; and capacity building needed for market-oriented economy.

Accordingly, the project has been highly relevant to the development plans and needs of Armenia, as well as Japan's ODA policies. Its relevance is therefore considered high.

3.2 Effectiveness [5](Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

The project development objectives were to enhance stability and reliability of electricity supply, reduce technical losses and increase tariff collection rates by rehabilitating the transmission and distribution network and installing meters for consumers in Armenia, thereby contributing to improve the international trade balance through strengthening the financial condition of transmission and distribution enterprises, and using the energy resources more effectively. Under the cofinancing scheme (among JICA, WB and USAID)[6], the original scope of work assigned to JICA was rehabilitation of transmission and distribution system. The project was consisted of all the components financed by three institutions. Since examination of the effectiveness of the project could not be made separately on each component funded by three agencies, all the components implemented by three institutions were assessed as one package. Since the project's outcome is to enhance stability and reliability of electricity supply, to reduce technical losses in the electricity transmission network and to increase tariff collection rates, the quantified effects on these are examined below.

(1) Reduction of Technical[7]/Commercial[8] Losses in the Distribution System (enhancement of stability of electricity supply)

Reduction of technical/commercial losses in the distribution system after completion of the project is shown in Table 1.

Table 1: Reduction of Technical/Commercial Losses

	Baseline	Original Target	Actual			
	1999	2007	2009	2010	2011	2012
Technical/ Commercial Losses	Assumed to be 33% of the total electricity distributed	Less than 18% of the total electricity distributed	12.9%	13.2%	12.9%	12.9%

Source: The baseline and original target numbers are taken from the World Bank Implementation Completion Report. Actual figures are shown in the responses to the Questionnaire.

Note: According to the World Bank Implementation Completion Report issued on June 30, 2008, the reduced amount of technical/commercial losses of the distribution system in 2003 and in 2006 was 21.7% and 15.1%, respectively.

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

[6] Main components funded by WB were rehabilitation of transmission and distribution system and consulting services. USAID funded the replacement of meters for consumers.

[7] Phenomenon, in which the electric energy is partially dissipated as heat due to resistance of the transmission and distribution cables.

[8] Pilferage, non-payment of tariffs by users, and errors in billing process

According to the WB Implementation Completion Report, it was considered that the total amount of losses before the project was about 33% of the total electricity supply, and it was planned that the original target in 2007 was less than 18%. The actual figure for the immediate past two years after completion of the project is 12.9%, which is lower than the original target by 5%.

The reason why the loss rate had been lowered in 2009 before the JICA-funded components were completed is considered that components financed by the World Bank and part of the JICA project components had been already operational.

(2) Reduction of Technical Losses in the Transmission System (enhancement of stability of electricity supply)

Reduction of technical losses after completion of the project is shown in Table 2.

Table 2: Reduction of Technical Losses

	Baseline	Actual				
	2003	2006	2009	2010	2011	2012
Technical Losses	4.2% of total electricity transmitted	1.4%	1.36%	1.68%	2.01%	2.05%

Source: The baseline and original target numbers are taken from the World Bank Implementation Completion Report. Actual figures are shown in the responses to the Questionnaire.

Note: According to the World Bank Implementation Completion Report issued on June 30, 2008, the reduced amount of technical losses of the transmission system in 2003 and in 2006 was 4.2% and 1.4%, respectively.

The amount of technical losses in the transmission system in 2003 before commencement of full-scale operations was 4.2%. Actual amount of losses in 2012 was 2.05%, which is about half of that in 2003. The reason why the loss rate had been lowered in 2009 before the JICA-funded components were completed is considered that components financed by the World Bank had been already operational.

(3) Increase of Tariff Collection Rates (improvement of the commercial performance and financial condition of High Voltage Electric Network Company and Distribution Company) (Replacement of meters for consumers[9])

The tariff collection rate at the appraisal stage (1999) was 85%, and the target upon completion of the project was set to be 95%. After meters for consumers, which were partly funded by USAID, were installed at user's homes (households), the actual tariff collection rate has been 100% since 2009.

[9] As discussed in 3.4 Efficiency, part of replacement of meters was to be funded by the ODA loan. However, this component was canceled from the project and locally funded.

(4) Facility Operational Ratio (enhancement of stability of electricity supply)

The operational ratio of transformers in substations has been almost 100%. However, even after the project completion, the planned outage has partly continued.

(5) Annual Average Outage Hours (enhancement of stability of electricity supply)

The impact on outage hours after completion of the project is shown in Table 3.

Table 3: Annual Average Outage Hours

Unit: minutes /consumer

	2008	2009	2010	2011	2012
Planned Outage	91	95	186	174	123
Unplanned Outage	816	774	1,013	599	401
Total	907	869	1,199	773	524

Source: Responses to the Questionnaire

Note 1: The reason why the unplanned outage hours for the past two years (2011, 2012) are longer that those in 2008 and 2009 is that the regular inspection has been implemented in order to undertake further rehabilitation.

Note 2: The reason why the outage hours in 2010 are high is that it took a long time to repair the electric lines cut due to the adverse weather condition (heavy snow in winter and storms in spring).

Since the project was completed in October 2010, the annual average outage hours have been steadily decreasing.

The current technical/commercial losses in the distribution system are lower than the original target by 5% and the technical losses in the transmission system is about half of the baseline. Thus, the project contributes to the enhancement of stability of electricity supply. The tariff collection rate has been 100% since 2009. This means that tariffs could be unfailingly collected from users so that the project has helped improve the commercial performance and financial condition of relevant power sector companies.

3.2.2 Qualitative Effects

(1) Reduction of Facility Failure, Supply of Power with Stable Voltage, and Improvement of the Financial Condition of Transmission and Distribution Companies

The power sector business in Armenia is implemented under control and guidance of Ministry of Energy and Natural Resources as follows: Electro Power System Operator CJSC (EPSO) is responsible for comprehensively managing generation, transmission and distribution business in order to optimize the use of power. The Settling Center measures and confirms the amount of electricity actually generated, transmitted and distributed by the entities and companies in charge of generation, transmission and distribution. Establishment of this kind of system enabled the effective use of energy

resources and stable supply of energy. International financial control and auditing systems have been applied to Electricity Network of Armenia (ENA) and High Voltage Electric Network CJSC (HVEN), and external audits have been performed by international audit firms. Thus, these practice contributes to strengthen commercial performance and financial condition of both companies.

3.3 Impact

3.3.1 Intended Impacts

The project originally aimed at contributing to improve the international trade balance.

(1) Contribution to Increase of Direct Foreign Investment and International Trade Balance.

The increase of direct foreign investment after completion of the project is shown in Table 4 and the international trade balance in Table 5.

Table 4: Direct Foreign Investment

Unit: million USD

Year	1999	2008	2009	2010
Invested amount	122	935	777	935

Source: World Bank Project Appraisal Document (1999, 2012)

Table 5: International Trade Balance

Unit: million USD

Year	1999	2008	2009	2010
Imported amount	811	4,426	2,378	3,783
Exported amount	232	1,057	624	1,011
Trade Balance	579	3,369	1,754	2,772
Trade total	1,043	5,483	3,002	4,794

Source: World Bank Project Appraisal Document (1999, 2012)

Although the direct foreign investment amount once decreased in 2009 after the Lehman Shock, in 2010 the amount reached the level recorded in 2008, which is about 8 times of amount recorded in 1999, when the appraisal was made. Although the total trade amount once decreased in 2009, the amount recovered well in 2010, which is about 4.6 times of amount recorded in 1999, when an appraisal was made. However, the adverse trade balance has been still continuing because of the Armenian economic form. It is difficult to clarify whether or not the project contributed to increase of the direct foreign investment and international trade balance.

(2) Increase of Exported/Imported Amount of Electricity

The exported/imported amount of electricity after completion of the project is shown in Table 6.

Table 6: Exported/Imported Amount of Electricity

Unit: million kWh

Year	2007	2008	2009	2010	2011
Exported amount	313	360	336	1,061	1,383
Imported amount	409	338	246	157	71

Source: Responses to the Questionnaire

Electricity is currently exported to, and imported from only Iran. There is an agreement in which both countries accommodate each other on electricity depending on the demand/supply condition. Armenia exports electricity to Iran during summer time (April – September), while it imports during winter time (October – March).

3.3.2 Other Impacts

(1) Impacts on the natural environment

It is reported by the implementing agency that treatment of the existing facility waste (used oil, construction equipment and material, and others), which was pointed out at the appraisal stage was properly undertaken. It was confirmed that substations (for distribution) are doubly protected by fences (around the substation site and around the internal transformation facility) and protection measures for electric shock accidents are properly implemented. Since rehabilitation of substations (for distribution) and installation of SCADA was done within the existing facility, no adverse impact to environment is observed.

(2) Land Acquisition and Resettlement

The project scope is rehabilitation of the existing facilities, and no land acquisition and resettlement occurred.

(3) Other Positive and Negative Impacts

Since disconnectors in substations were changed from the oldg “oil” type to the modern “gas” type, consumption of oil was reduced resulting in cost reduction and improvement of environment around facilities within substations due to oil leakage.

It was confirmed that the project has achieved its objectives in terms of enhancement of stability and reliability of electricity supply, reduction of technical losses in the electricity transmission network, and increase of tariff collection rates. The project has largely achieved its objectives, and therefore, its effectiveness is high.

3.4 Efficiency (Rating: ②)

3.4.1 Project Outputs

The original and actual output of the project (Japanese ODA loan portion) is shown in Table 7.

Table 7: Output (original and actual)

Item	Project Scope at Appraisal	Revised Project Scope (August 2008)	Project Scope at Project Completion (Actual)
Transmission System Rehabilitation	1) Rehabilitation of 6 units of 220kV substations (Ekhegnadzor, Shahumyan-2, Shinuhair, Vardashen, Vardashe and Shengavit, including replacement of disconnectors, breakers and air compressors. ・ Procurement of equipment (vehicles, tools and testing apparatus). ・ Safety measures for substations (rehabilitation of safety facilities in substations.) 2) Installation of Communications and System Control and Data Acquisition (SCADA)	1) Rehabilitation of 33 units of 110kV substations (disconnectors, breakers, transformers and others) 2) Installation of SCADA	1) Installation of SCADA: as planned except installation of a Video Wall (additional work)
Distribution Rehabilitation	1) Rehabilitation and modernization of facilities in Yerevan, Central and Southern Distribution Districts (breakers, fuse, transformers, and electric cable) 2) Replacement of meters for consumers in 4 distribution districts.	1) Rehabilitation of distribution substations was canceled form the ODA loan project. 2) Replacement of meters for consumers in Yerevan district.	1) Rehabilitation of 17 units of 110kV substations 2) Replacement of meters for consumers in Yerevan district - canceled from the project.
Consulting services	1) Detailed signs (power supply control system), review of detailed designs, assistance in tendering and supervision 2) Environmental protection related work: ・ Advice on designs and bid documents on environmental issues and protection of living environment. ・ Inventory survey on equipment needed for environmental monitoring ・ Advice on environmental protection during construction stage. Foreign: 81 M/M, Local: 59 M/M, Local Office staff: 237 M/M	1) Detailed signs (power supply control system), review of detailed designs, assistance in tendering and supervision 2) Addition of detailed designs for rehabilitation of 110kV substations 3) Environmental protection related work: ・ Advice on designs and bid documents on environmental issues and protection of living environment. ・ Inventory survey on equipment needed for environmental monitoring ・ Advice on environmental protection during construction stage.	Scope of work for consulting services was almost as planned. Foreign: 69 M/M, Local: 229 M/M, Local Office staff: 483 M/M

Source: JICA appraisal documents, JICA internal documents, Project Completion Report, Responses to Questionnaire

Note 1: In the scope of work revised in August 2000, rehabilitation of 33 units of 110kV substations was classified as part of components under the rehabilitation of transmission system. However, in the project completion report prepared by the executing agency and the World Bank Implementation Completion Report, it was classified as part of components under the rehabilitation of distribution system. Thus, under the row for "actual" in Table 7, it is shown in the components under the rehabilitation of distribution system. As a result of discussions with the World Bank on the demarcation, it was agreed that the World Bank would be responsible for rehabilitation of transmission system, and it financed 8 units of 220 kV substations.

The whole project was implemented with the cofinancing arrangements by three institutions including US Agency for International Development (USAID), the World Bank (WB) and JICA. However, due to the impact of the structural reform (e.g. privatization) of the power sector in Armenia, discussions on components to be implemented by each institution were made during the project implementation and revisions were made. The JICA-funded rehabilitation work was implemented by diverting funds among categories. Although the project's outputs of JICA-funded components were substantially changed, their changes were unavoidable and they are considered reasonable. Main changes made and their reasons are as follows:

1) Rehabilitation of 6 units of 220kV substations was originally planned to be done. However, revisions on components to be funded were made through discussions with WB, and this component was changed to rehabilitation of 33 units of 110kV substations. Further, it was changed from partial rehabilitation of 33 units of substations to overall/fundamental rehabilitation of 17 units of substations. Rehabilitation of substations of the transmission system (including 8 units of 220kV substations) was undertaken with the WB financing.
2) Replacement of meters for consumers was to be undertaken by the Armenian government, and thus, this component was canceled from the JICA-funded components.
3) A video wall (control panel) was installed as an additional work.
4) Since the project implementation period was substantially extended, the man-months (M/M) of local experts and local staff under the consulting services were substantially increased.

Instrument rehabilitated at Kirza Substation

SCADA Video Wall

3.4.2 Project Inputs

3.4.2.1 Project Cost

The estimated project cost of the JICA-funded portion at appraisal was 5.838 billion yen, of which the total Japanese ODA loan of 5.399 billion yen was to be used for foreign currency and part of local currency portions, and the remaining 438 million yen was to be own-funded. Even

though the project scope was substantially changed, the actual project cost was 5.368 billion yen, which was about sufficient to cover the revised project scope. Thus, the actual cost was lower than planned, which is equivalent to 92% of the planned cost.

Major changes of the project scope made on the JICA-funded portions are discussed under 3.4.1 Outputs.

The total project cost, which was estimated and partly included the actual costs as of 2008, after JICA decided to participate in the cofinancing scheme with USAID and WB was 89.82 million dollars (about 9.398 billion yen using the exchange rate of 1US$ = 104.64 yen as of May 3, 2008). The actual project cost at the JICA's loan closing date (October 2010) was 89.52 million dollars (about 9.367 billion yen using the same exchange), which is equivalent to about 100% of the planned cost.

