

Lao People's Democratic Republic

FY2021 Ex-Post Evaluation Report of Japanese ODA Loan

“Southern Region Power System Development Project”

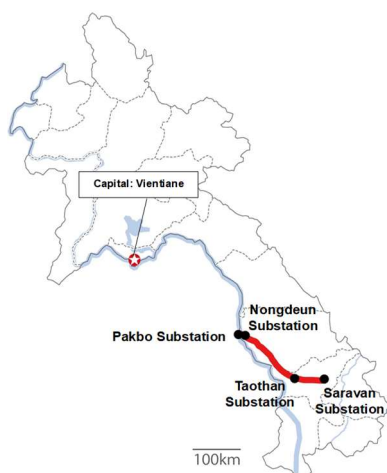
External Evaluator: Masumi Shimamura, Mitsubishi UFJ Research and Consulting Co., Ltd.

0. Summary

This project constructed 115kV power transmission lines and related facilities in the southern region of Laos with the aim of ensuring stable power supply in Savannakhet Province and its surrounding areas. The project, which connects the country's fragmented main power system, is consistent with Laos' development policy and development needs. The project is also consistent with Japan's development cooperation policy, and concrete results can be confirmed through collaboration with organizations outside of JICA. Therefore, relevance and coherence of the project are high. In terms of project implementation, there were some changes from the original plan, such as increase in total length of transmission lines, but all of these changes were based on the site conditions at the time of detailed design, and were appropriate changes. Both project cost and project period were within the plan and thus efficiency of the project is very high. Regarding project effects, of the indicators of quantitative effects set at the time of planning, “annual electric supply” was not achieved as planned but the remaining indicators, “maximum power flow” and “transmission loss” were mostly achieved as planned. Regarding impacts, results of interviews with the executing agency, Electricité du Laos (hereinafter referred to as “EDL”) and electricity consumers in the project area, as well as related data and trends of nighttime light intensity indicate that the project is facilitating rural electrification, investment promotion, and industrial revitalization in the southern region. No negative impacts on natural environment have been reported. Land acquisition was carried out without any particular problems, and resettlement did not take place. The project is also contributing to improving access to electricity for the poor through its collaboration with the World Bank's Rural Electrification Project. Therefore, effectiveness and impacts of the project are high. Regarding sustainability, some minor issues have been observed in the related technical and financial aspects, and the current status of operation and maintenance, sustainability of the project effects is moderately low.

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

1. Project Description



Project Locations



Saravan Substation

1.1 Background

In Laos, the country’s main power system connecting the north and south was fragmented, with some parts of the country exporting power to neighboring countries while areas with power shortages were importing power. In particular, the area surrounding Savannakhet Province in the southern part of the country, electricity was supplied by interchange from the northern and central parts of the country and imports from Thailand. The province passes through the East-West Economic Corridor linking Vietnam, Laos, and Thailand, and further growth in demand was expected as the Savan-Seno Special Economic Zone (hereinafter referred to as “SEZ”) was developed taking advantage of its location. Thus, there was an urgent need to take measures. On the other hand, in the area surrounding Saravan Province in the southern part of the country, power development plan for domestic use was progressing, and it was expected that surplus power would be generated. Therefore, it was necessary to develop Lao National Grid by connecting the areas around Savannakhet Province and Saravan Province with transmission lines and interconnecting fragmented grid to ensure stable power supply in the areas around Savannakhet Province in order to further improve investment environment and realize economic growth in this region.

1.2 Project Outline

The objective of this project is to interconnect the country’s fragmented main power system and to realize stable power supply in Savannakhet Province and its surrounding areas by constructing 115kV power transmission lines and related facilities in the southern region of Laos, thereby contributing to the promotion of economic growth of the country.

Loan Approved Amount/ Disbursed Amount	4,173 million yen / 4,164 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 2012 / March 2012
Terms and Conditions	Interest Rate 0.01% Repayment Period 40 years (Grace Period 10 years) Conditions for Procurement General Untied
Borrower / Executing Agency	Electricité du Laos: EDL
Project Completion	June 2016
Target Area	Southern region of Laos
Main Contractors (Over 1 billion yen)	J-Power Systems Corporation (Japan) / Mitsubishi Corporation (Japan) (JV)
Main Consultants (Over 100 million yen)	Nippon Koei Co., Ltd. (Japan) / Tokyo Electric Power Services Co., Ltd. (Japan) (JV)
Related Studies (Feasibility Studies, etc.)	<ul style="list-style-type: none"> • JICA “The Study on Power Network System Plan in Lao People’s Democratic Republic” (technical cooperation for development planning) (2010) • JICA “Data Collection Survey on Power System Development” (System Analysis Review) (2011)
Related Projects	<p>[Technical Cooperation]</p> <ul style="list-style-type: none"> • Improvement of the Power Sector Management (2010–2013) • Project on Power System Master Plan (2017–2020) • Project for Improvement of Power Utility Management of Electricite du Laos (Scheduled for 2021–2024) • Individual Experts “Electricity Policy Advisor” (2006–Present) <p>[World Bank]</p> <ul style="list-style-type: none"> • Rural Electrification Project Phase 2 (2010–2015)

2. Outline of the Evaluation Study

2.1 External Evaluator

Masumi Shimamura, Mitsubishi UFJ Research and Consulting Co., Ltd.

2.2 Duration of Evaluation Study

This ex-post evaluation study was conducted with the following schedule.

Duration of the Study: October 2021–February 2023

Duration of the Field Study: July 8–29 2022, October 3–12 2022

2.3 Constraints during the Evaluation Study

In this study, due to the global spread of COVID-19, the external evaluator could not travel to Laos. Instead, local consultant was utilized remotely to conduct the survey. The external evaluator was unable to collect answers to the questionnaires, conduct interviews with stakeholders and beneficiaries, and carry out project site survey, etc. directly in the field, which limited the information and data necessary for the evaluation and analysis. Therefore the external evaluator conducted evaluation analysis and judgment by closely examining the information and data obtained through the remote surveys and desk research.

3. Results of the Evaluation (Overall Rating: B¹)

3.1 Relevance/Coherence (Rating: ③²)

3.1.1. Relevance (Rating: ③)

3.1.1.1 Consistency with the Development Plan of Laos

At the time of the project appraisal, Lao government has set the expansion of power grid as a goal in its *Seventh Five-year National Socio-Economic Development Plan (2011-2015)* and has placed a high priority on this project. In addition, Lao government has set a goal of raising the national household electrification rate to 90% by 2020, and construction of new Thaothan substation by the project was expected to promote electrification of rural areas surrounding the substation.

At the time of the ex-post evaluation, Lao government has regarded promotion of rural electrification through expansion of power grid as priority issues in its *Ninth Five-year National Socio-Economic Development Plan (2021-2025)*. The government also aims to improve and strengthen interconnections between domestic grids and to neighboring countries, to increase flexibility of power interchange, and to increase power exports. Furthermore, Lao government has set the goals of “promoting international interconnection of power grids in the ASEAN region” and “achieving stable power supply for industrialization and modernization” in its *Vision 2030 (2016-2025)*. The project, which contributes to stable power supply, economic growth, and rural electrification in Laos by developing main power grid, is also consistent with Lao PDR’s development policy at the time of the ex-post evaluation.

¹ A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

² ④: Very High, ③: High, ②: Moderately Low, ①: Low

3.1.1.2 Consistency with the Development Needs of Laos

At the time of the project appraisal, power import from neighboring countries was increasing in Laos due to increasing domestic power demand and underdeveloped power transmission and distribution network, which resulted in chronic shortage of power in Savannakhet Province, where Savan-Seno SEZ was under construction. On the other hand, many power development projects were planned in the vicinity of Saravan Province, which was expected to expand power generation capacity, and generation of surplus power was anticipated. Therefore, there were urgent needs to secure stable power supply in the area surrounding Savannakhet Province (hereinafter referred to as “S1 area”³) by connecting the area with the area surrounding Saravan Province (hereinafter referred to as “S2 area”⁴) with transmission lines and interconnecting the fragmented grid through this project.

At the time of the ex-post evaluation, with the progress of economic and social development and rural electrification in Laos, domestic power demand and consumption have been steadily increasing, and stable power supply to S1 area continues to be necessary. The necessity of promoting rural electrification in S1 and S2 areas is also pointed out. Table 1 summarizes the trend of maximum power demand and power consumption in S1 and S2 areas.

Maximum power demand in S1 area in 2020 is about 1.6 times higher than in 2015, and power consumption in 2020 is 10% higher than in 2015. Similarly, maximum power demand in S2 area in 2020 is about 1.3 times higher than in 2015, and power consumption in 2020 is 39% higher than in 2015.⁵ Decrease in power consumption in S1 area in 2021 compared to the previous year can be attributed to the effects of spread of COVID-19, especially among large power consumers. According to EDL and tenant companies in the Savan-Seno SEZ, S1 area has many large power consumers, including the SEZ, and they were affected by temporary suspension of factory operations, etc. On the other hand, in S2 area, there are many family-owned micro-enterprises,⁶ and from the perspective of power consumption, it is thought that they were not affected as much as the large power consumers.

³ S1 area includes two provinces, Savannakhet and Khammouan.

⁴ S2 area includes four provinces, Saravan, Xekong, Champasak and Attapeu.

