



1. Project Data

Project ID

P131558

Project Name

Transmission Efficiency Project (TEP)

Country

Vietnam

Practice Area(Lead)

Energy & Extractives

L/C/TF Number(s)

IBRD-84170

Closing Date (Original)

31-Dec-2019

Total Project Cost (USD)

318,526,230.61

Bank Approval Date

07-Aug-2014

Closing Date (Actual)

31-Dec-2021

IBRD/IDA (USD)
Grants (USD)

Original Commitment

500,000,000.00

0.00

Revised Commitment

500,000,000.00

0.00

Actual

318,526,230.61

0.00

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2. Project Objectives and Components

a. Objectives

According to the International Bank for Reconstruction and Development (IBRD) Loan Agreement (p.5) dated November 12, 2014, and the Project Appraisal Document (PAD, p.5), the project objective is “to improve the capacity, efficiency and reliability of electricity transmission services in selected parts of the electricity transmission network in the territory of the Borrower.” The Borrower is defined as the Socialist Republic of Vietnam.



b. Were the project objectives/key associated outcome targets revised during implementation?

No

c. Will a split evaluation be undertaken?

No

d. Components

According to the loan agreement, the project consisted of three components.

A. Enhancing Transmission Infrastructure. (*Appraisal cost: US\$625.00 million; actual cost: US\$464.53 million*)

This component was to finance an infrastructure investment program to increase the capacity and reliability of the electricity transmission network. Project activities were to include the construction and rehabilitation of transmission lines and substations at the 220 kV and 500 kV levels in three key economic development areas—the Greater Hanoi Area, the Greater Ho Chi Minh City Area and the Mekong Delta, and Central Region. These investments would support the government's Power Development Master Plan 7 (PDMP7) and finance 15 percent of the infrastructure to be built between 2105 and 2020 to improve reliability of both the transmission and distribution network through increased transmission capacity. Three project management boards (PMBs) under the National Power Transmission Corporation (NPT) were to implement these activities in their respective regions—north, central, and south.

B. Developing Smart Grid Network. (*Appraisal cost: US\$80.00 million; actual cost: US\$46.01 million*)

This component was to finance a substation modernization program to replace or upgrade monitoring, control, protection, and other ancillary equipment in 220 kV and 500 kV transmission substations with smart grid technology. The activities were not to result in any transmission capacity increase. This component was also to support the NPT in upgrading the operation and equipment management information systems and establishing a data and metering system. PMBs were to implement these activities in their respective regions.

C. Capacity Building. (*Appraisal cost: US\$25.00 million; actual cost: US\$5.74 million*)

This component consisted of the following technical assistance activities for NPT's capacity building: (a) improvement of the asset management system (AMS); (b) assistance in cost-reflective transmission tariff application; (c) building financial reporting capacity on the basis of international financial reporting standards (IFRS); and (d) upgrading of the electrical testing laboratory center.

Revised Components

Some project activities that were to be partly financed by the IBRD loan were fully financed by the counterpart. These activities were the following: (a) Establishment of data and metering system for NPT because of the new system data guidelines that required the procurement of this system together with the other parts of the entire NPT system; (b) cost reflective tariff application because the NPT decided to avoid the time constraints of the project; (c) building financial reporting capacity on the basis IFRS because the NPT decided to implement this activity as part of its parent company, Vietnam Electricity's (EVN) reform to ensure consistency with the EVN Group; and (d) upgrading of the electrical testing laboratory center



because the cost of the activity almost doubled following a detailed feasibility study; NPT decided to finance a partial upgrade from its own funds. The upgrading of operation and management information systems under the second component was cancelled as the current system was assessed to be properly functioning. As a result, the IBRD loans financed only one technical assistance activity—the improvement of AMS under the third component—while the NPT financed all other technical assistance activities except the cancelled upgrading of operation and management information systems activity. Under the second component, one substation out of 16 was cancelled; the upgrading of the Ninh Binh substation was cancelled because it was decided to dismount the substation.

e. Comments on Project Cost, Financing, Borrower Contribution, and Dates

Project Cost: The total project cost was originally estimated at US\$731.25 million including US\$1.25 million for front-end fees and US\$50.00 million for contingencies. On December 31, 2021, the project closed with a total cost of US\$517.53 million. The actual project cost was significantly lower than the conservative cost estimated at appraisal that led to an overestimation. Lower steel prices during implementation and cancellation of some project activities contributed to a lower actual cost (see Revised Components above).

Financing: At appraisal, the IBRD loan was estimated at US\$500.00 million. By project closing in December 2021, the project had disbursed US\$318.53 million. The disbursement was lower than the estimated amount at appraisal because of cost overestimation at appraisal and loan savings (see Project Cost above). The balance amount was cancelled, and all project funds were accounted for at the time of project evaluation.