Table 8: Comparison of Project Cost (Planned and Actual) - ODA Yen Portion

unit: million yen

Item	Originally planned					Planned after revision	Actual				
	Foreign Yen loan	Local		Total		Yen loan	Foreign Yen loan	Local		Total	
		Own fund	Yen loan	Total	Yen loan			Own fund	Yen loan	Total	Yen loan
1) Transmission System Rehabilitation	1,555	79	479	2,113	2,035	616	1,482	0	0	1,482	1,482
・ Rehabilitation of substations	972	34	360	1,366	1,333	0	0	0	0	0	0
・ Rehabilitation of SCADA	583	45	119	747	702	616	1,482	0	0	1,482	1,482
2) Distribution Rehabilitation	2,486	314	0	2,800	2,486	4,211	3,576	0	0	3,576	3,576
・ Improvement of substations	1,490	184	0	1,674	1,490	3,213	3,576	0	0	3,576	3,576
・ Replacement of meters for consumers	9986	130	0	1,126	996	998	0	0	0	0	0
3) Consulting services	281	0	43	324	324	214	305	0	0	305	305
4) Physical contingency	216	21	26	263	242	358					
5) Price escalation	275	25	38	339	313						
6) JICA commitment charge						0	5	0	0	5	5
Total	4,813	438	586	5,838	5,399	5,399	5,368	0	0	5,368	5,368

Source : JICA appraisal documents, JICA internal documents, Project Completion Report, Responses to Questionnaire

Exchange rates : At appraisal US$ = 119 yen (June 1997), During implementation 1 US$ = 104.64 yen (May 31, 2008)

Note 1 : In the scope of work revised in August 2000, rehabilitation of 33 units of 110kV substations was classified as part of components under the rehabilitation of transmission system. However, in the project completion report prepared by the executing agency and the World Bank Implementation Completion Report, it was classified as part of components under the rehabilitation of distribution system. Thus, under the row for "actual" in Table 8, it is shown in the components under the rehabilitation of distribution system.

3.4.2.2 Project Period

The project period was much longer than planned. The project period planned at appraisal was from February 1999 (signing of the Loan Agreement) to December 2003 (completion of civil work) with a total period of 59 months. The actual project period was from February 1999 (signing of the Loan Agreement) to October 2010 (revised loan expiry date) with a total period of 141 months, or equivalent to 239% of the plan. Consulting services were also completed in October 2010.

Table 9: Comparison of Project Period (Original Plan and Actual) of ODA Yen portion

Activity	Plan (at L/A signing)	Actual
Loan effectiveness	1999.05	1999.10
Transmission System Rehabilitation: Rehabilitation of substations	2000.09 - 2003.10	Deleted from the project
Bidding for SCADA installation	1999.09 - 2000.08	Bidding (including PQ process) commenced in June 2002. However, the bidding was canceled in 2006. Re-bidding was made during February 2007 - February 2008.
Installation of SCADA Installation of a Video Wall (additional work)	2001.07 - 2003.12	2008.04 - 2010.09 (installation of SCADA) 2010.06 - 2010.09 (installation of a Video Wall) Calibration and test run during September 2010 - September 2011.
Rehabilitation of Distribution System: Bidding for rehabilitation of 33 distribution substations	1999.09 - 2000.08	Bidding commenced in April 2002. However, the bidding was canceled in 2005. Re-bidding was made during April 2007 – August 2008.
Rehabilitation of Distribution System: Rehabilitation of 33 distribution substations	2000.07 - 2001.10	2008.09 – 2010.09 (17 substations (110kV only) were rehabilitated)
Replacement of meters for consumers	2000.10 - 2001.11	Deleted from the project.
Selection of consultants	1999.02 - 1999.07	2000.12 - 2001. 03
Consulting services	1999.05 - 2003.12	2001.03 - 2010.10

Source: JICA appraisal documents, Project Completion Report, Responses to the Questionnaire

The main reasons for the delay are as follows:

1) 5 months delay during the Loan Agreement effectiveness process, since it took a longer time to prepare the required documents needed for the loan effectiveness.
2) 20 months delay at the stage of selection of consultants, since the executing agency was unfamiliar with the international competitive procurement procedure (preparation of TOR and short lists)
3) More time than expected was needed to prepare detailed designs and bidding documents (for International Competitive Bidding procedure) after commencing the consulting

services. Those for SCADA and 17 substations (110kV) were completed in November 2004 and in February 2004, respectively.

4) In order to procure the latest model of facility, specifications and its corresponding bill of quantities for SCADA were revised after commencing the bidding. The Project Management Board reviewed the bid evaluation results based on the revised specifications and canceled the bidding in 2006. Re-bidding was implemented during February 2007 and February 2008.

5) Regarding the bidding for rehabilitation of 17 substations (110kV), only one bidder among prequalified bidders submitted the bid and their bid price was higher than the estimated cost by 60%. The Project Management Board canceled the bidding and suspended the procurement in 2005. Later, re-bidding was implemented without prequalification during April 2007 and August 2008.

6) While the selection of a consulting firm and procurement of contractors was being implemented after signing of the Loan Agreement, the electricity distribution business (less than 110 kV), which is one of project components was privatized in 2004 and was sold to a British steel manufacturer. The distribution company was sold to a Russian electric enterprise in 2005, and it took a long time for the executing agency to settle the sublease agreement with a private enterprise. Further delay of submission of documents required for clearance by JICA resulted in substantial impact to the project implementation schedule.

7) Replacement of meters for consumers was canceled by the Project Management Board after a contractor was selected. Later, the employer decided to procure meters with their own funds, resulting in the delay of project implementation to some extent.

3.4.3 Results of Calculations of Internal Rates of Return (all the project components) (for reference)

3.4.3.1 Financial Internal Rate of Return (FIRR)

FIRR (for the whole project) at the project completion stage (June 2008) of the WB-funded components was recalculated based on the same assumptions and conditions applied at the project appraisal stage as shown in Table 10.

Table 10: FIRR (at appraisal and project completion stage)

	At Appraisal (1999)	At project completion of World Bank funded portion
FIRR(%)	23	16

Source: The World Bank Implementation Completion Report)
Cost: construction costs, operation and maintenance costs
Benefits: enhancement of system stability, reduction of technical losses

It is considered that the lower FIRR at the project completion stage (June 2008) of the WB-funded components is partly due to the increase of the project cost (the total project costs in Armenia Dram including those financed by USAID, the World Bank and JICA).

3.4.3.2 Economic Internal Rate of Return (EIRR)

EIRR calculated at appraisal was 24%. Since the project scope has been substantially revised, it is difficult to recalculate EIRR at the ex-post evaluation stage.

The project cost was lower than planned, but the project period was significantly longer than planned. Therefore, the efficiency of the project is fair.

3.5 Sustainability (Rating: ②)

3.5.1 Structural Aspects of Operation and Maintenance

The Executing Agency for the project was Energy Investment Project Implementation Office, which was abolished due to the institutional reform in 2011, under Ministry of Energy and Natural Resources, and the Borrower is the Armenian Government represented by Ministry of Finance. At the appraisal stage, Armenergo and High Voltage Electric Network CJSC (HVEN) were to be responsible for operation and maintenance of the transmission system and four distribution companies for operation and maintenance of the distribution system. However, the organizational setup of the power sector was completely renewed in 2011 as shown in Figure 2. Relevant institutions and entities, which are currently responsible for operation and maintenance of facilities installed and rehabilitated under the project (JICA-funded components), are as follows.

Table 11: Responsible Agencies for Operation and Maintenance and their Role/Responsibility

Responsible agency	Role/Responsibility (operation and maintenance of the facilities rehabilitated under the project)
Ministry of Energy and Natural Resources	Policy and strategy for the power sector
Electro Power System Operator CJSC (EPSO)	Operation of system (Dispatching): The state-owned EPSO is responsible for operation and maintenance of SCADA installed under the project. Responsibility was transferred from Armenergo in December 2004.
Settling Center	Registration and confirmation of the amount of generation, transmission and distribution.
High Voltage Electric Network CJSC (HVEN)	Transmission of electricity generated at nuclear, thermal, hydro and renewable energy (wind, solar) plants through 220-110kV networks.
Electric Networks of Armenia (ENA)	Responsible for operation and maintenance of 17 substations (110kV), rehabilitated under the project. ENA distributes electricity to about 935,000 consumers with a total network length of about 36,000 km.
Public Services Regulatory Commission	Licensing for power sector business and setting tariff rates

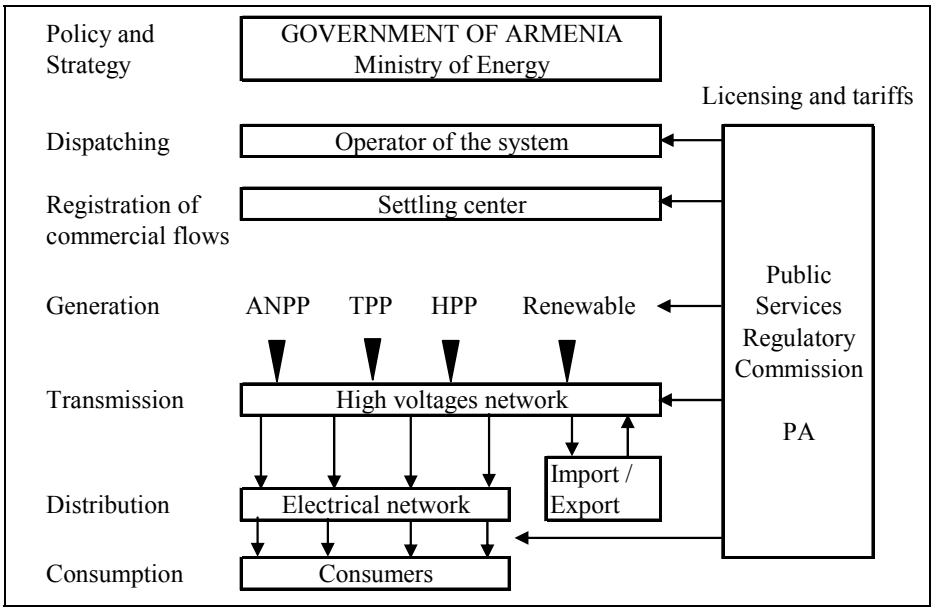


Figure 2: Organizational Setup of Armenian Power Sector

EPSO, which is responsible for operation and system management of the Armenian power sector is a 100% state-owned enterprise. It has about 80 staff in the headquarters and about 200 staff in branch offices. About 50 staffs of EPSO are in charge of operation and maintenance. EPSO is also in charge of operation and maintenance of SCADA, which was installed under the project. ENA, which is responsible for operation and maintenance of the distribution system, is a 100% privately owned company, which is an affiliate company of Russian OJSC "INTER RAO UES". ENA has 11 branch offices and about 8,000 employees, among whom about 670 employees are assigned at the headquarters. About 80 staffs are responsible for operation and maintenance of 17 units of 110kV substations, which were rehabilitated under the project. The management of EPSO and ENA confirmed that appropriate number of staffs, including technical staffs are assigned to operation and maintenance of facilities installed/rehabilitated under the project by EPSO and ENA.

EPSO and Settling Center

SCADA-related Facility in Yerevan Power Plant

3.5.2 Technical Aspects of Operation and Maintenance

In the Headquarters Control Center for SCADA, a Controller and two Deputy Controllers are regularly assigned and they provide instructions to optimize the use of electricity. In the Control Center, various operation manuals are prepared, and a simulation desk for training is also equipped. The training for emergency operations is regularly undertaken.

A Control Center is installed at the ENA headquarters as well and is connected with substations. At each substation, about 4-5 maintenance staff are stationed in shifts for 24 hours and they monitor the operation status. A maintenance team consisting of about 5 staffs, who is responsible for several substations comes around regularly and undertake simple routine maintenance work. In the ENA compound, a sample facility for the training needed for field work is prepared. Staffs in charge of maintenance regularly take the lecture-type training (e.g. business/management improvement, company regulations and rules, accounting and tax treatment, IT and personnel management) and on-job-training on technical issues. In 2011, 792 employees took any of these special training courses and passed the final examination. It was confirmed during the field inspection that various operation and maintenance manuals (e.g. operation of relay protection, operation of power equipment) are prepared at each substation.

3.5.3 Financial Aspects of Operation and Maintenance

Entities responsible for operation and maintenance of facilities and equipment for transmission and distribution system, which were rehabilitated or installed under the project are EPSO and ENA. EPSO is a 100% state-owned enterprise and its main revenue source is the electricity tariffs collected from consumers. The flow of funds is that electricity tariffs collected by ENA are remitted to EPSO through High Voltage Electric Network CJSC and Settling Center. EPSO is responsible for repayment of the loan borrowed for the project. The income and expenditure statements including the repayment of loan for the past two years show the negative balance. The revenue gained in 2011 was 1,302.3 million AMD[10] (about 260.5 million yen). The expenditure was 2,076.7 million AMD (about 415.3 million yen), resulting in loss of about 774.4 million AMD (about 154.9 million yen). In the expenditure, the labor cost for about 50 staffs with a total amount of about 90 million AMD is included.

Tariffs are set so that at least the operation and maintenance cost, and part of technical losses and debt service (interest payment plus repayment of principal) can be covered. However, Public Services Regulatory Commission has an authority to decide the revision and setting tariffs. A financial staff of EPSO reported that from the beginning of 2013, yen has been depreciated and thus repayment has become somewhat easier and that the financial balance

[10] Armenian monetary unit, and abbreviation of Armenian Dram. 1AMD is about 0.2 yen (annual average exchange rate for 2011)

would improve. EPSO is a state-owned company and eventually the government, represented by Ministry of Finance is responsible for repayment of the loan, when repayment cannot be made by EPSO. However, at this moment it is not clear how EPSO would be financially assisted by the government under the new organizational structure for the power sector.

ENA is a private enterprise and has a sole license on the distribution service in Armenia. The operation and maintenance of the distribution business is implemented and managed using revenues collected as tariffs. ENA is one of largest tax payers in Romania. The income and expenditure statement of ENA for the past three years is shown in Table 12.

Table 12: Income and Expenditure Statement of ENA

Unit: million AMD

Item	2009	2010	2011
Sales/Revenue	92,090	99,329	108,681
Operation and Maintenance (excluding depreciation)	9,415	10,068	7,398
Labor Costs (including social payments)	14,029	14,762	15,717
Operational Profit (excluding depreciation)	16,686	25,362	16,673
Operational Profit	12,336	21,245	20,994
Net Profit	-21,540	11,670	2,826

Source : ENA Annual Report, Responses to the Questionnaire

Note: The table includes only the major financial items. Please refer to numbers on each item.