⁵ While Table 1 includes data through 2021, comparison of data is made from 2020 and 2015 here because 2021 was the year affected by the spread of COVID-19 (comparisons with 2021 data was avoided since they may have been affected by external factors).

⁶ According to EDL, about 80% of power consumed in Saravan Province is for residential use (including family-owned microenterprises).

Table 1: Trend of Maximum Power Demand and Power Consumption in S1 and S2 Areas

	2015	2016	2017	2018	2019	2020	2021
S1 Area (Savannakhet and Khammouan Provinces)							
Maximum Power Demand (MW)	116.68	131.62	152.02	141.33	173.62	183.89	188.05
Power Consumption (GWh)	505	519	506	503	527	551	501
S2 Area (Saravan, Xekong, Champasak and Attapeu Provinces)							
Maximum Power Demand (MW)	107.59	117.05	115.87	114.91	120.52	136.11	130.10
Power Consumption (GWh)	472	487	505	535	610	656	671

Source: Results from questionnaire survey of EDL

Note: In 2021, Power supply and demand were considered to have been affected by the spread of COVID-19 pandemic.

The main power source in Laos is hydropower, and if power output in dry season is secured to meet the demand, surplus power will be generated in rainy season when the amount of power generated is high. Surplus power is exported to neighboring countries, but the majority of exports are made by private independent power producers (hereinafter referred to as “IPPs”). The problem is that power cannot be flexibly and optimally transferred between the country and neighboring countries. For this reason, Lao government is aiming to develop and establish a wide-area interconnection system that connects domestic grid with neighboring countries’ power grids.

3.1.1.3 Appropriateness of the Project Plan and Approach

As mentioned later in “3.3.1.1 Quantitative Effects (Operation and Effect Indicators),” among the operation and effect indicators set at the time of the appraisal, “annual electric supply” has not achieved its target as planned. Regarding the reason for this, EDL stated, “It is considered that the power demand forecast referenced to at the time of the appraisal was excessive.” Since data to back up the statement was not available from the EDL, analysis was also conducted by referring to the documents at the time of the appraisal and the analysis of the technical cooperation project “Project on Power System Master Plan” (2017-2020) Final Report. (See “3.3.1.1 Quantitative Effects (Operation and Effect Indicators)” for details.) The power demand forecast referenced at the time of the appraisal was based on Lao government’s Power Development Plan (2010-2020) at the time, and it would have been difficult to foresee at the time of the appraisal that the actual results would deviate significantly from the future forecast. Therefore, project plan and approach are considered to be appropriate.

In terms of equity, the project is designed to ensure that the poor have access to power

through collaboration with the World Bank's Rural Electrification Project⁷ (2010-2015). (See "3.1.2.3 External Coherence" for details)

3.1.2 Coherence (Rating: ③)

3.1.2.1 Consistency with Japan's ODA Policy

At the time of the appraisal, Japan's *Country Assistance Program for Lao PDR* (September 2006) placed development of socioeconomic infrastructure and effective utilization of existing infrastructure as one of the priority areas. In addition, Japanese government placed electric power sector as part of its "Electricity Development Program," with a policy of cooperating in the development of government-owned power generation facilities and main power grids, as well as development of facilities for rural electrification, in order to expand safe and stable power supply. This project contributes to promote economic growth and rural electrification by providing stable power supply to Laos, and the project objectives are consistent with Japan's development cooperation policy at the time of the appraisal.

3.1.2.2 Internal Coherence

According to the documents at the time of the appraisal, this project was expected to have synergistic effects with the technical cooperation project "Improvement of the Power Sector Management"⁸ (2010–2013) and the individual experts "Electricity Policy Advisor."⁹ However, it was not possible to confirm direct collaboration with this project from the responses to the questionnaires and interviews with EDL, the consultants in charge of construction supervision of the project, and the electricity policy advisor at the time. According to the consultant in charge of construction supervision, project progress reports were made to the Electricity Policy Advisor as appropriate, but there was no direct effect on this project. The Electricity Policy Advisor¹⁰ interviewed visited the project site after the facilities developed by the project started operation, but he was not particularly aware of any collaboration during project implementation, and there was no specific collaboration for the procurement of spare parts after project completion. (See "3.2.2.2 Project Period" for procurement of spare parts)

3.1.2.3 External Coherence

At the time of the appraisal, it was expected that this project would collaborate with the

⁷ Rural Electrification Project Phase 2

⁸ Human resource development, including capacity building for examination and inspection work at the Department of Electricity of the Ministry of Energy and Mines, was conducted to strengthen regulatory functions in the Laotian power sector.

⁹ Capacity building support was provided to EDL staff for power development planning, and operation and maintenance of existing facilities.

¹⁰ The local assignment period was from August 2016 to August 2019.

World Bank's Rural Electrification Project (2010–2015), and collaboration has taken place and synergistic effects have been generated. The World Bank's project promoted rural electrification in seven provinces, including Savannakhet and Saravan, which are the target areas of the project. At the time of the appraisal, it was expected that the substations developed by the project would be connected to the power distribution network developed by the World Bank's project to promote rural electrification and to increase access to power for the poor, and these substations have actually been connected. According to EDL, during project implementation process, information and data on power supply and demand and power consumption in the project area were shared with the World Bank project stakeholders, and the results of specific collaboration were also confirmed. (See 6) in "3.3.2.2 Other Positive and Negative Impacts" for details)

In terms of consistency with international frameworks, interview with EDL confirmed that the project contributes to SDG Goal 7 (Affordable and clean energy) and Goal 13 (Climate action).

The project is consistent with Lao PDR's development policy and development needs, and the project plan and approach were appropriate. The project is also consistent with Japan's development cooperation policy, and concrete results can be confirmed through collaboration with organizations outside of JICA and coordination with international frameworks. In light of the above, relevance and coherence of the project are high.

3.2 Efficiency (Rating: ④)

3.2.1 Project Outputs

This project connected the country's fragmented main power system in order to realize stable power supply in S1 area. Table 2 compares the planned and actual major outputs.

Table 2: Comparison of Planned and Actual Major Outputs

Plan	Actual	Comparison (Major Difference)
Civil Works, Procurement of Equipment etc.		
<ul style="list-style-type: none"> • Construction of Transmission Lines (115kV, Two lines) (Total length about 200km) • Development of Nongdeun Substation Facilities (Installation of four 115 kV transmission line bays (Note) for Pakbo and Thaothan Substations) • Development of Pakbo Substation Facilities (Installation of two 115 kV transmission line bays for Nongdeun Substations) • Development of Saravan Substation Facilities • Construction of new Thaothan Substation 	<ul style="list-style-type: none"> • Construction of Transmission Lines (115kV, Two lines) (Total length about 226.74km) • Development of Nongdeun Substation Facilities (Installation of three 115 kV transmission line bays for Pakbo and Thaothan Substations) • Development of Pakbo Substation Facilities (Dismantling of one existing 115 kV line and installation of one 115 kV transmission line bay for Nongdeun Substation) • Development of Saravan Substation Facilities • Construction of new Thaothan Substation 	<ul style="list-style-type: none"> • Increase in total length of transmission lines • Development of Nongdeun Substation Facilities (Reduction of a 115 kV transmission line bay for Pakbo and Thaothan Substations) • Development of Pakbo Substation Facilities (Dismantling of one existing 115 kV line and reduction of one 115 kV transmission line bay for Nongdeun Substation) • As planned • As planned
Consulting Services		
Plan	Actual	
<ul style="list-style-type: none"> • Detailed Design, Preparation of Bid Documents • Tendering Assistance • Construction Supervision • Environmental Measures (assistance with environmental monitoring during construction and advice on countermeasures in the event of problems, etc.) • Completion and Defect Inspections 	<ul style="list-style-type: none"> • As planned • As planned • As planned • As planned • As planned 	

Source: Results from questionnaire survey of EDL

Note: A bay is an electrical wire used to electrically connect power lines and transformers to busbars in a substation.

Regarding civil works, there were some changes from the original plan, including increase in total length of transmission lines, reduction of a 115 kV transmission line bay, and dismantle of one existing 115 kV line.

Total length of transmission line increased by about 27 km because EDL changed the location of towers and rerouted transmission lines to reduce impacts on social environment at the request of the landowners. Regarding dismantling of one existing 115kV line, at the time of project planning, one transmission line was connected between Pakbo substation and the Kengkok substation, which is located about 50km southeast of Pakbo substation, and was not connected to Nongdeun substation. However, at the start of the project, it was found that one line was connected from Pakbo substation to Kengkok substation via Nongdeun substation, and the original one line from Pakbo substation to Kengkok substation was disconnected. Under such situation, if two lines were installed between Pakbo and Nongdeun substations as planned, total number of transmission lines would be three, and there was a risk that the existing one would become overloaded, so the existing one was dismantled and two lines were installed as planned (See Figure 1). Reduction of 115 kV transmission line bay is due to the dismantling of one existing 115 kV line. All of these changes were according to the actual conditions at the site at the time of detailed design and were appropriate changes.