Borrower's contribution: At appraisal, the borrower's contribution was estimated at US\$231.25 million. At project closing, the borrower's contribution stood at US\$199.01 million.

Restructurings: The project was restructured once:

- **Project Restructuring (Level 2 – December 31, 2019):** The project closing date was extended by 24 months from December 31, 2019 to December 31, 2021 to allow time for the upgrading of 16 substations under the second component that were significantly delayed because of the time required to review the substations' technical designs by the Ministry of Industry and Trade (MoIT), which had concerns about the need to disconnect the substations for upgrading, decide on the smart grid technology to be implemented systemwide, and prepare the relevant regulations. At the time of project restructuring, there had been no progress in the implementation of project activities under the second component. The project closing date extension was also to allow additional time for the completion of the construction of two substations and four overhead transmission lines under the first component that were delayed because of the processing of the contracts following the bidding stage and the issues related to compensations to project-affected people.

Dates: The project was approved on August 7, 2014. The Loan Agreement was signed on November 12, 2014, and the loan became effective on February 10, 2015. The Mid-Term Review was conducted in August 2017. The original project closing date was December 31, 2019. The project closing date was extended by 24 months, and the project closed on December 31, 2021. The reasons for project closing date extensions are given in the restructuring entry above.



3. Relevance of Objectives

Rationale

At the time of project closing in December 2021, the project objectives were substantially aligned with the World Bank's then-current strategy as defined in the Country Partnership Framework for FY2018-22 (CPF) for Vietnam. The project sought to address the development problem of insufficient electricity transmission capacity in the economic growth areas of Vietnam that caused frequent and long power outages and high amounts of unserved energy adversely affecting long-term sustained economic development of the country. The Bank strategy did not directly cover this development problem in contrast to its wide coverage of the topic in the previous World Bank strategy for FY2012-18. Having supported Vietnam in unbundling its electricity sector through sector reform, achieving universal access to electricity, and strengthening the electricity network, the focus of World Bank strategy for Vietnam moved on to the decarbonization of the electricity sector through the promotion of low carbon energy generation and reduction of greenhouse gas emissions. Therefore, the development problem partly fits under the third focus area of the CPF, i.e., ensuring environmental sustainability and resilience, and contributes to the achievement of "Objective 9 to promote low carbon energy generation, including renewables and energy efficiency, and reduce GHG emissions" (CPF, p.23). The project was to support the achievement of this objective through electricity transmission capacity increase and grid technology upgrade; the expected outcomes were improved efficiency of electricity transmission—reduced unserved electricity; hence, lower GHG emissions—and a strong transmission network that would facilitate the smooth integration of renewable energy because of smart grid technologies to be installed in the transmission substations.

The project objectives were highly relevant to the country context. The project objectives supported the government's strategic objective of improving the transmission network to address the unreliable electricity supply barrier to sustained economic growth. The project objectives were appropriately pitched to the development status and capacity of the country as described in the CPF. The project objectives supported the achievement of the government's Socioeconomic Development Strategy 2011-2020 and the Socioeconomic Development Plan, which "guided the development of the power sector to meet the country's socioeconomic needs" (ICR, p.7). Since the project financed activities that were listed in the government's Seventh Power Development Master Plan covering 2011-2020, the government had high ownership of the project. The constraints on the operational context were few since the NPT and the project implementing PMBs had experience in implementing World Bank-financed projects.

The World Bank has been a development partner of Vietnam in the power sector since 1995. Until the appraisal of the project in 2014, the World Bank had provided a total of US\$3.7 billion in funding for energy projects in power sector reforms and restructuring, transmission and distribution, rural electrification, and renewable energy development. The World Bank has had a long sector and country experience. The objective remained relevant throughout the project cycle and was a necessary response to a development gap in Vietnam, but the objective was closer to the output level, rather than the outcome level.

Overall, the relevance of objectives is rated High.

Rating



High

4. Achievement of Objectives (Efficacy)

OBJECTIVE 1

Objective

To improve the capacity of electricity transmission services in selected parts of the electricity transmission network in the territory of the Borrower.