The income and expenditure statement of ENA shows negative balance in 2009, but a surplus for the immediate past two years. The balance between income and expenditure of ENA depends on the sales (revenue source), which are affected by the basic tariff setting for electricity. As mentioned previously, regarding the tariffs to be charged, the Public Services Regulatory Commission has the authority to determine the tariffs taking into account the company's financial status, charges/tariffs charged under other public services, and other factors. The current (as of March 2013) tariffs for 35-110kV is 21 AMD/kWh during day time, and 17 AMD/kWh during night time. (1AMD=about 0.2 yen)

Since most of facilities and equipment rehabilitated or installed under the project are under the warranty period, costs for materials accrued are minimal. Only labor costs for maintenance staffs have accrued. The labor costs for about 80 staffs in charge of operation and maintenance work is about 117 million AMD and paid from the ENA annual budget. According to ENA, the maintenance costs after the expiration of the warranty period will not be substantially increased for a while, and there would be no problems taking into account the financial capability of ENA. ENA is an affiliate company of Russian OJSC "INTER RAO UES", which undertakes the power business in 14 foreign countries, and has no financial problem.

The revenue and expenditure sheets of EPSO, which is the core agency in the power sector show negative balance for the past two years. Since EPSO is a state-owned company, it can eventually obtain the financial assistance. However, under the current financial condition, it is

not clear how the government would provide the financial assistance.

3.5.4 Current Status of Operation and Maintenance

Since SCADA and 17 substations (under the distribution rehabilitation), which are operated and maintained by EPSO and ENA, respectively are still new after completion of the project, facilities and equipment have been functioning without major problems.

The warranty period for SCADA has expired only half a year ago, and a simple inspection has been undertaken once a year as routine maintenance for the substations. It is reported that ENA stores sufficient spare parts and keeps appropriate number of maintenance equipment. Maintenance work has been regularly undertaken according to manuals prepared for each facility and equipment.

Since some problems have been observed in terms of financial condition , therefore sustainability of the project effect is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The project objectives were to enhance stability and reliability of electricity supply, reduce technical losses in the electricity transmission network and increase tariff collection rates by rehabilitating the transmission and distribution network and installing meters for consumers in Armenia, thereby contributing to improve the international trade balance through strengthening the financial condition of transmission and distribution enterprises, and using the energy resources more effectively. The project has been highly relevant to the development plans and needs of Armenia, as well as Japan's ODA policies. Regarding enhancement of stability and reliability of electricity supply, reduction of technical losses in the electricity transmission network and increase of tariff collection rates, which are the project's objectives, since the project has largely achieved its objectives, its effectiveness and impact are high. Even though the project's outputs changed substantially from the original plan, changes made are considered reasonable. Although the project cost was within the plan, the project period was significantly longer than planned. Therefore, the efficiency of the project is fair. Since some problems have been observed in terms of financial condition, 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

None.

4.2.2 Recommendations to JICA

None.

4.3 Lessons Learned

None.

Comparison of the Original and Actual Scope of the Project

Item	Original Plan at Appraisal	Revised Scope of Work (August 2000)	Actual
1. Output Transmission System Rehabilitation	1) Rehabilitation of 6 units of 220kV substations (Ekhegnadzor, Shahumyan-2, Shinuhair, Vardashen, Vardashe and Shengavit, including replacement of disconnectors, breakers and air compressors. ・ Procurement of equipment (vehicles, tools and testing apparatus). ・ Safety measures for substations (rehabilitation of safety facilities in substations.) 2) Installation of Communications and System Control and Data Acquisition (SCADA)	1) Rehabilitation of 33 units of 110kV substations (disconnectors, breakers, transformers and others) 2) Installation of SCADA	1) Installation of SCADA: as planned except installation of a Video Wall (additional work)
Distribution Rehabilitation	1) Rehabilitation and modernization of facilities in Yerevan, Central and Southern Distribution Districts (breakers, fuse, transformers, and electric cable) 2) Replacement of meters for consumers in 4 distribution districts.	1) Rehabilitation of distribution substations was canceled form the ODA loan project. 2) Replacement of meters for consumers in Yerevan district.	1) Rehabilitation of 17 units of 110kV substations 2) Replacement of meters for consumers in Yerevan district - canceled from the project.
Consulting services	1) Detailed signs (power supply control system), review of detailed designs, assistance in tendering and supervision 2) Environmental protection related work: ・ Advice on designs and bid documents on environmental issues and protection of living environment. ・ Inventory survey on equipment needed for environmental monitoring ・ Advice on environmental protection during construction stage. Foreign: 81 M/M, Local: 59 M/M, Local Office staff: 237 M/M	1) Detailed signs (power supply control system), review of detailed designs, assistance in tendering and supervision 2) Addition of detailed designs for rehabilitation of 110kV substations 3) Environmental protection related work: ・ Advice on designs and bid documents on environmental issues and protection of living environment. ・ Inventory survey on equipment needed for environmental monitoring ・ Advice on environmental protection during construction stage.	Scope of work for consulting services was almost as planned. Foreign: 69 M/M, Local: 229 M/M, Local Office staff: 483 M/M
2. Project Period	February 1999 - December 2003 (59 months)	February 1999 - October 2010 (141 months)	February 1999 - October 2010 (141 months)
3. Project Cost Amount paid in Foreign currency Amount paid in Local currency Total Japanese ODA loan portion Exchange rate	 4,813 million yen 1,024 million yen 5,838 million yen 5,399 million yen 1US$ = 119 yen (as of June 1997)	 4,940 million yen 459 million yen 5,399 million yen 5,399 million yen 1US$ = 119 yen (as of June 1997)	 5,368 million yen 0 million yen 5,368 million yen 5,368 million yen 1US$ = 119 yen (used the rate at appraisal)

Romania

Ex-Post Evaluation of Japanese ODA Loan Project

Railway Rehabilitation Project of Bucharest-Constanta Line

External Evaluator: Yasuhiro Kawabata, Sanshu Engineering Consultant

0. Summary

The objectives of the project were to expand the transporting capacity and improve the transporting efficiency by ensuring stability and safety of the railway operation through upgrading the existing railway tracks (86km) and related facilities including signals, telecommunication systems, electrical facilities, and station facilities between Bucharest and Constanta (225km), which is a segment of the European Fourth Corridor. The project has been highly relevant to the development plans and needs of Romania, as well as Japan's ODA policies. With respect to the expansion of transporting capacity and improvement of transport efficiency, which are the project objectives, the project has largely achieved its objectives, and thus the effectiveness and impact are high. Outputs of main project components are almost as planned. However, both project cost and project period significantly exceeded the plan. Therefore, efficiency of the project is considered low. No major problems have been observed in the operation and maintenance system, therefore sustainability of the project effect is considered high.

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

1. Project Description

Projection Location

Fetesti-Constanta section

Ending Point of the Project (Constanta)

1.1 Background

The railway in Romania, which had exclusively served for the medium and long distance transport by 1980s, had been required to undertake the fundamental reform since the political

system changed in 1989. Referring to the demand to the transport sector in 1990s, on the freight transport, the demand to roads and inland waterways was expected to be relatively increased and the railway to be lowered. On the other hand, on the passenger transport demand, the railway was still the major mode, and it had still served the important role in Romania.

Former Romanian National Railway Company (CFR), which became independent from Ministry of Transport in 1991, had continuously deficit in 1990s. Thus, since rehabilitation and maintenance had not been properly undertaken, and the existing tracks had been deteriorated, decrease of operating speed due to weaker base foundation had grown increasingly apparent. Under these circumstances, the World Bank provided the technical assistance with a target to improve the management system and strengthen the technical capacity of CFR during 1992 – 1994. Moreover, the structural reform plan in the railway sector was prepared in collaboration with European Bank for Reconstruction and Development (EBRD) and EU. Under the reform planning process, the Romanian government started the fundamental reform in the railway sector including division of the former CFR into several entities/enterprises.

While the expansion strategy to the east[1] by EU had been promoted from mid 1990, the main railway and highway network in the central and eastern Europe was planned to be intensively developed as the "European Corridors" and was to be unified to the western Europe standards. After collapse of the cold war system, the relationship between central/eastern European countries and the former Soviet Union was weakened, and instead, that with western countries was strengthened. Consequently, the transport demand along the east and west corridor connecting between central/eastern European countries and western countries was increasing. In the Pan-European Transport Minister's Conference held in 1994, "Central-Eastern Europe Transport Corridor Concept" targeting the international transport network in the eastern Europe was developed, and Romania was obliged to rehabilitate and develop the sections passing through the nation along Corridor 4 (Berlin – Istanbul), Corridor 7 (Danube waterways), and Corridor 9 (Helsinki – Plovdiv). Among three corridors, Corridor 4, which links between western Europe and Asia, is the most important corridor for Romania. Corridor 4 connecting with the western Europe via Hungry branches off in capital city, Bucharest with one route connecting with Turkey and another connecting with Constanta, which is the largest commercial port, faced to the Black Sea. The Bucharest – Constanta section is the most important trunk corridor for Romania, and the freight (container) transport demand is particularly anticipated in a long run. It was expected that the transport route originating at Constanta port (the Japanese ODA loan for the project was signed in 1998) would be more expanded after rehabilitation was made,

[1] It was recognized that it was essential to expand EU member countries including countries in the Balkan Peninsula in order to achieve peace, stability and prosperity in Europe by settling the conflict in the Balkan Peninsula.

1.2 Project Outline

The objectives of the project were to expand the transporting capacity and improve the transporting efficiency by ensuring stability and safety of the railway operation through upgrading the existing railway tracks (86km) and related facilities including signals, telecommunication systems, electrical facilities, and station facilities between Bucharest and Constanta (225km), which is a segment of the European Fourth Corridor. The location of the project site is shown in Figure 1.

Note: The section shown in green (Baneasa - Fetesti) was financed by EU.

Figure 1: Location of Project Site

Loan Approved Amount/ Disbursed Amount	25,635 million yen/24,988 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 2001/March 2001
Terms and Conditions	For civil work and procurement: Interest Rate: 2.20%, Repayment Period: 30 years (Grace Period: 10 years) Conditions for Procurement: General untied For Consulting services: Interest Rate: 0.75% Repayment Period: 40 years (Grace Period: 10 years) Conditions for Procurement: General untied
Borrower / Executing Agency(ies)	Government of the Republic of Romania / Railway Infrastructure Company (CFR)
Final Disbursement Date	November 2008

Main Contractor (Over 1 billion yen)	Leonhard Weiss Bauunternehmung(Germany)/E. Heitkamp Gmbh (Germany)/Taisei Construction Co., Taisei Construction Co., Swietelsky Baugesellschaft M.B.H. (Germany)/H. F. Weebe Gmbh & Co Kg (Germany)/Takenaka, Balfour Beatty Rail Gmbh (Germany), Thales Rail Signaling Solutions Gmbh (Germany/Thales Rail Signaling Solutions S.R.L. (Romania)
Main Consultant (Over 100 million yen)	Obermeyer Planen / Beraten (Germany)/JARTS/Pacific Consultants International/Japan Transportation Consultants, Pacific Consultants International/Padeco/Seneca(USA)
Feasibility Studies, etc.	Romanian Ministry of Transport prepared the feasibility study report with the financial assistance of EU (1999)
Related Projects (if any)	Constanta South Port Development Project (Japanese ODA loan was signed in1998)

2. Outline of the Evaluation Study

2.1 External Evaluator

Yasuhiro Kawabata, Sanshu Engineering Consultant

2.2 Duration of Evaluation Study

Duration of the Study: September 2012 – August 2013

Duration of the Field Study: November 24 – December 9, 2012, March 3 – March 22, 2013

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

3.1 Relevance (Rating: ③[3])

3.1.1 Relevance with the Development Plan of Romania

In October 1999, the Romanian government developed "National Development Preliminary Plan 2000-2002". Later, "National Development Plan 2002-2005[4]", which was expanded based on the preliminary plan, was adopted as the mid-term national development plan. National Development Plan 2002-2005 covered all the agenda discussed in the previous preliminary development plan, and the key strategic agenda were strengthening of industrial development and competitiveness, development of the private sector, development of infrastructure, promotion of agriculture and rural development and others. More specific strategies for the infrastructure development were development of transport and urban infrastructure, and investment to the information technology related infrastructure, and thus, the proposed project

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

[3] ③: High, ② Fair, ① Low

[4] Since the document introducing the content of National Development Preliminary Plan 2000-2002 is not available, the Development Plan 2002-2005, which covers the Preliminary Plan 2000-2002 was used as the base material at the appraisal stage.

was one of key strategic agenda.

National Development Plan 2007-2013, developed in 2007 defines six priorities including the followings: 1) increasing economic competitiveness and developing the knowledge-based economy; 2) development and modernization of transport infrastructure; 3) environment protection and improvement; 4) development of human resources, promotion of employment and social inclusion, strengthening of the administrative capacity; 5) development of the rural economy and increase of agricultural productivity and 6) reducing regional development gaps. Regarding development and modernization of transport infrastructure, since Romania joined European Union (EU) in January 2007, rehabilitation and development of infrastructure based on the EU standards was particularly the agenda to be urgently tackled.

At appraisal (2001) and at ex-post evaluation, development and modernization of transport infrastructure in the transport sector was/is considered to be a priority agenda and one of key strategies for Romania.

3.1.2 Relevance with the Development Needs of Romania

In 1990s, since former Romania National Railway Company (Căile Ferate Române - CFR) had kept low tariffs, and its institutional setup was ineffective, CFR have had continuously deficit. Since rehabilitation had not been properly undertaken and thus, tracks had been deteriorated, lowering of the operational speed was considered to be an issue.

In the Pan-European Transport Minister's Conference held in 1994, "Central-Eastern Europe Transport Corridor Concept" was developed, and Romania was obliged to rehabilitate and develop the sections passing through the nation along three corridors including the Corridor 4 (Berlin - Istanbul), in which the part of the section is the project section. Accordingly, Romania needed to upgrade and high-standardize the current tracks and related facilities conforming to the EU standards.

The Corridor 4 branches off in Bucharest, Romania. One route connects with Turkey and another connects with Constanta, which is the largest commercial port, faced to the Black Sea, and is the most important corridor for Romania. Although the section under the project occupies 2% of the total length of the railway network in the country, the section covers about 17% of total transported amount. Thus, the transport demand, particularly on the freight (container) had been anticipated in a long run.