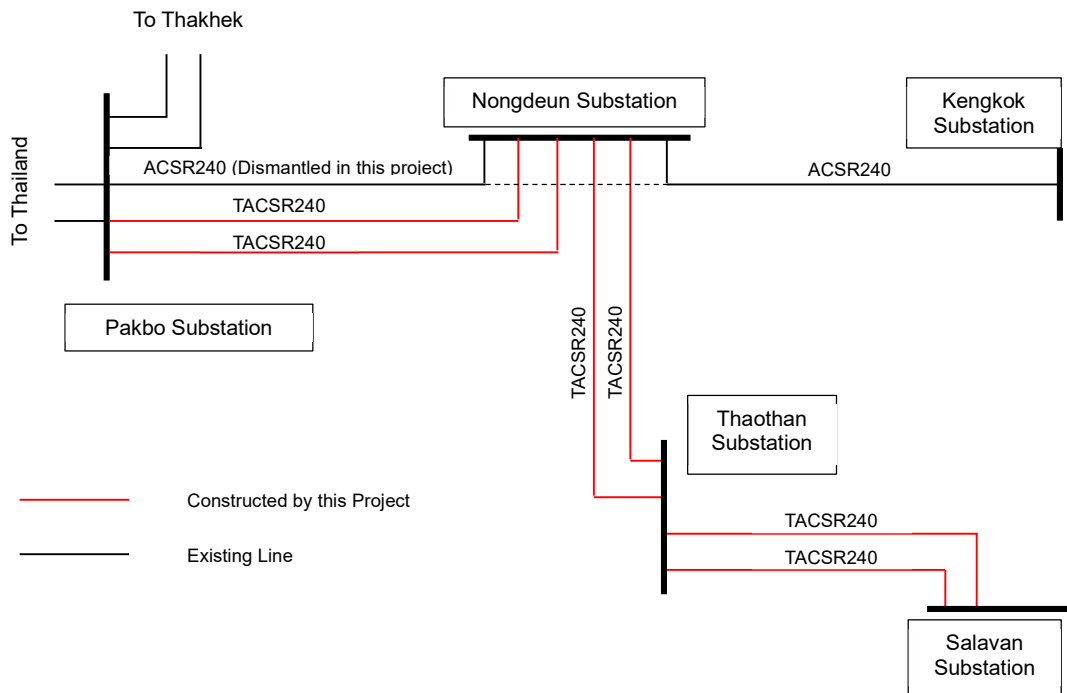


Figure 1: Design of this Project

Source: Prepared based on information provided by JICA



Control Room at Savaran Substation



Thaothan Substation



Nongdeun Substation



Pakbo Substation
(Entrance to Substation Site)

3.2.2 Project Inputs

3.2.2.1 Project Cost

The total project cost was initially planned to be 4,660 million yen (out of which 4,173 million yen was to be covered by Japanese ODA loan). In actuality, the total project cost was 4,639 million yen¹¹ (out of which 4,164 million yen was covered by Japanese ODA loan), which is within the plan (100% of the planned amount).

3.2.2.2 Project Period

The project period was planned as 54 months, from March 2012 (signing of Loan Agreement) to August 2016 (when the facilities started operation) as opposed to 52 months in actuality, from March 2012 (signing of Loan Agreement) to June 2016 (when the facilities started operation), which is within the plan (96% of the planned period).

¹¹ The exchange rate was calculated at 1 LAK=0.01274 yen. (From IMF International Financial Statistics (2012–2016 average rate))

Table 3 summarizes the comparison of planned and actual project period.

Table 3: Comparison of Planned and Actual Project Period

Item	Plan	Actual
Signing of Loan Agreement	Mar. 2012	Mar. 2012
Selection of Consultants	Mar. 2012–Feb. 2013 (12 months)	May 2012–Dec. 2012 (8 months)
Consulting Services	Mar. 2013–Aug. 2017 (54 months)	Dec. 2012–Dec. 2017 (61 months)
Selection of Contractors	Jun. 2013–Aug. 2014 (15 months)	Mar. 2013–Mar. 2014 (13 months)
Construction Works	Sept. 2014–Aug. 2016 (24 months)	Mar. 2014–Jun. 2016 (28 months)
Start of Facility Operation	Aug. 2016	Jun. 2016

Source: Information provided by JICA and results from questionnaire survey of EDC

Note: Definition of project completion is at the start of facility operations.

The consultant and contractor selection periods were four and two months shorter than planned, respectively, so the four-month construction delay did not affect the project, and the entire project was completed two months earlier than planned. The four-month delay in construction was due to thorough investigation and disposal of unexploded ordnance at the project site.

While the project period was within the plan, the loan period was extended from July 2018 to July 2019. This was due to procurement of additional spare parts utilizing the unused balance of ODA yen loan. EDL submitted the relevant application to JICA in 2018, and JICA made concurrence in December of the same year. Procurement of additional spare parts was completed in July 2019. The reason for this response was that procurement of spare parts that had been initially planned was canceled due to a possibility of cost-overrun because of large fluctuation in the exchange rate (depreciation of yen) during the construction period after the loan agreement was signed and EDL was to make adjustments to cover the cost. However, depreciation of yen did not progress as expected during the construction period, resulting in an unused balance. In response to this, EDL expressed its desire to use the remaining balance to procure spare parts that were originally planned to be procured, in order to make more sustainable use of the facilities developed by the project. Although the loan period was extended, procurement of additional spare parts was not included in the project period, since the definition of project completion was at the start of facility operations, and thus project period was within the plan.

3.2.3 Results of Calculations for Internal Rates of Return (Reference only)

Economic internal rate of return (EIRR) calculated by EDL at the time of the appraisal was

13.0%. Since information/data was not provided by EDL and alternative approaches were attempted, but no information/data were available. Thus, EIRR recalculation at the time of the ex-post evaluation was not possible.

Therefore, both the project cost and the project period were within the plan and efficiency of the project is very high.

3.3 Effectiveness and Impacts¹² (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

At the time of the appraisal, “maximum power flow,” “annual electric supply” and “transmission loss” were set as quantitative effects of the project. Table 4 summarizes target values and actual values between 2018 and 2021 for each indicator. As the project completion is June 2016, the target year to be compared is 2018, two years after completion. The target achievement rates are shown in parentheses in the table.

Table 4: Operation and Effect Indicators

Indicators	Baseline value 2010 Actual value	Target value 2018 2 Years After Completion	Actual value			
			2018	2019	2020	2021
Maximum Power Flow (MW)	—	100	36.46 (36%)	132.7	181.51	107.16
Annual Electric Supply (GWh)	—	613.2	223.67 (36%)	313.72 (51%)	414.23 (68%)	341.53 (56%)
Transmission Loss (%)	—	7.0	0.87	1.22	1.67	1.5

Source: Ex-ante evaluation report and PCR

Note 1: Coverage is the sections of the 115kV transmission line (Pakbo Substation to Saravan Substation) developed by the project.

Note 2: Achievement rates in the lower rows of Maximum Power Flow and Annual Electric Supply.

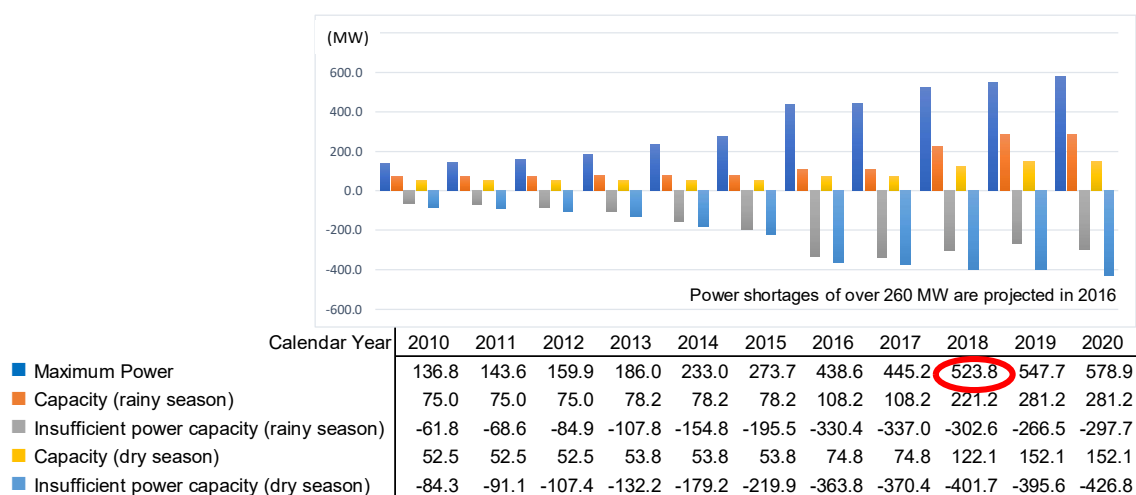
Note 3: According to EDL, both the target value and actual value of Transmission Loss are “values calculated by dividing the difference between the amount of power at the sending end and the amount of power delivered to the customer by the amount of power at the sending end.”

¹² When providing the sub-rating, Effectiveness and Impacts are to be considered together.

For “maximum power flow,” the actual value in 2018 was significantly below the target value, but has exceeded the target values since 2019. According to EDL, power demand in the southern region did not increase as much as expected in 2018, and it is considered that power supply was possible within the region. Although back up data to support this statement could not be obtained from EDL, EDL’s explanation is consistent with the fact that maximum power demand in S1 and S2 areas in 2018, summarized in Table 1, was lower than the figures for the previous year and the following year.