Rationale

Theory of Change

The project's inputs—IBRD loans and technical assistance support—were to be used to finance the construction and rehabilitation of high voltage transmission lines and substations, and upgrading of existing substations, all including smart grid technology. The immediate output of these activities would be an increase in the transmission capacity. Therefore, the first objective to improve the capacity of electricity transmission services was at the output level rather than outcome level. Assuming no electricity generation shortage, the project output of increased transmission capacity would ease the overload on the transmission lines and the substations that would lead to the project's expected outcomes of fewer electricity outages and load-shedding because of fewer tripping in substations, and a decrease in the amount of unserved energy, i.e., lower technical losses in the system. A decrease in the number and duration of electricity outages corresponds to an improvement in the reliability of electricity supply. Lower unserved electricity amount corresponds to improved efficiency and availability of electricity to meet increasing electricity demand in the urban and industrial load-centers. Improved reliability of power supply supports long-term socio-economic development and improved efficiency of electricity supply lowers the amount of greenhouse gas emission. Overall, the causal pathways from inputs to outcomes were valid and direct, and the achievement of the outcomes and project objectives could be attributed to the project's intervention as there was no other intervention in the project areas. The capacity building activity did not directly support the achievement of the project objectives. However, increased technical and operational capacity of the NPT—because of the implementation of an asset management system, financial reporting on the basis of IFRS, and application of performance-based transmission tariff application—should be expected to contribute to improved operational efficiency and technical capacity for adequate maintenance of the transmission network that would improve the sustainability of the electricity transmission services.

Outputs

- **Transmission lines rehabilitated under the project.** The target was to rehabilitate 120 km of transmission lines. The achievement was 260.60 km.
- **Transmission lines constructed under the project.** The target was to construct 920.20 km of transmission lines. The achievement was 980.76 km including Nho Quan-Phu Ly-Thuong Tin transmission line expected to be completed in June 2023. The construction of this line was delayed beyond project closing because of the rerouting of a 10 km section of the line just six months before



project closing. The line was planned to be completed in December 2022, but because of delays in the approval of the land allocation, the completion of the line is now expected in June 2023.

- **Number of substations (500 kV) upgraded with smart grid technology:** The project financed the upgrading of five 500 kV substations with smart grid technology as targeted.
- **Number of substations (220 kV) upgraded with smart grid technology:** The project financed the upgrading of ten 220 kV substations with smart grid technology. The target was 11 substations. The upgrading of the Ninh Binh substation was cancelled because it was decided to dismount the substation.

Outcomes

- **Transformer capacity installed under the project.** The project team reported that eight substations were upgraded under the first component with addition of new transformer capacity. The target was to install 3,950 MW additional capacity as a result of the addition of transformers to the substations. The transformer capacity increased by 4,263 MW.
- **Additional transfer capacity in project areas.** The target was to increase the transmission capacity in the project areas by 80 percent. The achievement was 79.7 percent at project closing and is expected to increase to 85.6 percent at the end of December 2022 (see the entries for project areas below). The transmission capacity increase per project region is given below compared to the target of 80 percent increase:
 - **Greater Hanoi Area:** Baseline was 5,752 MW. The capacity increased to 10,320 MW at project closing and will be 10,945 MW upon the completion of Nho Quan-Phu Ly-Thuong Tin transmission line. These corresponds to 79.5 percent and 90.3 percent transmission capacity increases, respectively.
 - **Central Area:** Baseline was 600 MW. The capacity increased to 1,100 MW at project closing. This corresponds to an 83.3 percent increase in the transmission capacity.
 - **Greater Ho Chi Minh City Area and Mekong Delta:** Baseline was 4,235 MW. The capacity increased to 7,600 MW at project closing. This corresponds to a 79.5 percent increase in the transmission capacity.

The project successfully completed transmission investments except the upgrading of one substation which was cancelled. These investments resulted in a transmission capacity higher than the target set at appraisal. The transmission network in the project areas now have a higher capacity to transmit electricity. Improved transmission capacity should result in improved efficiency and reliability of the electricity transmission services, which are captured by the other two objectives.

In addition to increased transmission capacity, one of the two transmission lines constructed in the Central Area, i.e., the Quang Ngai-Quy Nhon 220 kV line, connected the 220 kV networks in the north and the south of the country allowing the improved use of hydro power from the Thuong Kon Tum Hydropower Station of 22 MW capacity system-wide (ICR, p.16). The upgrading of the substations with smart grid technologies is expected to lead to a smoother integration of variable renewable energy, i.e., wind and solar, to the grid in the future.

Overall, the project's efficacy in achieving Objective 1 is rated High.



Rating
High

OBJECTIVE 2

Objective

To improve the efficiency of electricity transmission services in selected parts of the electricity transmission network in the territory of the Borrower.

Rationale

Theory of Change for Objective 2

Please see “Theory of Change” under Objective 1 above.

Outputs

Please see “Outputs” and “Outcomes” under Objective 1.

- **Asset Management System (AMS) fully operational.** At project closing project-financed AMS was installed and fully operational as targeted.