Regarding the railway transport infrastructure, rehabilitation and modernization of the sections comprising the part of Trans-European Transport Network (TEN-T), in which the Bucharest-Constanta section under the project is part of TEN-T, was needed to be urgently tackled. Rehabilitation of Corridor 4 commenced in 1996, and the non-project Baneasa – Fetesti section within the Bucharest – Constanta section was completed with EU funds in 2011.

Advantages of railway transport in comparison to other transport modes are: energy

efficiency (the energy consumption for a conventional ton-km is about 1/6 of road vehicles) and lower pollution (the air pollution per ton of freight represents only 1/10 of other modes). Thus, the proposed project is in line with the EU strategy, in which the amount of air pollution would be reduced by 2030.

3.1.3 Relevance with Japan's ODA Policy

In the JICA's Country Assistance Strategy for Romania (issued in March 2001), the Japanese government committed to assist in the development of transport network in the Balkan region taking into account the return of new Yugoslavia to the international community. In this regard, the Japanese government intended to give a priority to the transport infrastructure, which could provide benefits not only to the regional development, but also to the economic development of Romania. Thus, the project matched with the Japan's ODA policies.

Accordingly, the project has been highly relevant with the Romanian development plan and needs, as well as Japan's ODA policies. Its relevance is therefore considered high.

3.2 Effectiveness[5] (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

Since the outcome of the project was to expand the transporting capacity and improve transport efficiency by ensuring the stability and safety of the railway operation, the following quantitative effects were examined. Results of the analysis are shown below.

(1) Major indicators on railway operations

Major indicators on railway operations are shown in Table 1.

Originally, civil works and procurement of equipment were scheduled to be completed in December 2006 and in June 2004, respectively. The target figures for each indicator were set for those in 2008.

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

Table 1: Major Operational Indicators for the Fourth Corridor

	Base Line	Actual				
	2000	2008	2009	2010	2011	2012
1) Freight transport (million ton-km/year) (Fetesti – Constanta)						
Projected		1,216				
Actual	887		961	768	987	1,015
2) Passenger transport (million passenger km/year) (Fetesti – Constanta)						
Projected		608				
Actual	526		825	884	961	987
3) Average track capacity (trains/day) (Bucharest – Constanta)						
Actual	105	48	48	48	144	144
4) Average delay time (minutes/train) (Bucharest – Constanta : Direct Train)						
Actual			29	24	06	60
5) Average travel time (minutes) (Bucharest – Constanta : Direct Train)						
On Timetable	165	298	265	234	170	158
6) Maximum operating speed (km/hour) (Bucharest – Constanta)						
Freight: Projected		120				
Actual	80		80	80	80	80
Passenger: Projected		160				
Actual	120		120	120	140	140

Source: Responses to the Questionnaire

Note 1: The project volume of freight and passenger transport after 2009 is not available.

Note 2: The average travel time is the average time by direct trains between Bucharest and Constanta shown in the timetable.

Note 3: During the winter time in 2012, Europe was attacked by heavy snow storms and delay of the travel time occurred resulting in the longer travel time in 2012.

Note 4: Maximum operating speed for freight and passenger trains will be raised to 120 km/hr and 160 km/hr, respectively starting in 2014.

Note 5: Track capacity: number of trains operational during the certain unit hour (generally per day) in certain section

Note 6: The reason for substantial increase of travel time for three years from 2008 through 2010 is that the Baneasa – Fetesti section was under construction with the EU fund.

1) After completion of the project, the volume of freight transported was slightly increased (by 3%) from 2011 to 2012. However, it was lower than the projected volume for 2008 (83%). Reasons why the actual volume in 2012 was only slightly higher than that in the previous year are likely: i) the train operations were partly suspended due to heavy snow in winter; and ii) the economic condition of Europe has been severely affected by the economical crisis in Greece.

Impacts to the transported volume by competition with the road transport are considered minimal as follows. According to the Romanian National Highway Authority, the annual average daily traffic in 2010 for the section between Fetesti and Cernavoda was 10,900 vehicles per day. However, since no traffic counting was undertaken in 2011 and 2012, the recent data on the average daily traffic was not available. The daily traffic based on the simple traffic counting, which was made in the same section when the field inspection was undertaken (on December 4, 2012) is estimated at about 15, 000 vehicles per day.

Regarding the impacts on the freight transport by the parallel expressway, it was observed that trucks were mostly transporting groceries and daily commodities in a container and that the competitiveness with railways, which can transport a bulk of cargo at once was low. Thus, the mode share depending on the type of freight transported has been established. (source: discussions with the cargo transport agent, state-owned CFR Marfa)

2) The amount of passenger transport for the past four years has been increasing. Comparing the actual passenger transport in 2012 with the projected volume for 2008, the passenger transport was increased by 1.9 times.
3) The average track capacity was increased by 40% against the baseline figure, since the rehabilitation/improvement of the EU-funded Baneasa - Fetesti was completed in 2011 and thus, the whole alignment of Bucharest - Constanta became fully operational.
4) The average travel time between Bucharest and Constanta was reduced from 165 minutes before the project to 158 minutes after the project.
5) The maximum operating speed was 80 km/hour for freight trains and 120 km /hour for passenger trains before the project. After completion of the project, the maximum speed for passenger trains was raised to 140 km/hour. Starting in 2014, the maximum speed for freight and passenger trains is to be raised to 120 km/hour and 160 km/hour, respectively.

(2) Railway Accidents (Bucharest - Constanta section)

Data for the past four years indicates that in 2011 there were 2 train/car collisions and one was killed in one of the accidents. The train/car accidents took place at the at-grade crossing, which had a simple crossing bar for an approaching car for each direction, and after the accident, a set of crossing bars, which covers completely both directions was installed at all the at-grade crossings with the European funds.

3.2.2 Qualitative Effects

Under the ex-post evaluation exercise, beneficial surveys were undertaken[6]. The summary of survey results are discussed below.

[6] Beneficiary surveys were conducted in the following manner. Date of surveys undertaken: December 17-20 , 2012. Locations: around Bucharest and Constanta stations. Number of samples collected: 92 males and 63 females with a total of 155 (139 passengers and 16 non-passengers).

・ Improvement of safety after project

Unit: %

Fully disagree	Disagree	Not clear	Agree	Fully agree	No idea
2	2	16	32	44	4

・ Reduction of travel time after project

Unit: %

Fully disagree	Disagree	Not clear	Agree	Fully agree	No idea
4	8	25	34	27	2

・ Reduction of waiting time at station after project

Unit: %

Fully disagree	Disagree	Not clear	Agree	Fully agree	No idea
3	7	26	34	24	6

・ Improvement of delay of train operation after project

Unit: %

Fully disagree	Disagree	Not clear	Agree	Fully agree	No idea
5	8	23	32	30	2

About 80% of respondents recognize that the safety has been improved after completion of the project, and about 60% noted that the travel time has been shortened. The results likely confirm that the project has contributed to qualitative improvement for the transport demand. Moreover, about 60% of respondents conceive that the project has contributed to the reduction of waiting time at stations and to the improvement for delay of train operation. Thus, the project in some degree contributes to addressing the transport demand.

3.3 Impact

3.3.1 Intended Impacts

(1) Contribution to Promotion of Economic Development

As a result of the global financial crisis, Romania's GDP fell more than 7% in 2009, prompting Romania to seek a $26 billion emergency assistance package from IMF, EU, and other international lenders. Drastic austerity measures led to a 1.6% GDP ($260.7 billion) contraction in 2010. In 2011, the export has increased with GDP of $267.1 billion, and the growth rate has turned to be plus (Source: CIA - The World Facebook). The freight amount handled at Constanta Port is as shown in Table 2. Since the data on the ratio of freight amount brought into/out of Constanta Port by mode (vehicles or railway) was not available, the degree of contribution by the project to the economic development and export is uncertain.

Table 2: Freight Amount handled by Containers at Constanta Port

Unit: TEU

Year	Export	Import	Transit	Total
2009	154,102	155,590	277,206	586,898
2010	190,109	196,447	162,640	549,196
2011	235,147	238,860	182,688	656,695
2012	299,069	297,139	253,191	849,399

Source: Constanta Port Authority
Note 1: TEU = Twenty-foot Equivalent Unit
Note 2: Figures for 2012 were estimated by prorating the 9-month data from January through September.
Note 3: The freight amount handled by containers at Constanta Port occupies about 13% of the total freight amount in ton basis.

Summary of the beneficial survey results on the enhancement of economic activities along the railway corridor and promotion of business after project are shown below.

・ Enhancement of Economic Activities along the Railway Corridor

Unit: %

Fully disagree	Disagree	Not clear	Agree	Fully agree	No idea
2	13	16	24	14	31

・ Promotion of Business after Project

Unit: %

Fully disagree	Disagree	Not clear	Agree	Fully agree
8	8	38	31	15

Note: responses of non-users (salesperson at stations, bus and taxi drivers who transport passengers between stations and towns)

According to the beneficial surveys, the ratio of respondents who conceived contribution of the project after completion of the project is about 40% regarding enhancement of economic activities along the corridor, and 50% on business promotion, respectively. The reason for the lower recognition of the project's contribution is mainly economic recession which affects the whole European countries.

3.3.2 Other Impacts

(1) Impacts on the natural environment

Ministry of Environment cleared the Environmental Impact Assessment (EIA) in March 2001, and it was valid until the project completion regarding the external agency-funded projects. According to National Railway Company (CFR), the railway alignment mostly passes through non-residential areas, and the impact to the living environment was very limited. During the project implementation, appropriate countermeasures were undertaken, including the slope protection work undertaken at

sites where topography or geological conditions were poor in order to prevent washout of soils from the project site. An environmental monitoring was undertaken during implementation, and it is reported that no major issue occurred.

(2) Land Acquisition and Resettlement

Since the project was rehabilitation work within the existing right-of-way, no additional land acquisition and no resettlement occurred. However, procedures for transfer of the ownership of national land with a total area of 30,255 m^2 were made.

(3) Other Positive and Negative Impacts

None.

Since the economic condition in Europe has been deteriorated because of the Lehman Shock occurred in September 2008, followed by breakout of Greek economic crisis in January 2010, the trade and logistics with neighboring countries have stayed stagnant. Thus, the growth of the amount of freight and passenger transported for the past two years (from 2011 to 2012) is minimal. However, the amount of passengers transported has been substantially increased compared the actual volume in 2012 with the projected volume for 2008. With respect to the expansion of transporting capacity and improvement of transport efficiency, which are the project objectives, increase of tracks capacity, and reduction of travel time have been achieved. The increase of operating speed is also planned. The project has largely achieved its objectives and thus the effectiveness is high.

3.4 Efficiency (Rating: ①)

3.4.1 Project Outputs

The original and actual output of the project is shown in Table 3.

The original scope of work at appraisal was planned based on the scope/bill of quantities defined and estimated in the feasibility study, completed in 1999. However, during the project implementation, the detailed designs and bidding documents were completed and the scope of work was partly revised.

Table 3: Output (original and actual)

Item	Original Plan	After revisions made (main items)	Actual
Civil Work	・ embankment consolidation (1.9 millionm^3, drainage : 87km) ・ rehabilitation of structures (11 bridges with 646m、25 culvert boxes) ・ construction of stations (platform 32,800m^2, 9 buildings) ・ rehabilitation of tracks (rail 57km, ballast 370,000m^3) ・ contact lines (260km)	・ embankment consolidation (2.4 million m^3, drainage : 87km) ・ rehabilitation of structures (16 bridges with 706m、51 culvert boxes) ・ construction of stations (platform 27,250m^2, 10 new buildings) ・ rehabilitation of tracks (rail 298km, ballast 600,000m^3) ・ contact lines (262km)	Almost as planned ・ embankment consolidation (2.2 million m^3, drainage : 100km) ・ rehabilitation of structures (16 bridges with 711m、51 culvert boxes) ・ construction of stations (platform 22,500m^2, 10 new buildings /rehabilitation) ・ rehabilitation of tracks (rail 305km, ballast 500,000m^3) ・ contact lines (280km)
Procurement/ installation of equipment	・ signals (112 units), telecommunication (85km), Electric (substations), Operating system (85kmABS) ・ equipment	・ signals (340 units), telecommunication (85km), Electric (substations), Operating system (85kmABS) ・ equipment	as planned ・ signals (340 units), telecommunication (85km), Electric (substations), Operating system (85km ABS) ・ equipment (4 items with 18 sets)
Consulting services	・ detailed designs ・ assistance in tendering (preparation of bidding documents, assistance in bid evaluation) ・ construction supervision ・ advice on clauses on environmental issues in the bidding documents ・ advice on management and financial issues ・ technical advice on environmental protection Foreign 360 M/M Local consultant: 720 M/M Local staff: 420 M/M		As planned ・ detailed designs ・ assistance in tendering (preparation of bidding documents, assistance in bid evaluation) ・ construction supervision ・ advice on clauses on environmental issues in the bidding documents ・ advice on management and financial issues ・ technical advice on environmental protection Foreign: 439 M/M Local consultant: 1,234 M/M Local staff: 860 M/M

Source: JICA appraisal documents, Project Completion Report, Responses to the Questionnaire
Note: Project length: Bucharest North – Baneasa (5.3 km) and Fetesti – Constanta (76.6km) with a total length of 82km.

Main revisions made on the scope of work during the detailed engineering stage are as follows:

1) At the feasibility study stage, no major rehabilitation on stations and main tracks was planned. However, in order to conform to the EU standards, major rehabilitation works were added at the detailed design stage.

2) Originally, double tracking work was planned for the section between Bucharest North and Baneasa. Later, this plan was canceled.
3) The number of bridges to be rehabilitated at the feasibility stage was 11, and this was later increased to 15.
4) The number of culverts planned to be rehabilitated was originally 25, however, this was increased to 51.

The revisions made are based on the results of detailed designs, and they are considered appropriate. It seems that the impacts to the project (particularly on operational indicators) by progress of the EU-funded rehabilitation and improvement work for the Baneasa - Fetesti section (completed in 2011) were not fully taken into consideration at appraisal stage.

Comparing the planned scope of work defined after completion of detailed designs with actually accomplished scope of work, there are no major changes except that the higher standards than those proposed at the planning stage were applied to the design standards.

Beginning point of Bucharest - Baneasa section (Bucharest Station)

Ending point of Bucharest North - Baneasa section (Baneasa Station)

3.4.2 Project Inputs

3.4.2.1 Project Cost

The estimated project cost at appraisal was 34.180 billion yen, of which the total Japanese ODA loan of 25.635 billion yen was to be used for foreign currency and part of local currency portions, and the remaining 8.545 million yen was to be own funded. The actual cost project was 78.862 billion yen, and substantially increased, which is equivalent to 231% of the planned cost. Comparing the project cost in Euro, the planned project cost at appraisal was 342 million Euro, and the actual cost was 536 million Euro, which is equivalent to 156% of the planned cost. The actual project cost excluding increase due to price escalation is 438 million Euro, which is equivalent to 128% of the planned cost.