“Annual electric supply” has fallen well below the target value not only in 2018 but also for each subsequent year. According to EDL, it is considered that power demand forecast that was referenced at the time of the appraisal was excessive. Since data to back up the statement was not available from the EDL, analysis was conducted by referring to the documents at the time of the appraisal and the analysis results of the final report of the technical cooperation project “Project on Power System Master Plan” (2017–2020). Table 5 shows power supply-demand balance forecast for S1 area at the time of the appraisal. According to this, the projected maximum power in S1 area for 2018 is 523.8 MW. On the other hand, the actual maximum power demand in S1 area in Table 1 for 2018 is only 141.33 MW. In addition, when comparing the actual values for other years, all are lower than those projected at the time of the appraisal.

Table 5: Power Supply-Demand Balance Forecast for S1 Area at the Time of the Appraisal (peak hour)
(Unit: MW)



Source: Prepared based on information provided by JICA (Original data are from the Lao government’s Power Development Plan 2010-2020)

Furthermore, in “Chapter 5: Review of Domestic Demand Forecast” of the final report (February 2020) of the “Project on Power System Master Plan,” it is pointed out that there is a

discrepancy (overestimation) between Laos’ power demand forecast and the actual results for 2016–2030 regarding domestic demand forecast. The reason cited for this is that the Large Industry’s¹³ power consumption estimates are excessive. In fact, looking at Table 6, among Large Industry projects in Savannakhet Province, the actual maximum power consumption projects in 2016 was 18 MW lower than expected in total.

Table 6: Large Industry Assumptions and Actual Values in 2016

	Province	Industry	Forecast	Actual	Difference
			Maximum Power (MW)	Maximum Power (MW)	Maximum Power (MW)
Central 2	Borikhamxai	Mine	13	45	+32
		Factory	10	0	-10
	Khammouan	Factory	17	17	0
		Mine	7	7	0
		Mine	10	0	-10
		Mine	5	0	-5
		Factory	5	0	-5
		SEZ	5	0	-5
		Savannakhet	Mine	45	35
	SEZ		2	0	-2
	SEZ		3	0	-3
	SEZ		3	0	-3

Source: Prepared in part from Table 5.1-1 on p.5-4 from “The Study on Power Network System Master Plan in Lao People’s Democratic Republic” Final Report 2020

The results of the above analysis are consistent with EDL’s explanation.

“Transmission loss” has achieved its target.

3.3.1.2 Qualitative Effects (Other Effects)

In light of the project objectives, “stabilization of power supply in Savannakhet and surrounding areas”¹⁴ was analyzed as qualitative effect. “Reduction of transmission loss” was also analyzed as qualitative effect.

As for “stabilization of power supply in the surrounding areas of Savannakhet Province,” Table 7 summarizes the maximum power demand and power consumption in Savannakhet Province. The Province’s maximum power demand is on the rise, and power is supplied in response to this.

¹³ In EDL, demand forecasts are made by classifying power users receiving power at 115 kV as Large Industry and those power users less than 115 kV as General Sector.

¹⁴ The beneficiary areas of the project are Savannakhet Province in S1 area and Saravan Province in S2 area. Project effects are different in each province, and the effectiveness (qualitative effects) was analyzed on “stabilization of power supply” for Savannakhet Province and impacts were analyzed on “promotion of rural electrification” in Saravan and Savannakhet Provinces.

Table 7: Maximum Power Demand and Power Consumption in Savannakhet Province

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Maximum Power Demand (MW)	42.83	50.56	65.42	66.17	64.89	76.72	96.94	87.4	114.89	119.03	116.61
Actual Power Consumption (GWh)	205	237	218	198	215	235	200	172	195	223	167

Source: Results from questionnaire survey of EDC

According to EDL's offices in Savannakhet and Saravan, power demand has increased year after year and power supply has improved after project completion. Furthermore, frequency of voltage fluctuations and power outages has also decreased significantly compared to before the project.

Interview surveys were conducted with 20 power consumers in Savannakhet and Saravan Provinces. All 20 consumers¹⁵ (nine in Savannakhet and 11 in Saravan) responded that voltage fluctuations and frequency of power outages has improved significantly after the project. Specifically, their responses are as follows.

- Three out of five power users in the power supply area of Nongdeun substation (Savannakhet Province) are employees of two tenant companies in Savan-Seno SEZ. They responded that before the project, many planned and unplanned power outages (up to about one hour) and voltage fluctuations were recorded, often shutting down production lines, but after the project, there has been a significant improvement. The remaining two respondents (an NGO staff member and a family-owned retailer) in the same area also indicated that power supply has been stable after the project.
- Four power users in the area served by Pakbo substation (Savannakhet Province) (all of whom run family-owned retail businesses in residential areas) reported that they have

¹⁵ Interviews were conducted with power consumers (four to six in each service area) who has been economically active in the areas around four substations (Nongdeun, Pakbo, Saravan and Thaothan) developed by the project. The breakdown of their attributes is as follows.

- Nongdeun substation (Savannakhet Province) power supply area (5 people): three from Savan-Seno SEZ, one from local NGO and one retailer.
- Pakbo substation (Savannakhet Province) power supply area (4 people): four retailers.
- Saravan substation (Saravan Province) power supply area (5 people): two from rice mills, one from gas station, one from clinic/ice factory and one retailer.
- Thaothan substation (Saravan Province) power supply area (6 people): three retailers, one manufacturer, one from a restaurant and one auto repair.

In addition, breakdown by gender and age is 10 men (one in 20s, five in 30s, one in 40s and three in 60s or older) and 10 women (four in 20s, three in 30s, one in 50s and two in 60s or older).

not experienced any voltage fluctuations or power outages after the project.

- 11 power users in the area served by Saravan and Thaothan substations (both in Saravan Province) also responded that power supply has been after the project, and that voltage fluctuations have improved and power outages have decreased. They pointed out that before the project, there were power outages that lasted from a few hours to half a day. According to the gas station owner, before the project, every time there was a power outage, gasoline refueling would stop, resulting in a loss of income and need to replace spare parts due to parts failure caused by voltage fluctuations, but such events have not occurred after the project.

Regarding “transmission loss,” EDL explained that the reduction of transmission loss has been achieved, promoting a stable and efficient power supply. The actual transmission loss rates in Table 4 above have also met the target values. In addition, results of interviews with power users in both provinces indicated that, as mentioned above, all respondents felt that power supply has stabilized, and that voltage fluctuations and voltage drops has improved. These responses are complementary information to the quantitative data (transmission loss) in Table 4.

3.3.2 Impacts

3.3.2.1 Intended Impacts

As impacts of this project, state of generation of “promotion of rural electrification in the South,” “investment promotion and industrial revitalization” and “promotion of economic growth in Laos” were evaluated.

1) Promotion of Rural Electrification in the South

Village electrification rates for Savannakhet and Saravan Provinces are shown in Table 8. Village electrification rate in Savannakhet Province has improved from 64.7% before the appraisal (2010) to 94.8% in 2021, and in Saravan Province from 64.8% before the appraisal (2010) to 97.4% in 2021. Since it is not possible to divide the village electrification rates in each Province into those within and outside the power supply area of the project, it is difficult to attribute the improved situation directly to the project. However, Table 8 is one that the project has promoted rural electrification in the South, since many Districts in each Province are covered by the project’s power supply.

Table 8: Village Electrification Rates in Savannakhet and Saravan Provinces

	2010	2018	2019	2020	2021
Savannakhet Province	64.71%	91.03%	94.91%	94.82%	94.82%
Saravan Province	64.75%	90.40%	93.04%	94.67%	97.39%

Source: Results from questionnaire survey of EDL

In addition, interviews with power users in both Provinces have shown that all 20 users indicated that rural electrification has been promoted after the project.

2) Investment Promotion and Industrial Revitalization

Table 9 summarizes the number of enterprises with capital values in Savannakhet and Saravan Provinces. The number of enterprises increased in Savannakhet Province from 2018 to 2020 but began to decline in 2021. The spread of COVID-19 may have had some effects. The capital value of the Province was over LAK 4 trillion in 2019, about LAK 7 billion per enterprise, which is much higher than the capital value per enterprise in other years (2018: about LAK 4.6 billion, 2020: about LAK 1.9 billion, 2021: about LAK 2.3 billion), which suggest that there were large investments. In Saravan Province, the number of enterprises increased annually from 2018 to 2021, but growth slowed in 2020. The capital value in the Province is also significantly higher than the capital value per enterprise in other years (2018: about 2.5 billion LAK, 2020: about 1.8 billion LAK, 2021: about 1.9 billion LAK), with about 7.3 billion LAK per firm in 2019. Since the number of enterprises and capital values in each Province cannot be divided into those within and outside of project's service area, it is difficult to attribute these trends directly to the project. However, since many Districts in each Province are within the project's service area, Table 9 provides one indication that investment has been promoted by the project.

Table 9: Number of Registered Enterprises with Capital Values in Savannakhet and Saravan Provinces

		2018	2019	2020	2021
Savannakhet Province	Number of Registered Enterprises	422	610	752	620
	Capital Values (Unit: mil. LAK)	1,944,820	4,247,191	1,451,013	1,444,219
Saravan Province	Number of Registered Enterprises	244	289	306	353
	Capital Values (Unit: mil. LAK)	613,379	2,111,450	564,685	683,095

Source: National Enterprise Database (<http://www.ned.moic.gov.la/>)

Note: Data is based on information centrally managed by the National Enterprise Database. Some District data might not be up to date.