Table 4: Comparison of Project Cost (Planned and Actual)

Unit: million yen

Item	Planed					Actual				
	Foreign Yen loan	Local		Total		Foreign Yen loan	Local		Total	
		Own fund	Yen loan	Total	Yen loan		Own fund	Yen loan	Total	Yen loan
Civil Work, Procurement of Equipment/ Installation	14,781	1,059	6,955	22,795	21,736	22,487	41,319	0	63,806	22,487
Consulting services	1,705	0	715	2,420	2,420	2,501	672	0	3,173	2,501
Contingency	1,479	802	0	2,281	1,479	-	-	-	-	-
Land acquisition	0	42	0	42	0	0	0	0	0	0
Tax	0	6,642	0	6,642	0	0	11,883	0	11,883	0
Total	17,965	8,545	7,670	34,180	25,635	24,988	53,874	0	78,862	24,988

Source: JICA appraisal documents, Project Completion Report, Responses to the Questionnaire

Exchange rate: 1 EUR =100.87 yen (at planning stage in June 2000), Average exchange rate during the project implementation: 1 EUR = 147 yen for civil work

Main reasons for substantial project cost increase are as follows:

1) Design changes were made and variation orders were issued during implementation (including construction of turnouts, embankment consolidation, change of interlocking system, protection of cables, long hauling distance of wastes, construction of a substation and others). Since the connecting Baneasa-Fetesti section was also under rehabilitation with the EU funds, various design changes were made to conform to the design standards applied to the Baneasa-Fetesti section. As rehabilitation and development of infrastructure conforming to the EU standards was also the agenda to be urgently addressed, all the design changes made are considered appropriate.
2) Contracts with contractors were made in Euro. During the project implementation after appraisal, the Japanese yen became weaker (from 1 EUR =100.87 yen to 1 EUR = 147 yen), and this resulted in 50% cost increase in Japanese yen.
3) The price escalation for materials, labor, transporting costs and equipment was estimated at 9.46 million Euro at the appraisal stage. However, the actual cost of price escalation was 88.54 million Euro, which is about 10 times of the estimated cost.

3.4.2.2 Project Period

The original project period planned at appraisal was from March 2001 (signing of the Loan Agreement) to December 2006 with a total period of 70 months. The actual project period was from March 2001 to October 2010 (commencement of operation of the project section) with a total period of 116 months, or equivalent to 166% of the plan. Although the loan was closed in November 2008, the remaining work was continued with own funds, and the whole project

including acceptance by the employer was completed in May 2012. However, since the project section became operational in October 2010, the project completion date was defined to be October 2010.

Table 5: Comparison of Project Period (Planned and Actual)

	Planned (at L/A signing)	Actual
Selection of a consultant	2001.07-2001.12	2001.03-2002.09
Detailed designs	2002.01-2002.12	2003.02-2004.08
Bidding for civil work	2002.07-2004.06	2004.05-2005.11
Civil work	2004.01-2006.12	2005.12-2010.10
Procurement of equipment	2002.07-2004.06	2004.10-2006.06
Consulting services	2002.01-2006.12	2003.02-2012.05

Source : JICA appraisal documents, Project Completion Report, Responses to the Questionnaire

Main reasons for delay of the project implementation are as follows:

1) At the selection process for consultants, the implementation was delayed by 9 months against the original schedule.
2) Preparation of detail designs was delayed, resulting in 20 months delay at the completion of detailed designs.
3) Due to delay of completion of detail designs, the tendering process for selection of contractors was delayed, resulting in 17 months delay at the tendering process stage.
4) Originally, construction was planned to commence in December 2005 and complete by December 2008. However, since the train operation had been continued according to the normal time table until October 2008, construction did not progress as planned. On the other hand, by November 2008 the loan was almost 100% withdrawn, and the remaining work needed to be completed with own funds. Due to the economic crisis, the government could not allocate the budget as needed, and payment to contractors was delayed, resulting in much slower progress of the work. Consequently, the project period was substantially extended.

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

Financial Internal Rate of Return (FIRR) and Economic Internal Rate of Return (EIRR) calculated at appraisal were 7.27% and 16.71%, respectively. It is not possible to recalculate FIRR and EIRR at the ex-post evaluation stage, since it is extremely difficult to collect accurate relevant information and data needed for recalculation, which includes construction and operation/maintenance costs for the EU-funded Baneasa – Fetesti section with respect to costs, and tariff/charge revenue from relevant enterprises and entities (refer to 3.5.1 the operation and maintenance organization under the Sustainability) regarding benefits.

Outputs of main project components are almost as planned. However, both project cost and

project period significantly exceeded the plan. Therefore, efficiency of the project is considered low.

3.5 Sustainability (Rating: ③)

3.5.1 Structural Aspects of Operation and Maintenance

National Railway Company (Căile Ferate Române - CFR) is responsible for operation and maintenance of the completed railway lines including maintenance of infrastructure and operational control of railway lines after completion of the project. The total number of employees as of 2011 is about 24,000. However, maintenance of contact lines, electrical traction substations and supply sources installed under the project is entrusted to the 100% CFR-owned "Electrificare", which has about 2,800 employees as of 2011. While, maintenance of telecommunication networks is performed by the 100% CFR-owned "Telecomunicatii", which has about 1,000 employees as of 2011 on an annual contract basis.

Regarding the operation and maintenance of the project sections, the Bucharest Regional Center for Operation, Maintenance and Repair is responsible for the section between Bucharest North and Baneasa, while the Constanta Regional Center is responsible for the section between Fetesti and Constanta. The total number of technical employees in charge of maintenance of the project section is about 300, which includes some staffs, who are responsible for other sections as well.

Operation system at Cernavoda Pod

Freight transported by railway

3.5.2 Technical Aspects of Operation and Maintenance

All the staffs in charge of operation and maintenance of the project section at CFR Regional Centers for Operation, Maintenance and Repair, Electrificare and Telecomunicatii have taken the on-the-job training on operation and handling in case of failure from suppliers/contractors after the facilities were completed or equipment was installed, and operation and maintenance manuals are well prepared. Most of equipment installed are still within the warranty period, and thus, it is possible to call suppliers/contractors and handle the issue together when any

problem occurred, which could be part of on-the-job training as well.

Regarding the maintenance work for infrastructure, internal regulations and manuals are prepared for each facility and equipment by CFR, and staffs have taken relevant training courses regularly.

3.5.3 Financial Aspects of Operation and Maintenance

The Income and Expenditure Statement of CFR for the past three years is shown in Table 6.

Table 6: Income and Expenditure Statement of CFR

Unit: thousand lei

	2009	2010	2011
Fare revenue	983,280,925	2,166,850,975	3,089,763,226
Financial income	156,362,647	923,853,382	981,811,524
Revenue total	1,139,643,572	3,090,704,357	4,071,574,750
Operation and maintenance costs	2,263,682,114	4,384,982,499	4,780,029,762
Financial expenses	160,567,830	927,714,090	718,652,813
Income tax	28,667	32,250	0
Balance	△1,124,038,542	△1,294,278,142	△708,455,012

Source: Project Completion Report, Responses to the Questionnaire

CFR has had adverse balance for the past three years, but deficit has been subsidized by the national budget in the following year. In 2011, rehabilitation of the EU-funded section was completed, and since then, the transport volume has been increasing. Although it also depends on how soon the European economy would recover, it is expected that the balance would improve with increase of the fare/charge revenue, since the Bucharest – Constanta section became fully operational.

The actual maintenance expenses spent for the Fetesti – Constanta section and the budget allocated for fiscal year 2013 are shown in Table 7.

Table 7: Actual Maintenance Expenses spent for the Fetesti – Constanta section and Budget allocated for Fiscal Year 2013

Unit: lei

Item	2011 (Actual)	2012 (Actual from January to June)	2013 (Budget)
Tracks, Superstructure, Signals	4,064,557	2,505,113	4,500,000
Buildings	952,308	35,289	3,000,000
Telecommunications	121,324	62,286	-
Contact lines/ Power source	7,658,780	3,785,473	4,630,000
Total	12,796,969	6,388,161	12,130,000

Source: Project Completion Report, Responses to the Questionnaire

Since the Bucharest North – Banease section under the project is only 5km, the actual maintenance expenses spent for the Fetesti – Constanta section and the budget allocated are shown. Since facilities and equipment rehabilitated or installed under the JICA- and EU-funded projects are still partly within the warranty period, the maintenance budget has not been fully allocated to some items. The implementing agency commented that the budget allocated for maintenance for the past two years and this year is appropriate.

3.5.4 Current Status of Operation and Maintenance

Regarding facilities and equipment rehabilitated or installed under the project, the routine maintenance (e.g. ocular inspection) and periodic maintenance (e.g. replacement of worn out rails, crushed stone compaction) have been undertaken according to the CFR's maintenance manuals. No major problems are reported.

During the field inspection, it was noted that a railway control technician was walking along the railway tracks while checking the condition of rails and sleepers. This ocular inspection has been undertaken every day. Regarding procurement and management of spare parts, since the equipment and facilities are still within or right after expiration of the warranty period, no particular problems have been reported.

No major problems have been observed in the operation and maintenance system, therefore sustainability of the project effect is considered high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objectives of the project were to expand the transporting capacity and improve the transporting efficiency by ensuring stability and safety of the railway operation through upgrading the existing railway tracks (86km) and related facilities including signals, telecommunication systems, electrical facilities, and station facilities between Bucharest and Constanta (225km), which is a segment of the European Fourth Corridor. The project has been highly relevant to the development plans and needs of Romania, as well as Japan's ODA policies. With respect to the expansion of transporting capacity and improvement of transport efficiency, which are the project objectives, the project has largely achieved its objectives, and thus the effectiveness and impact are high. Outputs of main project components are almost as planned. However, both project cost and project period significantly exceeded the plan. Therefore, efficiency of the project is considered low. No major problems have been observed in the operation and maintenance system, therefore sustainability of the project effect is considered high.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

None.

4.2.2 Recommendations to JICA

None.

4.3 Lessons Learned

As discussed under the Efficiency, during the project implementation, changes of project scope were made in order to conform to the EU standards, and this is the main reason for substantial difference in output. Since the EU-funded project was already planned at the appraisal stage, the project should have taken into consideration the impacts by the EU-funded project. When other plans and programs such as country's future plans and relevant infrastructure projects, affecting the scope of the proposed project, were already foreseen, verification and analysis on these plans and programs needs to be undertaken at the preparation stage for the similar type of future projects. Then, the appropriate project scope, which takes into account the relevant other plans and program needs to be defined.

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Output 1) Civil Work	・ embankment consolidation (1.9 million m^3, drainage: 87km) ・ rehabilitation of structures (11 bridges with 646m、25 culvert boxes) ・ construction of stations (platform 32,800m^2, 9 buildings) ・ rehabilitation of tracks (rail 57km, ballast 370,000m^3) ・ contact lines (260km)	Almost as planned ・ embankment consolidation (2.2 million m^3, drainage: 100km) ・ rehabilitation of structures (16 bridges with 711m, 51 culvert boxes) ・ construction of stations (platform 22,500m^2, 10 new buildings/rehabilitation) ・ rehabilitation of tracks (rail 305km, ballast 500,000m^3) ・ contact lines (280km)
2) Procurement /installation of equipment	・ signals (112 units), telecommunication (85km), Electric (substations), Operating system (85kmABS) ・ equipment	・ signals (340 units), telecommunication (85km), Electric (substations), Operating system (85km ABS) ・ equipment (4 items with 18 sets)
3) Consulting Services	・ detailed designs ・ assistance in tendering (preparation of bidding documents, assistance in bid evaluation) ・ construction supervision ・ advice on clauses on environmental issues in the bidding documents ・ advice on management and financial issues ・ technical advice on environmental protection Foreign experts 360 M/M Local experts 720 M/M Local staff 420 M/M	As planned ・ detailed designs ・ assistance in tendering (preparation of bidding documents, assistance in bid evaluation) ・ construction supervision ・ advice on clauses on environmental issues in the bidding documents ・ advice on management and financial issues ・ technical advice on environmental protection Foreign experts 439 M/M Local experts 1,234 M/M Local staff 860 M/M
2. Project Period	March 2001 -December 2006 (70 months)	March 2001 -October 2010 (116 months)
3. Project Cost Amount paid in Foreign currency Amount paid in Local currency Total Japanese ODA loan portion Exchange rate	 17,965 million yen 16,215 million yen 34,180 million yen 25,635 million yen 1EUR = 100.87 yen (as of June 2000)	 24,988 million yen 53,874 million yen 78,862 million yen 24,988 million yen 1EUR = 147 yen (average between December 2005 and October 2010)

Egypt

Ex-Post Evaluation of Japanese ODA Loan Project

Zafarana Wind Power Plant Project

External Evaluator: Yasuhiro Kawabata, Masami Tomita, Sanshu Engineering Consultant

0. Summary

This project aimed at increasing power supply and reducing the use of fossil fuels, by constructing the 120MW of wind power plant in Zafarana of Egypt, and thereby contributing to reduction of air pollution, amount of greenhouse gas emissions equivalent to the amount when a similar size of a thermal power plant is operated and global warming.

Relevance of this project is high, as the project is consistent with priority areas of Egypt's development plans and Japan's ODA policy, and moreover development needs for the project are high. Actual figures of almost all the operation and effect indicators are higher than approximately 80% of target figures for two years after project completion, and the project contributed to the increase of power supply and reduction of the use of fossil fuels and the amount of greenhouse gas emissions. Thus, effectiveness and impact of the project are high. Sustainability of the project is also high, as no major problem has been observed in institutional, technical and financial aspects of operation and maintenance (O&M) and current O&M status. On the other hand, efficiency of the project is low, as both actual project cost and period largely exceeded planned cost and period.

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

1. Project Description

Project Location

Wind Power Plant Constructed by the Project

1.1 Background

Before the project was implemented, Egypt had been faced with power supply constraints, and there were frequent power cuts during peak time of summer in 2002, which became a social

problem[1]. In order to address the problem, the Egyptian government promoted construction of power plants, particularly of thermal power plants, and also promoted utilization of new and renewable sources of energy, to advance energy saving and environmental protection.