Table 10 shows the number of enterprises in the Savan-Seno SEZ. The number of enterprises has been increasing year by year.

Table 10: Number of Enterprises in Savan-Seno SEZ

2011	2019	2020	2021
23	65	71	73 (as of April) 76 (as of July)

Source: Prepared from various Savan-Seno SEZ related public documents.

Interviews with power users in Savannakhet and Saravan Provinces have shown that all 20 consumers responded that improved power supply as a result of the project was one of the important factors for them to consider continuing or expanding their business. In addition, several family-run business owners explained that they had diversified their businesses after the project.

Existing study¹⁶ have shown that nighttime lights are strongly correlated with economic indicators. Therefore, as an alternative indicator for village electrification rate, number of enterprises and capital values, analysis was made on the changes in nighttime light intensity from 2016 to 2021 in the entire Savannakhet and Saravan Provinces, which are the

¹⁶ Masamitsu Kurata, *Correlation between Nighttime Lights and Socio-Economic Indicators in Low-Income Countries*, Sophia Economic Review, Vol.LXII No.1, 2, March 2017
https://dept.sophia.ac.jp/econ/econ_cms/wp-content/uploads/2016/11/62-2.pdf

beneficiary areas of the project. Specifically, using Google Earth Engine, nighttime light data of VIIRS Nighttime Day/Night Band Composites Version 1 was extracted using the boundary data of administrative Districts of Humanitarian Data Exchange v1.56.0, and annual average nighttime light intensity was calculated. (Figure 2)

Nighttime light intensity increased significantly in 2016, when the facilities developed under the project were put into service, and nighttime light intensity has been increasing since 2017. See Appendix for images of nighttime lights for the entire Savannakhet and Saravan Provinces.

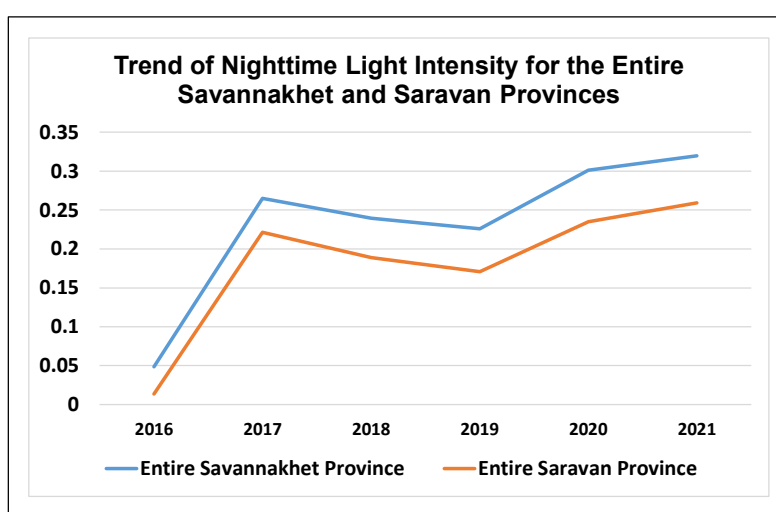


Figure 2: Trend of Nighttime Light Intensity (average) in the Entire Savannakhet and Saravan Provinces

Source: Created from VIIRS Nighttime Day/Night Band Composites Version 1, Humanitarian Data Exchange v1.56.0

In addition, the location map of the project’s major power supply areas (Districts) in each Province is shown in Figure 2. A similar analysis of nighttime light intensity for these Districts from 2016 to 2021 shows an increasing trend for all Districts. (Figures 3 and 4)

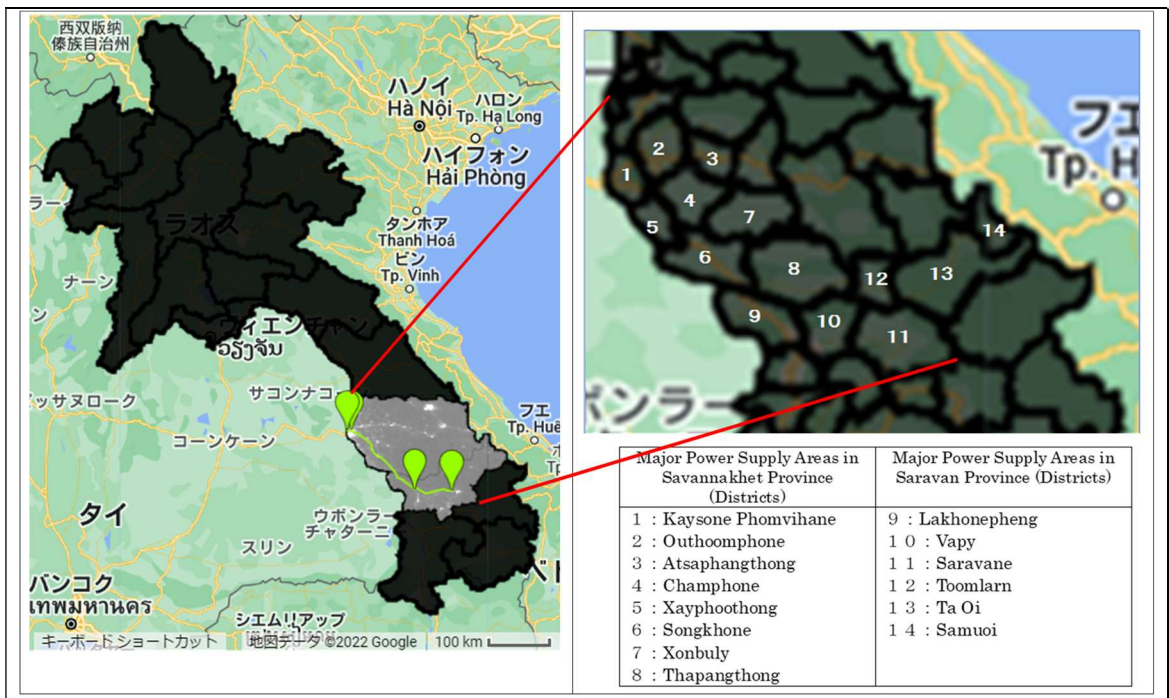


Figure 2: Location Map of Major Power Supply Areas of the Project (Districts)

Source: Created from VIIRS Nighttime Day/Night Band Composites Version 1, Humanitarian Data Exchange v1.56.0

Note: On the nighttime light figure on the left, the substations developed by the project (from left to right: Pakbo, Nongdeun, Thaothan, and Saravan) are indicated by yellow-green balloons, and the 115 kV transmission lines constructed by the project are indicated by yellow-green lines.

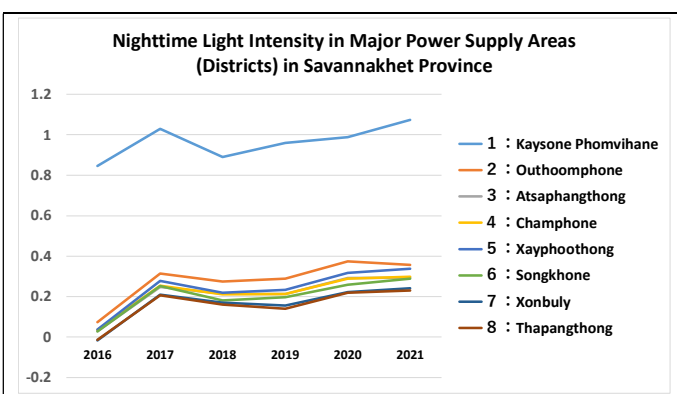


Figure 3: Trend of Nighttime Light Intensity (average) in Major Power Supply Areas (Districts) in Savannakhet Province

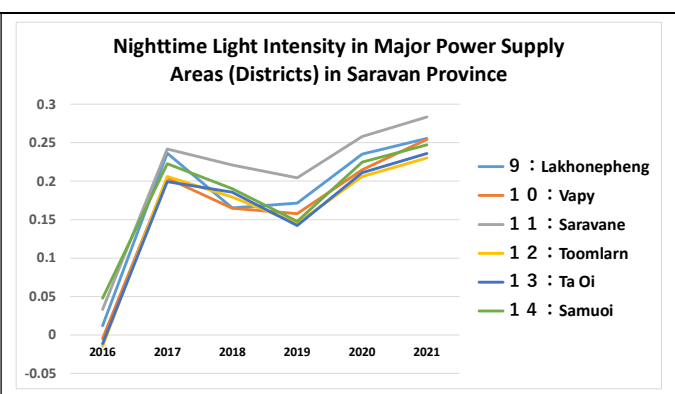


Figure 4: Trend of Nighttime Light Intensity (average) in Major Power Supply Areas (Districts) in Saravan Province

Source: Created from VIIRS Nighttime Day/Night Band Composites Version 1, Humanitarian Data Exchange v1.56.0

Note: Savan-Seno SEZ is located at 1. Kaysone Phomvihane.