The project site, Zafarana, is an area which is endowed with stable wind speed and direction almost throughout a year and is suitable for wind power generation (the average wind speed from 1991 to 2001 was 9.0 m/sec[2]). Moreover, the availability factor of the existing wind power plants in the area (30MW constructed with assistance from Danish International Development Agency (DANIDA) and 33MW constructed with assistance from Kreditanstalt für Wiederaufbau (KfW)) was as high as 98%[3]. Therefore, this project was implemented in order to increase power supply and reduce air pollution and greenhouse gas emissions through reduction of the use of fossil fuels, by utilizing wind energy.

This project was also approved as a Clean Development Mechanism (CDM) project by the CDM Executive Board of the United Nations in 2007[4]. Japan is obliged to reduce greenhouse gas emissions to a level 6% below 1990 levels during the first commitment period (2008-2012) which was defined in the Kyoto Protocol. However, private enterprises have shown cautious reactions to institutional and commercial risks related to the Kyoto Mechanisms, and thus the amount of private funds available for CDM projects is limited. On the other hand, CDM projects provide developing countries with the secondary benefits such as reduction of air pollution and saving of foreign currencies through slower demand for oil. Moreover, CDM projects compensate low profitability of projects through acquisition of Certified Emission Reductions (CER) credits, which enables proper project operation. Therefore, based on above reasons, this project was implemented as a CDM project[5].

1.2 Project Outline

The objective of this project is to increase power supply and reduce the use of fossil fuels, by constructing the 120MW of wind power plant in Zafarana of Egypt (on the Red Sea coast

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1 Source: Japan International Cooperation Agency (JICA) appraisal document

2 Source: interviews with the executing agency (New and Renewable Energy Authority: NREA)

3 Source: JICA appraisal document

4 Background of CDM: the United Nations Framework Convention on Climate Change (UNFCCC), which states international efforts to reduce greenhouse gas emissions, was adopted in 1992. Then, the Kyoto Protocol was adopted in 1997, which obliges developed countries to reduce greenhouse gas emissions to certain levels below 1990 levels during the first commitment period (2008-2012), in order to achieve the objective of the convention. Moreover, the Kyoto Mechanisms was established, which allows developed countries to utilize reduced amount of greenhouse gas emissions in other countries in addition to the amount reduced in their own countries, in order for developed countries to achieve numerical targets for emission reduction stated in the Kyoto Protocol. The Kyoto Mechanisms consists of 1) Clean Development Mechanism (CDM), 2) Joint Implementation (JI), and 3) Emissions Trading (ET). CDM, which was adopted in this project, is a mechanism in which developed countries reduce greenhouse gas emissions in developing countries through projects and utilize the reduced amount to achieve their reduction targets in their country.

5 Source: JICA internal document

220km southeast of Cairo), and thereby contributing to reduction of air pollution, amount of greenhouse gas emissions equivalent to the amount when a similar size of a thermal power plant is operated and global warming.

Loan Approved Amount/ Disbursed Amount	13,497 million yen / 13,497 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	October, 2003 / December, 2003
Terms and Conditions	Interest Rate: 0.75% Repayment Period: 40years (Grace Period: 10 years) Conditions for Procurement: General Untied
Borrower / Executing Agency(ies)	New and Renewable Energy Authority: NREA Guarantor: Government of Egypt
Final Disbursement Date	July, 2010
Main Contractor (Over 1 billion yen)	Gamesa Eolica SL (Spain)
Main Consultant (Over 100 million yen)	DECON Deutsche Energie-Consult Ingenieurgesellschaft (Germany) ・ Oriental Consultants (Japan) (JV)
Feasibility Studies, etc.	Japan Consulting Institute (JCI), 1999
Related Projects (if any)	Wind power plants assisted by DANIDA (180MW in total), assisted by KfW (160MW in total), assisted by Spanish government (85MW in total)

2. Outline of the Evaluation Study

2.1 External Evaluator

Yasuhiro Kawabata, Masami Tomita, Sanshu Engineering Consultant

2.2 Duration of Evaluation Study

Duration of the Study: September, 2012 – August, 2013

Duration of the Field Study: December 6 – December 15, 2012, March 14 –March 23, 2013

3. Results of the Evaluation (Overall Rating: B[6])

3.1 Relevance (Rating: ③[7])

3.1.1 Relevance with the Development Plan of Egypt

At the time of project appraisal, Egypt, which was faced with power supply constraints, aimed at increasing power supply comprehensively by 1) effective utilization of resources (water resources and natural gas) and enhancement of efficiency of existing power generation

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

[7] ③: High, ② Fair, ① Low

facilities (transition from traditional steam turbine to combined cycle) and 2) energy diversification (hydraulic power, wind power and solar power) through construction of new power generation facilities [8] . The Fifth Five-Year National Development Plan (2002/2003-2006/2007) states that the country would promote utilization of new and renewable sources of energy by implementing solar and wind power projects[9]. Moreover, the Long Term Electric Power Development Plan (2002-2012) states that construction of 11,279MW in total of new power generation facilities was planned, of which 880MW was planned to be covered by new and renewable sources of energy by 2010 (of which, 815MW was planned to be covered by wind power generation)[10].

On the other hand, at the time of ex-post evaluation, the Sixth Five-Year National Development Plan (2007/2008-2011/2012) (Chapter 5) emphasizes utilization of new and renewable sources of energy, and the supply capacity of wind power generation is targeted to be increased to 1,050MW in total during the plan period[11]. Moreover, according to the Energy Sector Development Plan of Egypt (2012/2013 -2016/2017), 13,970MW in total of power-generating capacity is planned to be developed during the plan period, of which 2,850MW is planned to be covered by wind power generation[12].

Therefore, enhancement of power supply capacity and utilization of new and renewable sources of energy including promotion of wind power projects are emphasized in national and sector development plans of Egypt both at the time of project appraisal and ex-post evaluation, and thus the project is consistent with the development plans.

3.1.2 Relevance with the Development Needs of Egypt

At the time of project appraisal, electric power demand in Egypt had been increasing by 5-7% a year since 1995, and it was expected to be tripled in 20 years from 1997[13]. The target figure for the supply reserve margin[14] in the country is set at 15%, however, the margin was expected to decrease to approximately 10% in 2004/05 due to increasing power demand[15]. In August 2002, power demand increased sharply due to heat wave, which caused serious power shortage and periodic power cuts in the country[16]. Therefore, to increase power supply and to reduce environmental burdens were required.

Table 1 shows the transition of total power generation capacity, peak power demand (peak

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8 Source: JICA appraisal document
9 Source: same as above
10 Source: same as above
11 Source: Egyptian government HP (http://www.mop.gov.eg/english/sixth%20five%20year.html)
12 Source: document provided by Egyptian Electricity Holding Company (EEHC)
13 Source: JICA appraisal document
14 The supply reserve margin = ((total power generation capacity – peak demand) / peak demand) x 100
15 Source: JICA appraisal document
16 Source: same as above

load), and the supply reserve margin in Egypt from the time of project appraisal to ex-post evaluation.

Table 1: Total Power Generation Capacity, Peak Demand, and the Supply Reserve Margin in Egypt

Financial Year	2001/02	2002/03	2003/04	2004/05	2005/06
Peak Power Demand (MW)	13,326	14,401	14,735	15,678	17,300
Total Power Generation Capacity (MW)					
Thermal	13,498	13,498	13,187	13,804	15,438
Hydro	2,745	2,745	2,745	2,783	2,783
Wind	63	63	140	140	183
Solar	0	0	0	0	0
Private Sector	683	1,365	2,048	2,048	2,048
Total	16,989	17,671	18,120	18,775	20,452
Supply Reserve Margin (%)	27	23	23	20	18
Financial Year	2006/07	2007/08	2008/09	2009/10	2010/11
Peak Power Demand (MW)	18,500	19,738	21,330	22,750	23,470
Total Power Generation Capacity (MW)					
Thermal	16,889	17,389	18,230	19,388	21,514
Hydro	2,783	2,842	2,800	2,800	2,800
Wind	225	305	425	490	687
Solar	0	0	0		
Private Sector	2,048	2,048	2,048	2,048	2,048
Total	21,945	22,584	23,503	24,726	27,049
Supply Reserve Margin (%)	19	14	10	9	15

Source: EEHC Annual Report

According to the table above, the actual figures of the supply reserve margin had been above the target (15%) until 2006/07, however, the margin has been below the target since 2007/08, and to increase power supply is still an important issue for the country.

The power plant constructed by the project is connected to the national grid, and electric power has been supplied to the Zafarana area from the national grid since 2003 (previously power was supplied 4 hours a day only from 17:00 to 21:00 using generators). The amount of power sold in the area in 2003 was 136MWh, which increased to 54,360MWh in 2012 by 400 times[17].

Therefore, electric power demand in Egypt has been increasing since the time of project appraisal, and relevance of the project, which aimed at increasing power supply, remains high at the time of ex-post evaluation.

3.1.3 Relevance with Japan's ODA Policy

According to the Country Assistance Policy for Egypt (2002), Japan emphasizes development of economic and social infrastructures and environmental conservation etc. in the country as

[17] Source: document provided by the executing agency (Egyptian Electricity Transmission Company (EETC))

priority areas for assistance[18]. Moreover, the Overseas Economic Cooperation Operation Policy of JICA (former JBIC) emphasizes "infrastructure development for economic growth" and JICA planned to provide assistance for promoting economic growth through development of economic and social infrastructures including electricity. Also, the policy states that JICA actively supports introduction of new and renewable sources of energy including wind power in an effort to solve global issues, and the project was consistent with these policies[19].

This project has been highly relevant with Egypt's development plan, development needs, as well as Japan's ODA policy, therefore its relevance is high.

3.2 Effectiveness[20] (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

Table 2 shows planned and actual figures of operation and effect indicators for the project.

Table 2: Operation and Effect Indicators for the Project (planned and actual)

Indicator	Planned 2009 (2 years after completion)	Actual 2008[1] (start of operation)	Actual 2009 (project completion)	Actual 2010	Actual 2011 (2 years after completion)	Actual 2012
Maximum Output (MW)	120	85.9	120.7	120.7	120.7	120.7
Utilization Factor (%) [2] (figures in brackets are achievement rates against targets)	40	2.8 (7%)	26.9 (67%)	32.8 (82%)	31.8 (80%)	30.0 (75%)
Unplanned Outage Hours (hours/year) [3]	0	N/A	229	184	165	134
Planned Outage Hours due to inspection& maintenance (per unit) (hours/year) [3]	13	N/A	14	14	14	14
Availability Factor(%) [4] (figures in brackets are achievement rates against targets)	97	N/A	98.4 (101%)	98.9 (102%)	98.7 (102%)	98.6 (102%)
Net Electric Energy Production (GWh/year) [5] (figures in brackets are achievement rates against targets)	415	29.5 (7%)	284.6 (69%)	346.8 (84%)	335.8 (81%)	317.4 (76%)
Amount of Fossil Fuels Saved (ton/year) [6]	N/A	6,000	61,000	75,000	72,000	68,000

Source: Planned: JICA appraisal documents, Actual: Maximum Output / Unplanned Outage Hours / Planned Outage Hours due to Inspection &Maintenance / Net Electric Energy Production: answer to the questionnaire (CMS)

Note 1: Procurements were planned to be implemented by one lot at the time of project appraisal, however, one lot was divided into 11 lots in practice, and the first lot started operation in August 2008.

[18] Source: The Country Assistance Policy for Egypt, Ministry of Foreign Affairs

[19] Source: JICA HP

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

Note 2: Utilization Factor = (Annual Electricity Production (kWh) / (Rated Output (kw) x (Total Hours per Year (H)) x 100

Note 3: Outage hours are the average of each turbine.

Note 4: Availability Factor = (Annual Operation Hours (H) / Total Hours per Year (H)) x 100.
Annual Operation Hours = (Total Hours per Year) – (Outage Hours due to Mechanical Troubles and Natural Disasters etc.)

Note 5: Actual figures of Net Electric Energy Production are the amount of electricity which was received by EETC and certain amount of which was consumed by NREA (NREA is resupplied with electricity from EETC when wind power is not sufficient etc.) While target figures in the project appraisal unlikely took into account the possibility of NREA being resupplied with electricity from EETC, the ex-post evaluation used the most conservative figures as actual figures.

Note 6: Amount of Fossil Fuels Saved = Annual Electricity Production (kWh) x Fuel Consumption Rate (217g/kWh)

When comparing planned and actual figures of two years after project completion, actual figures of the utilization factor and net electric energy production are approximately 80% of planned figures, and actual figures of maximum output and the availability factor slightly exceeds planned figures. Actual figures of planned outage hours due to inspection and maintenance are almost the same as planned figures. According to the executing agency, the reason for actual figures of the utilization factor and net electricity energy production being approximately 20% below planned figures is mainly due to the decrease in the wind speed, as planned figures were calculated based on the wind speed of 9.0 m/sec which was actually measured at the time of project appraisal, however, the wind speed of recent years is approximately 7.5 m/sec. While there was no planned figure for the amount of fossil fuels saved, approximately 60,000 – 75,000 tons seem to have been saved per year.

Table 3 shows the breakdown of unplanned outage hours.

Table 3: Breakdown of Unplanned Outage Hours

(Unit: hours/year)

Year	Mechanical Troubles / Natural Disasters etc.	Others (Due to external factors such as shut down of the national grid etc.)	Total
2009	20,135 (average of 1 turbine: 142)	12,396 (average of 1 turbine: 87)	32,531 (average of 1 turbine: 229)
2010	13,776 (average of 1 turbine: 97)	12,400 (average of 1 turbine: 87)	26,176 (average of 1 turbine: 184)
2011	16,366 (average of 1 turbine: 115)	7,101 (average of 1 turbine: 50)	23,467 (average of 1 turbine: 165)
2012	17,947 (average of 1 turbine: 126)	1,122 (average of 1 turbine: 8)	19,069 (average of 1 turbine: 134)

Source: answer to the questionnaire (CMS)

Unplanned outage hours were targeted as zero hour at the time of project appraisal, however, in the case of zero unplanned outage hours, the availability factor becomes 99.8%, which contradicts with the planned figure of 97%. Moreover, according to the interviews with operation staff of the executing agency and local electricity experts, assuming zero unplanned outage hours due to

mechanical troubles and natural disasters is highly unlikely, and the planned figure for unplanned outage hours set at the time of project appraisal is considered to be unrealistic.

3.3 Impact

3.3.1 Intended Impacts: Reduction of Greenhouse Gas Emissions

Table 4 shows planned and actual figures of avoided CO_2 emission realized by the project.

Table 4: Avoided CO_2 Emission by the Project (Planned and Actual)

(Unit: both planned and actual: ton/year)

Year	Planned	Actual	Achievement Rate
2008	-	16,000	-
2009	233,000	157,000	67%
2010	233,000	191,000	82%
2011	233,000	185,000	79%
2012	233,000	175,000	75%

Source: Calculated by Net Electric Energy Production (MWh) x CO_2 Emission Factor ($0.55tCO_2/MWh$) based on CDM Project Design Document (PDD).

The original target of avoided CO_2 emission was estimated as 270,000 ton per year in the project appraisal[21], however, the net calorific value and the carbon emission factor used in the project appraisal are different from those used in CDM PDD, and thus planned and actual figures cannot be simply compared. Then, the target figure was recalculated using the net calorific value and the carbon emission factor adopted in PDM CDD, which turned out to be 233,000 ton per year. The achievement rate of actual figures against the revised target is approximately 80%. Approximately 180,000 – 190,000 ton of CO_2 emissions seem to have been avoided annually by the project, and it is considered to contribute to reduction of air pollution and global warming.

3.3.2 Other Impacts

3.3.2.1 Benefits for the Project Area and Local People

According to interviews with executing agencies (NREA and EETC), employment in the locality increased during the construction period and after commencement of operation in the power plant.

3.3.2.2 Impacts on the natural environment

Environmental management manuals were prepared by contractors of the project which indicate points to be complied during the construction period and after commencement of operation, and waste management and control of chemical products etc. have been conducted

[21] Source: JICA appraisal document

based on these manuals. According to executing agencies, the results of environmental monitoring were reported to JICA. Moreover, according to interviews with staff of NREA, EETC, the local government (Red Sea Governorate), and Romance Beach Hotel, there was no negative impact on environment due to the project. The contents of the project were construction of a new wind power plant and expansion of the existing substation in the desert area where there is no local residents, and thus there seems to have been no negative environmental impact such as noise problems etc.

3.3.2.3 Land Acquisition and Resettlement

According to executing agencies, there was no resettlement due to the project.

This project has largely achieved its objectives, therefore its effectiveness and impact are high.

3.4 Efficiency (Rating: ①)

3.4.1 Project Outputs

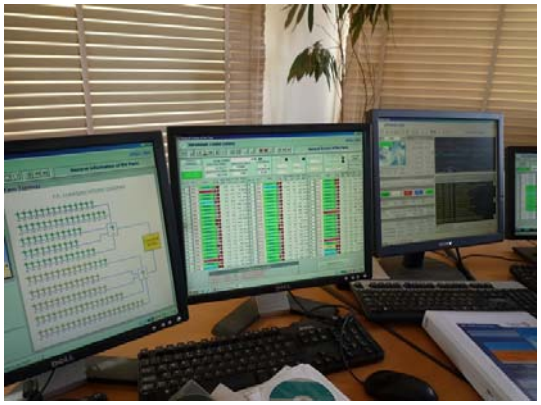
Outputs of the project (planned and actual) are shown below in Table 5. Regarding the wind power plant, while the maximum output of 120MW was planned in the project appraisal, the actual maximum output was 120.7MW, which was slightly higher than the plan, as the output of each turbine turned out to be 850kW for 142 units.

Table 5: Comparison of Outputs (Planned/ Actual)

Item		Planned	Actual
Civil Works	Construction of Wind Power Plant	・ Wind turbine generators (range from 600kW x 200 units to 1,000kW x 120 units), 120MW in total ・ Control monitoring system and other related equipment ・ Electrical works and civil & installation works	・ Almost as planned However, 120.7MW in total (850kW x 142 units)
	Expansion of Substation (not covered by Japan's ODA)	・ Transformers (125MVA x 2 units) and other related equipment ・ Electrical works and civil & installation works	・ As planned
Consulting Service	Contents	・ Conceptual design ・ Preparation of Pre-Qualification (P/Q) documents and bid documents ・ Assistance for evaluation of bids ・ Assistance for contract management ・ Supervision of the civil (construction) works etc.	・ As planned
	Mans-Month	・ International CS: 57M/M ・ Local CS: 119M/M 176M/M in total	・ International CS: 80M/M ・ Local CS: 40M/M 120M/M in total

Source: Planned: JICA appraisal documents, Actual: JICA internal documents and interviews with executing agencies

Substation installed by the project



Control Monitoring System

3.4.2 Project Inputs

3.4.2.1 Project Cost

The planned project cost at the time of project appraisal was 18,466 million yen (foreign currency: 13,915 million yen, local currency: 4,551 million yen), of which Japanese ODA Loan portion was 13,497 million yen[22]. Among the above, the planned cost for construction of the wind power plant was 17,927 million yen (foreign currency: 13,497 million yen, local currency: 4,430 million yen), of which Japanese ODA Loan portion was 13,497 million yen. The planned cost for expansion of the existing substation was 539 million yen (foreign currency: 418 million yen, local currency: 121 million yen), and the cost for expansion of the substation was to be covered by EETC budget[23].

On the other hand, the actual project cost was 26,292 million yen (foreign currency: 16,147 million yen, local currency: 10,145 million yen)[24], of which Japanese ODA Loan portion was 13,497 million yen, and it was higher than planned (142% against the plan). Among the above, the actual cost for construction of the wind power plant was 25,644 million yen (foreign currency: 15,693 million yen, local currency: 9,951 million yen), of which Japanese ODA Loan portion was 13,497 million yen. The actual cost for expansion of the existing substation was 648 million yen (foreign currency: 454 million yen, local currency: 194 million yen), and the cost for expansion of the substation was covered by EETC budget.

The reason for the actual cost for construction of the wind power plant exceeding the planned cost was because the actual cost for civil and engineering works largely exceeded the planned cost, while the actual cost for consulting service was almost the half of the planned cost. The reasons for this are the rising price of steel, the fact that the warranty period was extended to

[22] Source: JICA appraisal document

[23] Source: same as above

[24] Calculated by multiplying the actual cost by the average exchange rate of 1EUR=141.56JPY and 1EGP=18.50JPY (the average exchange rate of the Japanese ODA loan disbursement period of December 11, 2003 – July 20, 2010), based on documents provided by executing agencies.

three years after the completion of the last lot for training (OJT) of NREA staff on O&M of the power plant, and fluctuation of exchange rates etc.[25]

3.4.2.2 Project Period

The planned project period at the time of project appraisal was 39 months in total from December 2003 (signing of the loan agreement) to February 2007 (the completion of the project was defined as the completion of civil and engineering works and handing over of the power plant)[26]. On the other hand, the actual project period was 68 months in total from December 2003 (signing of the loan agreement) to July 2009 (completion of civil and engineering works)[27], and it was significantly longer than planned (174% against the plan). The reasons for the actual project period for construction of the wind power plant largely exceeding the planned period are a delay in pre-qualification, the fact that selection of a contractor was delayed due to a long time required for clarification of bidding documents and contract negotiations, the fact that the contact finally became effective in August 2007 while the contract procedure was completed in February 2007, due to a long time required for procedures for advance payment, the commencement of construction works being further delayed until December 2007, and the fact that construction works were stopped for three months due to a long time required for additional payment for higher prices of steel from the contractor to the subcontractor etc.[28] The reason for the actual project period for expansion of the substation exceeding the planned period is because selection of a contractor was delayed due to a delay in preparation of bidding documents, the bidding deadline being extended upon receiving a request from bidders, and a long time required for clarification of bidding documents etc.[29]

Table 6: Comparison of Planned and Actual Project Period for the Wild Power Plant Portion

Content	Planned	Actual
Selection of Consultant	July 2003 – December 2003 (6 months)	September 2003 – May 2004 (9 months)
Conceptual Design	January 2004 – January 2004 (1 month)	November 2004 – November 2004 (1 month)
Procurement of Civil Works	January 2004 – April 2005 (16 months)	January 2005 – February 2007 (26 months)
Civil Works	April 2005 – February 2007 (23 months)	August 2007 – July 2009 (24 months)

Source: Planned: JICA appraisal documents, Actual: answers to the questionnaire

[25] Source: project completion report and JICA internal documents
[26] Source: JICA appraisal document
[27] Source: JICA internal documents and answers to the questionnaire
[28] Source: JICA internal documents and interviews with NREA
[29] Source: interviews with EETC

Table 7: Comparison of Planned and Actual Project Period for the Substation Portion

Content	Planned	Actual
Procurement of Civil Works	May 2003 – August 2003 (4 months)	December 2003 – March 2005 (16 month)
Civil Works	September 2003 – September 2004 (13 months)	March 2005 – May 2006 (15 month)
Testing and Commissioning	October 2004 – November 2004 (1 month)	June 2006 – June 2006 (1 month)

Source: Planned: JICA appraisal documents, Actual: answers to the questionnaire

3.4.3 Results of Calculations of Internal Rates of Return (IRR) (for reference only)

(1) Financial Internal Rate of Return (FIRR)

Results of FIRR calculation at the time of project appraisal and ex-post evaluation are shown below in Table 8. FIRR was calculated using the same conditions as in the project appraisal, based on an assumption that almost the same amount of energy production and electricity price as in 2011 will be kept after 2013 onwards. The actual figure of FIRR is lower than the planned figure, as the actual project cost and O&M cost exceed the planned cost, the actual amount of energy production is a little smaller than the planned amount, the actual amount of subsidy is smaller than the planned amount (in the project appraisal, 50% of the export value – domestic sales value of fuels for power generation saved by the project was allocated as subsidy to be paid from the Ministry of Petroleum to the subsidy fund for renewable energy projects, however, in practice, 0.02LE/kWh is the ceiling for the subsidy) etc.

Table 8: Comparison of FIRR

Time of Calculation	Conditions for Calculation	Result
Project Appraisal (2003)	Cost: investment cost, operation and maintenance cost Benefit: income from energy sales, subsidy Project life: 20 years	1.22%
Ex-Post Evaluation (2012)	Same as above	▲4.40%

Source: Project appraisal: JICA appraisal documents, Ex-post evaluation: calculated based on documents provided by executing agencies

(2) Economic Internal Rate of Return (EIRR)

Results of EIRR calculation at the time of project appraisal and ex-post evaluation are shown below in Table 9. As with FIRR, EIRR was calculated using the same conditions as in the project appraisal, based on an assumption that almost the same amount of energy production and electricity price as in 2011 will be kept after 2013 onwards. While the actual project cost and O&M cost exceed the planned cost and the actual amount of energy production is a little smaller than the planned amount, the border price of electricity and fuel price rose steeply compared with those at the time of project appraisal, which increases the benefit related to the increase of electric power supply

(electricity sales income based on the border price) and the gain from exports of fuels for power generation saved by the project, and consequently, the actual figure of EIRR largely exceeds the planned figure.

Table 9: Comparison of EIRR

Time of Calculation	Conditions for Calculation	Result
Project Appraisal (2003)	Cost: investment cost, operation and maintenance cost Benefit: increase of electric power supply, reduction of CO_2 emission, gain from exports of fuels saved domestically Project life: 20 years	16.90%
Ex-Post Evaluation (2012)	Same as above	31.69%

Source: Project appraisal: JICA appraisal documents, Ex-post evaluation: calculated based on documents provided by executing agencies

The project cost exceeded the plan, while the project period significantly exceeded the plan, therefore efficiency of the project is low.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

Operation and maintenance (O&M) of the wind power plant constructed by the project is conducted by New and Renewable Energy Authority (NREA). The total number of staff in NREA as of 2011/12 is 1,199[30], of which 187 staff work in the Zafarana site, of which 10 engineers and 12 technicians operate and maintain the power plant constructed by the project in two shifts for 12 days each[31].

O&M of the substation added by the project is conducted by Egyptian Electricity Transmission Company (EETC). The total number of staff in EETC as of January 2013 is 33,500[32], of which 32 staff (8 engineers, 11 technicians, 5 workers, 2 drivers, 4 security staff and 2 assistants) operate and maintain the Zafarana substation No.1 added by the project in two shifts for 7days each[33].

Regular inspections are carried out based on maintenance manuals, and the availability factor of the power plant exceeds the target figure of 97%, and thus no major problem is observed regarding the institutional aspect of O&M.

3.5.2 Technical Aspects of Operation and Maintenance

Among 22 staff (engineers and technicians) of NREA responsible for O&M of the wind

30 Source: NREA Annual Report

31 Source: answers to the questionnaire

32 Source: same as above

33 Source: same as above. Among 32 staff in total, 19 staff operate the substation No.1 and 13 staff maintain the substation No. 1 and No. 2.

power plant constructed by the project, all engineers have a bachelor degree of engineering and all technicians have technical diploma[34]. The number of staff with over 10 years of work experience in the electric energy sector is 4, 5 to 10 years is 10, and less than 5 years is 8[35]. Among 22 staff, two staff (the leader of each working shift) had trainings for two weeks in Spain and one week in Egypt, and other staff had OJT for 6 months on average[36]. Maintenance manuals were also prepared.

Among 19 staff (engineers and technicians) of EETC responsible for O&M of the substation added by the project, the number of staff with 25 years of work experience in the electric energy sector is one, 6 to 16 years is 14, and less than 5 years is 4[37]. Trainings on repair and maintenance have been provided for 8 engineers for two weeks and for 8 technicians for 2-3 weeks in EETC's own training center, and maintenance manuals were also prepared[38].

NREA has wealth of experience on wind power generation and EETC has wealth of experience on transformation and transmission of electrical energy, and sufficient number of technical staff is assigned in the field, and no major problem was observed in the site inspection by the evaluator. Therefore, there seems to be no major problem regarding the technical aspect of O&M.

3.5.3 Financial Aspects of Operation and Maintenance

(1) NREA

NREA is an affiliated agency under the Ministry of Electricity and Energy and NREA is not necessarily financially independent, as NREA's revenues and expenditures of each financial year are tied to the national treasury. Table 10 below shows NREA's profit and loss statement (P/L), and while NREA's net income has been in deficit due to a large amount of interest payments related to foreign and domestic loans[39], operating income has been in profit even taking into account depreciation cost. According to the agreement made between the Ministry of Finance, the Ministry of Petroleum and the Ministry of Electricity and Energy in June 2012, it has been determined that the value equivalent to the amount of fuels for power generation (fossil fuels) saved by NREA's projects utilizing new and renewable sources of energy will be allocated to NREA as additional subsidy, which is expected to reduce NREA's deficits largely in the near future[40].