Furthermore, major power supply areas (Districts) of the project in each province and the growth rates of nighttime light intensity (2015–2021) for each entire province are summarized in Tables 11 and 12. While the growth rate for the entire Savannakhet Province is 175.0%, the average growth rate for the major power supply areas in the province is 190.0%, which is higher than the figure for the entire province (Table 11). Similarly, while the growth rate for the entire Saravan Province is 261.4%, the average growth rate for the major power supply areas in the province is 284.2%, exceeding the figure for the entire province (Table 12). Since the figures for each entire province include districts within each province other than the power supply areas of this project, the contribution from the project is considered to be reflected in the difference in the growth rate of nighttime light intensity (additional increase in the figures).

Table 11: Major Power Supply Areas of the Project in Savannakhet Province and Growth Rates of Nighttime Light Intensity in the Entire Province

Major Power Supply Districts of the Project in Savannakhet Province	Growth Rate of Nighttime Light Intensity (2015–2021)
1. Kaysone Phomvihane	30.9%
2. Outhoomphone	140.5%
3. Atsaphangthong	195.7%
4. Champhone	183.8%
5. Xayphoothong	203.3%
6. Songkhone	194.7%
7. Xonbuly	295.8%
8. Thapangthong	275.2%
Average of Major Power Supply Districts of the Project in the Province	190.0%
Entire Savannakhet Province	175.0%

Source: Created from VIIRS Nighttime Day/Night Band Composites Version 1, Humanitarian Data Exchange v1.56.0

Table 12: Major Power Supply Areas of the Project in Saravan Province and Growth Rates of Nighttime Light Intensity in the Entire Province

Major Power Supply Districts of the Project in Saravan Province	Growth Rate of Nighttime Light Intensity (2015–2021)
9. Lakhonepheng	250.6%
10. Vapy	335.4%
11. Saravane	180.2%
12. Toomlarn	255.5%
13. Ta Oi	328.7%
14. Samuoi	354.6%
Average of Major Power Supply Districts of the Project in the Province	284.2%
Entire Saravan Province	261.4%

Source: Created from VIIRS Nighttime Day/Night Band Composites Version 1, Humanitarian Data Exchange v1.56.0

3) Promotion of Economic Growth in Laos

Table 13 summarizes GDP trends for the entire Laos from the World Bank’s World Development Indicators. Although it is difficult to verify a direct causal relationship between economic growth of a country and the project because various factors other than the project affect the economic growth of a country, and it is difficult to measure the effect of the project by the trend of GDP. However, as mentioned above, based on the trends in the number of enterprises and capital values in Savannakhet and Saravan Provinces, trends in the number of tenant enterprises in Savan-Seno SEZ, results of interviews with power users in the two provinces, and trends in the growth rate of nighttime light in major power supply areas by the project, the project has been contributing to “investment promotion and industrial revitalization,” and thereby contributing to an increase in GDP.

Table 13: GDP Trends in Laos

	2015	2016	2017	2018	2019	2020
Real GDP (USD million, 2015 basis)	14,426	15,440	16,504	17,535	18,492	18,585
Its Growth Rate	7.27%	7.02%	6.89%	6.25%	5.46%	0.50%
Real GDP per capita (USD, 2015 base)	2,135	2,250	2,368	2,477	2,573	2,546
Its Growth Rate	5.66%	5.39%	5.24%	4.62%	3.87%	-0.96%

Source: Created from World Bank’s World Development Indicators

Note: In 2020, the real growth rate declined due to the spread of COVID-19.

3.3.2.2 Other Positive and Negative Impacts

1) Impacts on the Natural Environment

The project was classified as Category B based on the *JICA Guidelines for Confirmation of Environmental and Social Considerations* (April 2010) since it does not fall under any sensitive sectors/characteristics or sensitive areas, and its undesirable effects on the environment were considered to be not significant. According to EDL, it was not obligatory to prepare Environmental Impact Assessment (EIA) report due to minor impact on natural environment. Initial Environmental Examination (hereinafter referred to as “IEE”) and Environmental Management Plan (hereinafter referred to as “EMP”) were approved by the Ministry of Natural Resources and Environment on May 16, 2012.

According to EDL, no negative impacts on natural environment have been confirmed as a result of environmental monitoring. For monitoring during construction, a team consisting of EDL, consultants in charge of construction supervision, and related organizations at the central and local levels was formed to carry out quarterly environmental monitoring of air, water quality, waste, noise, vibration, etc. According to EDL, water was sprayed at the construction site three to four times a day as a measure against air pollution (dust, etc.) during construction, and waste separation tanks were set up at the construction workers’ base camp as a measure against waste disposal. The construction sites were located away from the community and no complaints have been received with no noise or vibration issues. Interviews with power users and the results of project site inspections indicate that there have been no major problems with natural environment.

2) Resettlement and Land Acquisition

According to EDL, 2.89 ha of land for the tower construction was acquired as originally planned, and compensation was paid to the land owners based on the agreed unit price between the project and the provinces concerned. Specifically, they are as follows. According to EDL, the amount of compensation was based on the reacquisition price and was consistent with Laotian laws¹⁷ and *JICA Guidelines for Confirmation of Environmental and Social Considerations*.

- Savannakhet Province (421 households): total 632,269,095 LAK
- Saravan Province (469 households): total 736,461,694 LAK

In addition, tall trees were cut down on 50 ha of land within the width of the site under

¹⁷ Decree on Compensation and Resettlement of People Affected by Development Projects No. 192/PM dated 7 July 2005.

the transmission lines. At the occasion of cutting trees in private properties, compensation was paid to the land owners. According to EDL, no specific complaints have been received regarding land acquisition and cutting of the trees. Resettlement did not occur.

3) Gender Equality

The project contributes to improving access to electricity for the poor through collaboration with the World Bank's Rural Electrification Project, and benefits to women have been confirmed in the World Bank's project. See "6) Unintended Positive/Negative Impacts" below for details.

4) Marginalized People

The project contributes to improving access to electricity for the poor through collaboration with the World Bank's Rural Electrification Project, and is generating tangible effects. See "6) Unintended Positive/Negative Impacts" below for details.

5) Social Systems and Norms, Human Well-being and Human Rights

None.

6) Unintended Positive/Negative Impacts

<Synergies with World Bank's Rural Electrification Project>

As mentioned in "3.1.2.3 External Coherence," at the time of the appraisal, this project was expected to collaborate with the World Bank project. Collaboration was actually carried out, and the project is considered to have contributed to promotion of rural electrification and increase of access to electricity for the poor.

According to World Bank's information,¹⁸ Rural Electrification Project targeted 525 villages in seven provinces¹⁹ in south-central Laos, where many poor people and small business workers are located. The World Bank project includes the beneficiary areas of Savannakhet and Saravan Provinces in its project scope, where a total of 47,255 households have gained new access to on-grid and off-grid electricity for the entire project. The following results are mentioned in the World Bank's information.

- Increase in household income (tripled on average)
- Reduction of women's housework hours (from 60 minutes or more per night to 23 minutes per night)
- Promotion of women's employment

¹⁸ Implementation Completion and Results Report (ICR3582) and IEG's Implementation Completion Report (ICR) Review

¹⁹ Bolikhamxai, Khammouan, Savannakhet, Attapu, Xekong, Saravan, and Champasak Provinces.

- Reduction of CO² emissions by approximately 300 kilotons annually, etc.

Four substations in Savannakhet and Saravan Provinces have been developed and expanded under this project, resulting in more stable power supply. This project is considered to have contributed to poverty reduction indirectly through collaboration with the World Bank's Rural Electrification Project.

<HIV/AIDS Control>

HIV/AIDS prevention program was implemented for construction workers in the project. HIV/AIDS control was also included in the environmental monitoring plan, and preventive program was conducted during construction of transmission lines. According to EDL, education and awareness-raising activities were carried out, and awareness of people involved in HIV/AIDS countermeasures was increased.

This project has mostly achieved its objectives. Therefore, effectiveness and impacts of the project are high.

3.4 Sustainability (Rating: ②)

3.4.1 Policy and System

According to EDL, there is no change in policy regarding priorities and goals set forth in the Lao government's *Ninth Five-year National Socio-Economic Development Plan* and *Vision 2030* and there is no change in the policy to improve and strengthen interconnections between domestic grids and to neighboring countries, to increase flexibility of power interchange, and to increase power exports.

Regarding system, EDL is undergoing a major reorganization at the time of the ex-post evaluation. In addition to changes in EDL's organizational structure, system changes in the Lao power sector are expected in the future,²⁰ including involvement of Chinese company²¹ in the operation of the high-voltage transmission line sector of 230 kV and above. JICA is currently implementing a technical cooperation project, "Project for Improvement of Power Utility Management of Electricite du Laos," scheduled for 2021–2024. Through this project, JICA is providing support to strengthen EDL organization, but it will take some time before the effects are realized.

From the above, sustainability of policy of the project is assured. While sustainability of

²⁰ EDL has been restructuring its operations due to its deteriorating financial situation, such as expansion of external debt, and in September 2020, high-voltage transmission division of 230 kV and above was separated, and a joint venture company, Electricite du Laos Transmission Company Limited (EDL-T), was established with China Southern Power Grid. (Source: JETRO Business Brief, "Private construction giant to acquire 24% stake in power generation company affiliated with Electric Power Corporation" (October 13, 2020))

²¹ China Southern Power Grid is actively participating in the development of "One Belt, One Road" and strengthening power cooperation with Greater Mekong Subregion (GMS) countries.

system will need to be assessed based on the results of ongoing technical cooperation project, it is expected to be ensured once the project objectives²² are achieved.

3.4.2 Institutional/Organizational Aspect

Operation and maintenance of transmission lines and substations after project completion is undertaken by EDL's regional transmission system division. Specifically, the Central 2 Transmission System and Southern Transmission System are in charge, while operation and maintenance works in the field are conducted by EDL Savannakhet Office and Saravan Offices under the management of these systems.

Seven to eight staff members in charge of operation and maintenance are assigned to each of the substations in Nongdeun, Pakbo, and Thaothan, which were developed under this project, and are engaged in daily operations. Saravan substation supervises and manages Thaothan substation and operates and maintains a total of six 115kV transmission lines, including two 115kV transmission lines developed by the project, with 15 staff members in charge of operation and maintenance. Each substation has four shifts per day (two people assigned to each shift) for 24-hour operation and maintenance work. According to each substation, personnel required for daily operation and maintenance work has been secured and there are no particular problems.

Division of duties, roles, coordination, and decision-making processes at each provincial office and substation that undertake operation and maintenance work are clear, and communication and coordination among personnel in the field and between the field and EDL headquarters are well organized.

In light of the above, EDL is undergoing a large-scale organizational restructuring, and although effects on the project's operation and maintenance system and personnel allocation is unknown, it can be considered that there are no particular problems with the current institution and organization.

3.4.3 Technical Aspect

According to EDL, staff in charge of operation and maintenance at the site have graduated from civil engineering vocational schools and colleges, and have accumulated the experience and knowledge necessary for daily operation and maintenance work through on-the-job training. In addition, a training center is located on the premises of EDL headquarters, and staff in charge of operation and maintenance attend training once or twice a year to improve their technical skills.

²² Project objectives: Strengthen the operation and management ability of EDL by constructing suitable corporate strategies and improving management mechanisms.

According to EDL, new technologies are emerging in the inspection of transmission lines, etc., and it is necessary to improve technical skills to keep up with evolving technologies and new equipment. Specifically, in Laos, drones are used to inspect equipment on IPP-dedicated transmission lines, and EDL is also introducing drones to improve efficiency of inspection work on transmission lines that are difficult to access in mountainous areas. EDL has pointed out technical issues related to the use of drones, which are expected to affect timely repairs in the event of problems with transmission lines, and thus the necessity for enhancing technological capacity is recognized.

According to EDL, maintenance manuals have been developed and updated to meet the needs of the field, and are referred to and used in daily operations, especially for on-the-job training and guidance for newcomers. EDL headquarters provides guidance in the development and updating of manuals, which are utilized after final approval by the respective offices in the province which is responsible for operation and maintenance in the field.

From the above, it is considered that staff in charge of operation and maintenance at the site have necessary technical skills to carry out their daily work. On the other hand, there are some points that need to be improved in terms of handling new technologies and equipment.

3.4.4 Financial Aspect

Table 14 summarizes EDL's financial situation. EDL's gross profit (segment result) is broadly flat. Operating profit and profit for the year have been declining year after year, resulting in a difficult financial situation. According to EDL Annual Report (2021), dividends from affiliate and joint venture investments nearly doubled from the previous year, as many of the domestic IPP projects in which EDL has a stake performed better than expected. On the other hand, depreciation of local currency LAK resulted in a foreign exchange loss (loss ballooned to 13.5 times the previous year's loss), which significantly reduced operating profit and profit for the year in 2021.

Table 14: Financial Situation of EDL (2018–2021)

(Unit: million LAK)

	2018	2019	2020	2021
Revenue from sale	1,137,430	1,217,530	1,167,375	1,196,664
Cost of sales	-532,735	-582,870	-567,894	-585,971
Segment result	604,695	634,660	599,481	610,693
Other income	26,476	31,270	44,092	55,292
Operating and administrative expenses	-169,215	-154,849	-198,319	-154,090
Foreign exchange loss, net (Note)	-29,050	71,524	-45,389	-612,913
Share of profit from investment in associate and joint ventures	626,001	339,377	498,703	960,715
Operating profit	1,058,907	921,982	898,568	859,697
Finance costs	-588,553	-724,366	-741,125	-855,815
Profit before income tax expense	470,354	197,616	157,443	3,882
Income tax expense	-	-	-	-
Profit for the year	470,354	197,616	157,443	3,882

Source: Prepared based on EDL Annual Reports

Note: According to the Annual Report (2021), foreign exchange losses occurred for interest payments on long-term debt, bonds, and short-term debt.

Major financial ratios of EDL are shown in Table 15. In 2021, net profit margin, return on equity, and return on assets decreased significantly from the previous year, while the debt to equity ratio increased. According to the Annual Report (2021), foreign exchange losses were the main reason for the decline in profits, as depreciation of local currency LAK caused foreign currency debt to swell. Earnings per share in 2021 are significantly lower than in the previous year by about one-fiftieth.

As described above, EDL's financial situation is seriously deteriorating.

Table 15: Major Financial Ratios of EDL (2020–2021)

	2020	2021
EBITDA Margin (Note)	85.4%	90.1%
Net Profit Margin	9.2%	0.2%
Return on Equity : ROE	1.7%	0.04%
Return on Assets : ROA	0.7%	0.02%
Debt to Equity Ratio : D/E	1.66	1.88
Earnings Per Share : EPS	94.49 LAK	2.62 LAK

Source: Prepared based on EDL Annual Report (2021)

Note: Earnings Before Interest, Tax, Depreciation and Amortization Margin. Calculated excluding net foreign exchange losses.

Behind the severe financial situation are the structural problems that EDL is facing. Specifically, since most of the power purchase agreements with IPPs are based on take-or-pay contracts, EDL has no choice but to purchase from IPPs surplus domestic power that the IPPs cannot sell overseas at a reverse price. In addition, Lao government has pushed forward with investment without conducting thorough analysis of domestic and international power supply and demand, procurement, and contract management, resulting in an increase in debt due to excessive capital investment, and the debt is further inflated by foreign exchange losses due to the depreciation of the local currency, LAK.²³ Furthermore, since EDL is a state-owned enterprise in the power sector and is a core enterprise responsible for economic and social development of Laos and the lifeline for the people, government regulations do not allow EDL to raise electricity rates at its discretion. In May 2020, Lao government decided to reduce electricity rates by 3% as a countermeasure against COVID-19.²⁴ Despite a 2% increase in electricity rates for households and small and medium businesses in March 2021,²⁵ EDL's financial situation remains tight.

According to an article in the local media Vientiane Times, in April 2022,²⁶ Lao government established the “EDL Reform Committee” to deal with these problems. The committee is expected to make recommendations for improving EDL's financial health, but no specific timing or other details are available.

²³ Source: From the related information of the technical cooperation project, “Project for Improvement of Power Utility Management of Electricite du Laos.”

²⁴ Source: From the World Bank Report *Linking Laos, Unlocking Policies, Lao PDR Country Economic Memorandum*, 2022

²⁵ Source: The Laotian Times, New Electricity Rates Set This Month, March 5, 2021
<https://laotiantimes.com/2021/03/05/new-electricity-rates-set-this-month/>

²⁶ Vientiane Times, EDL chief explains reasons behind losses, July 7 2022
https://www.vientianetimes.org.la/freeContent/FreeContent2022_EDL129.php

From the above, EDL's financial situation is becoming increasingly difficult. Lao government and EDL are taking measures to restore financial soundness, and JICA is providing support through the ongoing technical cooperation project, "Project for Improvement of Power Utility Management of Electricite du Laos" but the prospects for improvement cannot be predicted at the time of the ex-post evaluation. Therefore, it is considered that there are concerns about the financial aspect of operation and maintenance.

3.4.5 Environmental and Social Aspect

As a result of confirming with EDL, there were no unexpected environmental and social considerations.

3.4.6 Preventative Measures to Risks

It is not possible to predict the impacts of EDL's major reorganization at the time of the ex-post evaluation. However, there is a possibility that sustainability of the project effects may be greatly affected by changes in the operation and maintenance system of the project and allocation and distribution of various resources such as budget and staffing. Thus, it is important to continuously monitor EDL situation through ongoing technical cooperation project.

3.4.7 Status of Operation and Maintenance

As a result of interviews with EDL and field surveys of the project sites, transmission lines and distribution facilities developed by the project are well maintained and generally operated smoothly.

According to EDL, one cooling fan in the 115 kV control/relay panel at the Nongdeun substation has malfunctioned, and the door of the control/relay panel is left open all the time. The cause is currently under investigation.

Operation and maintenance staff assigned to each substation conduct daily maintenance, periodic maintenance every three months, and maintenance when problems occur. The problem with the cooling fan mentioned above is being dealt with as maintenance when problem occurs, and operation and maintenance personnel are dispatched from the regional control center to the site to handle the problem.

Maintenance manuals have been prepared for each substation, and staff in charge of operation and maintenance use these manuals on a daily basis. According to EDL, the manual is revised and utilized at least once a year in response to changing conditions and needs in the field. In addition, each substation is required to inspect its equipment and facilities and check its inventory of spare parts and tools, etc. and submit a report to the regional control center

annually. For spare parts, regional control center submits applications to EDL headquarters, and EDL headquarters procures the parts centrally.

From the above, there are some problems in the operation and maintenance status at the time of the ex-post evaluation, but as a whole, there is no problem because facilities are properly operated and maintained.