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34 Source: same as above
35 Source: same as above
36 Source: same as above
37 Source: same as above
38 Source: same as above
39 The capital of foreign and domestic loans does not appear in NREA's P/L, as capital is repaid by the Egyptian government.
40 Source: interviews with executing agency (NREA)

Table 10: Profit and Loss Statement of NREA

(Unit: thousand LE)

	2009/2010	2010/2011	2011/2012
Operating Revenue	**293,274**	**244,033**	**251,755**
Operating Expense	**187,319**	**207,784**	**227,807**
Material Inputs	8,714	8,584	10,237
Service Inputs	7,585	8,047	7,648
Wages	21,931	27,158	34,975
Depreciation	143,332	163,699	174,362
Rent	108	104	102
Others	5,649	192	483
Operating Income	**105,955**	**36,249**	**23,948**
Other Income	**20,120**	**26,633**	**20,128**
Subsidy	19,825	26,633	20,128
Others	295	0	0
Other Expense	**255,221**	**224,069**	**463,123**
Interest	242,406	191,410	427,899
Exchange Loss	0	24,331	35,177
Others	12,815	8,328	47
Net Income	**▲129,146**	**▲161,187**	**▲419,047**

Source: prepared based on documents provided by NREA

Table 11 below shows NREA's balance sheet (B/S). While the net income is in deficit of approximately 400 million LE in 2011/12 due to interest payments, the amount of capital was increased for more than 100 million LE. It is considered that this is due to compensation from the national treasury, as NREA's revenues and expenditures of each financial year are tied to the national treasury, as mentioned above, although details of money transfer is not clear[41]. Accordingly, while NREA's net income was in deficit in 2011/12, the capital-asset ratio is maintained at approximately 13%. While the amount of current liability is more than the amount of current asset, this will not be a major problem, as electricity tariffs are usually to be collected regularly in a short term.

Table 11: Balance Sheet of NREA

(Unit: thousand LE)

	2009/2010	2010/2011	2011/2012
Asset			
Current Asset	578,776	1,544,193	1,933,845
Fixed Asset	7,567,048	8,175,473	8,707,184
Asset Total	**8,145,824**	**9,719,666**	**10,641,029**
Capital/Liability			
Capital	1,298,544	1,264,302	1,381,632
Current Liability	629,040	1,854,734	2,521,893
Fixed Liability	6,218,240	6,600,630	6,737,504
Capital/Liability Total	**8,145,824**	**9,719,666**	**10,641,029**

Source: prepared based on documents provided by NREA

[41] While it cannot be denied that part of NREA's finance has been covered by borrowings, capital is repaid by the Egyptian government and hence the impact on NREA's finance is relatively low.

Regarding O&M cost related to the project, at the time of ex-post evaluation, approximately 690 to 820 thousand LE has been expensed annually for O&M of the wind power plant constructed by the project (labour cost, spare parts, and administration cost etc. for O&M)[42]. This project was completed in July 2009, and three years after project completion (until July 2012) is the warranty period, and defects occurred during the period are fixed by the contractor, and thus the O&M cost at the time of ex-post evaluation is relatively small. However, major repair (replacement of gearbox and generators etc.) is expected after 2015. O&M cost of 2015 is estimated approximately 13,000 thousand LE, which will increase steadily and O&M cost of 2022 is estimated approximately 28,000 thousand LE[43]. According to NREA, major repair for wind power plants is different from the case of gas turbines, where major repair is required for once in several years. Rather, major repair for wind power plants is required every year after several years of project completion, as there are 142 wind turbines.

The table 12 below shows the comparison of sales revenues from and O&M cost of the wind power plant constructed by the project.

Table 12: Sales Revenue from and O&M cost of the Wind Power Plant Constructed by the Project

(Unit: thousand LE)

	2010	2011	2012
O&M Cost	820	690	690
Sales Revenue	49,241	52,379	49,514

Source: O&M Cost: provided by NREA. Sales Revenue: calculated based on the amount of electric energy production provided by NREA and unit price of electricity provided by EETC.

As seen in the table above, O&M cost is sufficiently covered by sales revenues at the time of ex-post evaluation. Assuming that almost the same amount of energy production and electricity price as in 2011 will be kept (= electricity price will not be revised) in the future, O&M cost can still be covered by sales revenues after 2015, when major repair is expected.

Therefore, there seems to be no major problem regarding NREA's financial aspect of O&M.

(2) EETC

EETC, which is responsible for O&M of the substation, is also under the Ministry of Electricity and Energy. According to the P/L of EETC, net income has been in profit

[42] Source: interviews with executing agency (NREA)

[43] Source: same as above

from 2008/09 to 2010/11 as shown in Table 13 below, and there seems to be no major problem regarding the financial aspect of O&M of the facilities provided by the project.

Table 13: Profit and Loss Statement of EETC

(Unit: thousand LE)

	2008/2009	2009/2010	2010/2011
Operating Revenue	**16,816,176**	**18,901,224**	**21,067,838**
Operating Expense	**15,273,171**	**17,435,331**	**19,664,292**
Material Inputs	137,651	114,052	109,730
Wages	911,667	989,033	1,316,163
Depreciation	805,956	818,041	885,866
Purchases for Sale	12,914,615	14,756,800	16,246,692
Others	503,282	757,405	1,105,841
Operating Income	**1,543,005**	**1,465,893**	**1,403,546**
Other Income	**537,326**	**807,537**	**544,911**
Subsidy	306,619	455,127	337,987
Others	230,707	352,410	206,924
Other Expense	**1,398,734**	**1,419,451**	**1,758,156**
Interest	1,372,098	1,391,524	1,723,231
Exchange Loss	26,636	27,927	34,925
Net Income	**681,597**	**853,979**	**190,301**

Source: documents provided by EETC

Regarding O&M cost related to the project, approximately 188 to 213 thousand LE has been expensed annually for O&M (labour cost and spare parts etc. for O&M) at the time ex-post evaluation. O&M cost of the substation added by the project is expected to be sufficiently covered by revenues.

Therefore, there seems to be no major problem regarding EETC's financial aspect of O&M.

3.5.4 Current Status of Operation and Maintenance

Regarding the wind power plant constructed by the project, regular inspection and maintenance are conducted based on a maintenance plan, and inspection of all facilities such as blades, blade bearing, hollow shaft, main shaft, high speed shaft, gearbox, brake, generator, yaw gear, anemometer, tower, cables, etc. of each turbine, lubrication, oil change, and replacement of spare parts etc. are conducted every 6 months[44]. High vibration of a tower due to unbalanced blades and broken main shaft due to cracks (two turbines) were observed during the warranty period, however, both were already fixed[45]. While all the wind turbines are currently functional, there are some defects such as misalignment between gearbox and generator, faulty recharge batteries, high sound in yaw system, and faulty air conditioning unit, etc. in some of the turbines,

[44] Source: documents provided by executing agency (NREA)

[45] Source: interviews with executing agency (NREA)

and the contractor is currently repairing these problems, and thus the whole facilities constructed and procured by the project have not been handed over to NREA[46]. NREA requested third party experts to investigate these problems, and NREA, the contractor and the third party experts are currently discussing how to deal with these problems, and all the facilities constructed and procured by the project will be handed over after all the problems are solved[47]. Therefore, while there are some defects currently, stakeholders including third party experts are dealing with these problems, and thus there seems to be no major problem.

Regarding the substation added by the project, regular inspection and maintenance are conducted based on a maintenance plan, for example, feeder panels and circuit breakers are inspected every 6 months, protection equipment and mechanical parts of transformers are tested every year, mega test of winding resistance transformers is conducted every two years, and calibration of meters is conducted every three years, etc.[48] According to the executing agency, all facilities provided by the project are operational without problems, and no problem was observed in the site inspection by the evaluator.

No major problems have been observed in the operation and maintenance system, therefore sustainability of the project effect is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project aimed at increasing power supply and reducing the use of fossil fuels, by constructing the 120MW of wind power plant in Zafarana of Egypt, and thereby contributing to reduction of air pollution, amount of greenhouse gas emissions equivalent to the amount when a similar size of a thermal power plant is operated and global warming.

Relevance of this project is high, as the project is consistent with priority areas of Egypt's development plans and Japan's ODA policy, and moreover development needs for the project are high. Actual figures of almost all the operation and effect indicators are higher than approximately 80% of target figures for two years after project completion, and the project contributed to the increase of power supply and reduction of the use of fossil fuels and the amount of greenhouse gas emissions. Thus, effectiveness and impact of the project are high. Sustainability of the project is also high, as no major problem has been observed in institutional, technical and financial aspects of the operation and maintenance (O&M) and current O&M status. On the other hand, efficiency of the project is low, as both actual project cost and period largely exceeded planned cost and period.

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[46] Source: same as above

[47] Source: same as above

[48] Source: interviews with executing agency (EETC)

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

None

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

(1) In this project, the process for selection of a contractor for the power plant portion was delayed due to delays in P/Q and a long time required for clarification of bidding documents and contract negotiations etc. Then it also took 6 months for the contract to become effective due to a long time required for procedures for advance payment. The process for selection of a contractor for the substation portion was also delayed due to delays in preparation of bidding documents, postponed bidding deadline upon receiving a request from bidders, and a long time required for clarification of bidding documents etc. As a result, the actual project period largely exceeded the planned period. JICA should consider how to deal with these problems during appraisal if there is a risk of delay because executing agencies are unfamiliar with Japanese ODA Loan procedures. For example, the World Bank prepares a procurement assessment report for a new project during appraisal based on the country procurement assessment report, and the Bank assesses executing agencies' capabilities and risks related to procurement, and formulates a detailed project implementation plan based on the report, which could be one of the options for JICA.

(2) There is no explanation on the substation portion or actual figures of operation and effect indicators in the project completion report (PCR) of the project. Also, there are inconsistencies in actual project cost (by category and by year) stated in the PCR. PCR needs to be validated by JICA operating departments to ensure an appropriate implementation of PDCA (Plan-Do-Check-Action) cycles by executing agencies and an effective monitoring of project status and effects by donors.

Column: Clean Development Mechanism (CDM) Project

As explained earlier, this project was approved as a CDM project by the CDM Executive Board of the United Nations in 2007. (1) The process of CDM approval of the project, (2) Issues and obstacles related to the CDM approval, and (3) Merits and demerits derived from the project being approved as a CDM project are explained below.

(1) The process of CDM approval of the project:

1) Preparation of a plan for a CDM project by project stakeholders (JICA and NREA)
2) Approval of the plan by the designated state institution in the investing country (Japan) and in the host country (Egypt)
3) Validation of the CDM project by the Designated Operational Entity (DOE: the third party entrusted by the CDM Executive Board)
4) Registration of the CDM project by the CDM Executive Board (if DOE judged that it is appropriate to approve the project as a CDM project)
5) Project implementation and monitoring (monitoring of emissions reductions by the executing agency)
6) Verification and certification of Certified Emissions Reductions (CER) by DOE
7) Issuance and distribution of CER credits by the CDM Executive Board to the executing agency

(Source: JICA internal documents and interviews with NREA)

(2) Issues and obstacles related to the CDM approval:

According to NREA, issues and obstacles are that the CDM approval procedure was complicated and difficult, and rules and regulations of the procedure were revised often, and that DOE responsible for verification of CER was inexperienced and their performance was low, etc. DOE is to be selected through a competitive bidding by an executing agency from the list of 44 organizations provided by the CDM Executive Board. NREA selected 9 organizations from 44 organizations and conducted the competitive bidding, however, only one organization bid for the project, and thus NREA made a contract with the organization. However, there were several problems such as frequent changes of contact persons, slow response, and submission of reports being delayed etc. As explained below, NREA applied for CDM approval of three wind power generation projects after this project, and the CDM approval procedure of the DANIDA-assisted project, in which other DOE was involved, was completed in one year, on the other hand, the procedure for this project took three years.

Another issue regarding the CDM approval was that an executing agency is required to prove additionality of the project (the fact that the project could not be implemented other than as a CDM project), and this was also very difficult, according to NREA. Particularly, as part of discussion on additionality, it was stated in the Marrakesh agreements of 2001 that “public funding for CDM projects from Parties included in Annex 1 is not to result in the diversion of official development assistance (ODA)”, and NGOs raised issues including that if the diversion of ODA for projects that produce CER is allowed, it will give incentives to prioritize such projects for financing. A considerable time seems to have been spent to solve the issue, and it seems to have been cleared according to the reasons below;

- While the Marrakesh agreements state that it cannot be the diversion of ODA, it does not state that ODA cannot be used for CDM projects;

- ODA from KfW was used for the wind power plant project in Essaouira of Morocco, which was approved by the CDM Executive Board;
- The Egyptian government selects projects which have higher priorities based on its national development plans, policies and development needs, and requests the Japanese government to provide ODA loans, and there is no fact that financing was ever provided to a sector with low priorities;
- According to the verification tool for additionality adopted by the CDM Executive Board, the profitability of the project is low and there exist barriers to investment, which assures additionality, and revenues from CER credits will complement the low profitability and promote appropriate project implementation and operation.

(3) Merits and demerits derived from the project being approved as a CDM project:

According to NREA, this project enabled technological transfer related to CDM and NREA was able to become familiar with CDM approval procedures through the experience. After the CDM approval of this project, NREA applied for CDM approvals of three wind power generation projects (those assisted by KfW, DANIDA and Spanish government) from 2010 to 2011, and all of them were approved. Moreover, while CER of this project is currently being verified and CER credits have not yet been distributed, they will be issued and distributed from 2013, which will complement the low profitability of the project to some extent. According to NREA, there is no demerit related to the CDM approval of this project.

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Project Outputs	**Wind Power Plant Portion** ・ Wind turbine generators (range from 600kW x 200 units to 1,000kW x 120 units), 120MW in total ・ Control monitoring system and other related equipment ・ Electrical works and civil & installation works **Expansion of Substation Portion** ・ Transformers (125MVA x 2 units) and other related equipment ・ Electrical works and civil & installation works	**Wind Power Plant Portion** ・ Almost as planned However, 120.7MW in total (850kW x 142 units) **Expansion of Substation Portion** ・ As planned
2. Project Period	December 2003 – February 2007 (39 months)	December 2003 – July 2009 (68 months)
3. Project Cost Amount paid in Foreign currency	13,915 million yen	16,147 million yen
Amount paid in Local currency	4,551 million yen	10,145 million yen
	(224 million LE)	(548 million LE)
Total	18,466 million yen	26,292 million yen
Japanese ODA loan portion	13,497 million yen	13,497 million yen
Exchange rate	1 USD = 119.46 yen = 5.89LE (As of May 2003)	1 EUR = 141.56 yen 1 LE = 18.5 yen (Average between December 2003 and July 2010)