Some minor issues have been observed in the technical, financial and the current status of operation and maintenance. They are not expected to be improved/resolved. Therefore, sustainability of the project effects is moderately low.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project constructed 115kV power transmission lines and related facilities in the southern region of Laos with the aim of ensuring stable power supply in Savannakhet Province and its surrounding areas. The project, which connects the country's fragmented main power system, is consistent with Laos' development policy and development needs. The project is also consistent with Japan's development cooperation policy, and concrete results can be confirmed through collaboration with organizations outside of JICA. Therefore, relevance and coherence of the project are high. In terms of project implementation, there were some changes from the original plan, such as increase in total length of transmission lines, but all of these changes were based on the site conditions at the time of detailed design, and were appropriate changes. Both project cost and project period were within the plan and thus efficiency of the project is very high. Regarding project effects, of the indicators of quantitative effects set at the time of planning, "annual electric supply" was not achieved as planned but the remaining indicators, "maximum power flow" and "transmission loss" were mostly achieved as planned. Regarding impacts, results of interviews with EDL and electricity consumers in the project area, as well as related data and trends of nighttime light intensity indicate that the project is facilitating rural electrification, investment promotion, and industrial revitalization in the southern region. No negative impacts on natural environment have been reported. Land acquisition was carried out without any particular problems, and resettlement did not take place. The project is also contributing to improving access to electricity for the poor through its collaboration with the World Bank's Rural Electrification Project. Therefore, effectiveness and impacts of the project are high. Regarding sustainability, some minor issues have been observed in the related technical and financial aspects, and the current status of operation and maintenance, sustainability of the project effects is moderately low.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

It is desirable to improve efficiency of monitoring and inspection operations of transmission lines by improving technical capabilities to cope with technological advancements and new equipment, such as conducting drone inspections of transmission lines constructed by the project.

At Nongdeun substation, one cooling fan in the 115kV control/relay panel is malfunctioning, and prompt investigation of cause and response is desired.

4.2.2 Recommendations to JICA

A major reorganization of EDL is underway, and institutional changes in the Lao power sector are expected in the near future. Improving management and financial situation of EDL is an urgent issue, and it is important that JICA continuously monitor the situation through the ongoing technical cooperation project, “Project for Improvement of Power Utility Management of Electricite du Laos,” etc.

4.3 Lessons Learned

Importance of reviewing the adequacy of power demand forecasts in the existing development plans, etc.

The actual figures of the indicator “annual electric supply” set at the time of the appraisal have fallen far short of the target for this project. It is pointed out that power demand forecast referenced at the time of the appraisal was excessive as a reason. The power demand forecast was the demand forecast in the Lao government’s Power Development Plan at the time. Lao government has set goals to improve flexibility of power grid interchanges between the country and neighboring countries and to increase power exports, and power development in the country needs to take into account relationship with the power development plans and demand forecasts of neighboring countries. These variables could change power supply and demand situation significantly in the future. Therefore, when similar projects are implemented in the future, it is important to carefully examine and confirm the adequacy of data such as demand forecasts described in existing development plans, etc., at the time of preparatory studies and project appraisals. It is important to hold sufficient discussion with the counterpart country/executing agency the possibility of variable factors and set target values for quantitative effects after careful scrutiny and consideration.

END

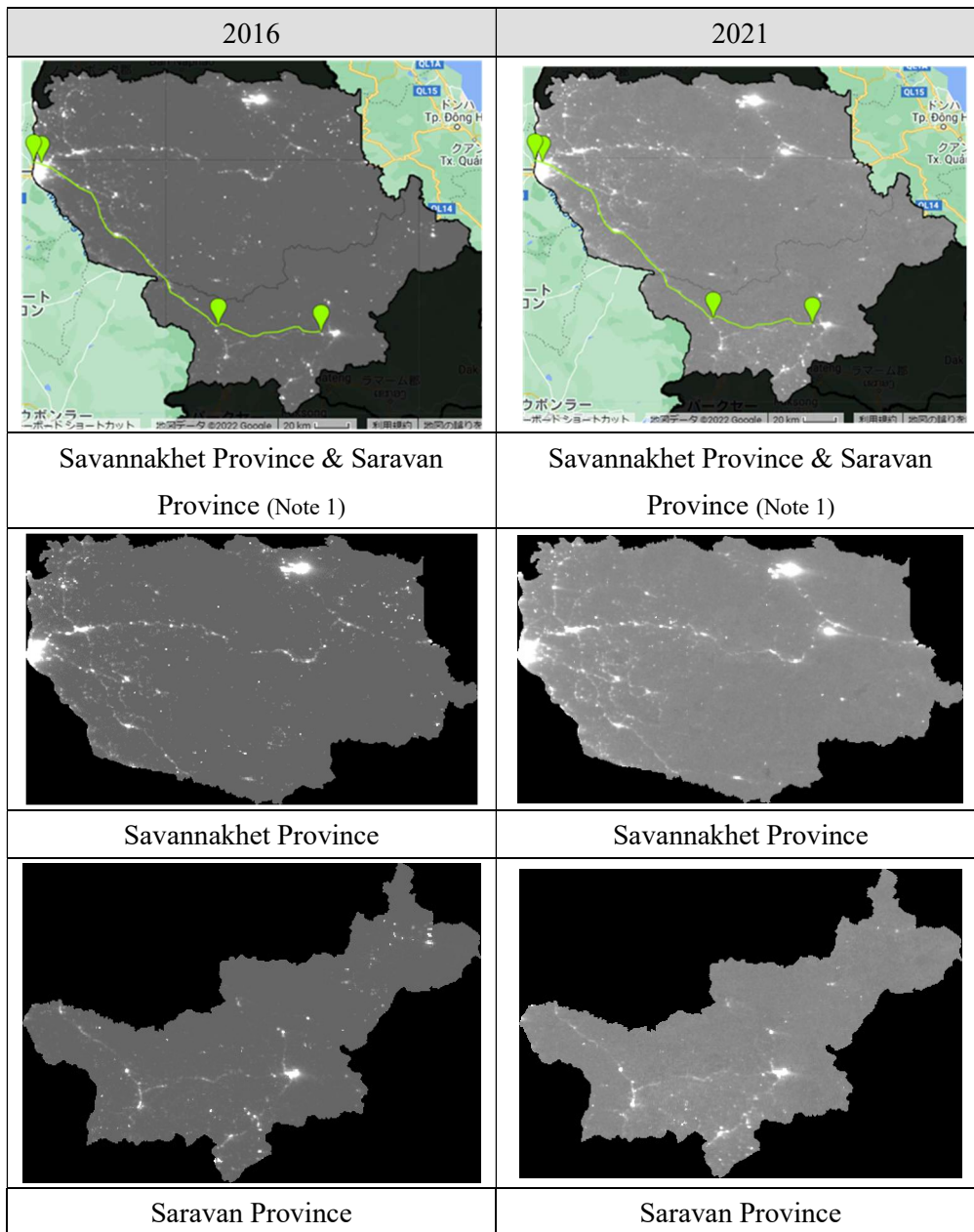


Figure: Images of Nighttime Lights in Savannakhet and Saravan Provinces

Note: Note: On the nighttime light figure, the substations developed by the project (from left to right: Pakbo, Nongdeun, Thaothan, and Saravan) are indicated by yellow-green balloons, and the 115 kV transmission lines constructed by the project are indicated by yellow-green lines.

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs	<p>1) Civil Works, Procurement of Equipment etc.</p> <ul style="list-style-type: none"> • Construction of Transmission Lines (115kV, Two lines) (Total length about 200km) • Development of Nongdeun Substation Facilities (Installation of four 115 kV transmission line bays for Pakbo and Thaothan Substations) • Development of Pakbo Substation Facilities (Installation of two 115 kV transmission line bays for Nongdeun Substations) • Development of Saravan Substation Facilities • Construction of new Thaothan Substation <p>2) Consulting Services</p> <ul style="list-style-type: none"> • Detailed Design, Preparation of Bid Documents • Tendering Assistance • Construction Supervision • Environmental Measures • Completion and Defect Inspections 	<p>1) Civil Works, Procurement of Equipment etc.</p> <ul style="list-style-type: none"> • Construction of Transmission Lines (115kV, Two lines) (Total length about 226.74km) • Development of Nongdeun Substation Facilities (Installation of three 115 kV transmission line bays for Pakbo and Thaothan Substations) • Development of Pakbo Substation Facilities (Dismantling of one existing 115 kV line and installation of one 115 kV transmission line bay for Nongdeun Substation) • As planned • As planned <p>2) Consulting Services</p> <ul style="list-style-type: none"> • As planned • As planned • As planned • As planned
2. Project Period	March 2012–August 2016 (54 months)	March 2012–June 2016 (52 months)
3. Project Cost		
Amount Paid in Foreign Currency	2,829 million yen	4,164 million yen
Amount Paid in Local Currency	1,832 million yen (190,705 million LAK)	475 million yen (37,284 million LAK)
Total	4,660 million yen	4,639 million yen
ODA Loan Portion	4,173 million yen	4,164 million yen
Exchange Rate	1LAK=0.0096 yen (As of December 2011)	1LAK=0.01274 yen (Average between 2012 and 2016)
4. Final Disbursement	July 2019	

END