Outcomes

- **Unserved Energy due to faulty events in intelligent electronic devices (IEDs) in all substations to be upgraded with smart grid (3-year rolling total) normalized to 2012 load.** At the end of 2012, the amount of unserved energy was 4,875 MWh. The target was to keep the unserved energy at the same amount. At project closing, unserved energy dropped to 817 MWh.
- **Average O&M expenses per energy transmitted per MWh.** Before project start, the average O&M expense per MWh energy transmitted was US\$0.87. The achievement was US\$0.67 against the target of US\$0.83. The reduction in O&M expenses directly linked to the increase in the amount of electricity transmitted—or similarly reduction in the unserved energy. Additionally, the increased decision-making capacity on investments and maintenance works based on the information provided by the AMS contributed to the reduction in O&M expenses along with fewer outages in the system achieved with the increase in the transmission capacity

An increase in transmission capacity decreases the occurrences of thermal losses and load losses, reasons for unserved energy. Thermal losses occur on transmission lines because of congestions that lead to overheating of the lines. Load losses occur in overloaded power systems that experience brownouts (drop in voltage) and blackouts (loss of electricity). The project, by creating a sizable transmission capacity increase in the project areas, decreased the number of outages (see Objective 3 below). This resulted in a significant reduction in the amount of unserved energy that is, in this project’s context, the amount of electricity demand that cannot be supplied within the project areas due to insufficient transmission capacity. The project activities also resulted in a decrease in O&M costs, contributing to the efficient provision of electricity transmission services. O&M costs constitute about 20 percent of the transmission tariff. Therefore, the decrease in O&M costs contributed to the gradual reduction of transmission tariff that decreased by 25 percent from 2015 to 2021 increasing the affordability of electricity (ICR, pp17-18).



Overall, the project's efficacy in achieving the project objective to improve the efficiency of electricity transmission services in selected parts of the electricity transmission network is rated High.

Rating

High

OBJECTIVE 3

Objective

To improve the reliability of electricity transmission services in selected parts of the electricity transmission network in the territory of the Borrower.

Rationale

Theory of Change for Objective 3

Please see "Theory of Change" under Objective 1 above.

Outputs

Please see "Outputs" and "Outcomes" under Objective 1 and Objective 2.

Outcomes

- **Number of unplanned faults per 100 km of transmission lines (more than one minute, 220 kV lines and above).** The baseline value was 0.51. The target was to decrease this number to 0.39. The achievement was 0.27. This indicator measured the achievement at the total NTP level; the measurement was not restricted to the project areas. Therefore, the achievement cannot be fully attributed to the project.
- **Number of unplanned faults in substations per year (more than one minute, 220 kV and above).** The baseline value was 0.66. The target was to decrease this number to 0.51. The achievement was 0.12. Like the previous indicator, this indicator measured the achievement at the total NTP level; the measurement was not restricted to the project areas. Therefore, the achievement cannot be fully attributed to the project.
- **Average duration of faults (more than one minute) in North Red River (both lines and substations).** The baseline value in this region around Hanoi was 310 minutes. The achievement was 195 minutes against the target of about 204 minutes.
- **Average duration of faults (more than one minute) in South Red River (both lines and substations).** The baseline value in the central region was 262 minutes. The achievement was 166 minutes against the target of 173 minutes.
- **Average duration of faults (more than one minute) in Tan Uyen area (both lines and substations).** The baseline value in the Ho Chi Minh City region was 95 minutes. The achievement was 61 minutes against the target of 63 minutes.

Increased transmission capacity led to a reduction in load stress levels in the system. Additionally, the construction of new transmission lines under the project resulted in the connection of each substation by at



least two different transmission lines satisfying the N-1 and N-2 criteria—these allow continuous supply of electricity if a single transmission line under N-1 or two transmission lines under N-2 experience outages. These achievements improved the reliability of the overall system as evidenced by the decrease in the average duration of faults.

Overall, the project's efficacy in achieving the project objective to improve the reliability of electricity transmission services in selected parts of the electricity transmission network is rated High.

Rating
High

OVERALL EFFICACY

Rationale

The project successfully implemented the transmission lines and substations investments resulting in an 85 percent transmission capacity increase with substations equipped with smart grid technology. This capacity increase led to a significant reduction in the amount of unserved electricity and duration of outages. As a result, the transmission system's reliability and efficiency improved. This capacity increase with smart grid technology should be expected to facilitate the integration of variable renewable energy to the grid in the future. Overall, the project's efficacy in achieving the project's objectives is rated High.

Overall Efficacy Rating

High

5. Efficiency

Economic Analysis

At appraisal, a "with the project" and "without the project" economic analysis was conducted for the transmission line investments and the upgrading of substations (smart grid benefits). Quantifiable benefits of the transmission infrastructure investments were defined as follows: (a) expanded transmission capacity to meet the rising demand, which was quantified using the transmission tariff per kWh as willingness-to-pay for transmission service; (b) reduction in load loss under brownouts quantified using incremental cost of alternative power supply; (c) reduction in transmission line losses; and (d) improved reliability from reduction in load loss under blackouts both of which were quantified using the weighted average cos of grid-based power supply. The benefits of the smart grid investments were defined as follows: (a) Improved system reliability through reduced frequency and duration of system faults quantified using incremental cost of alternative power supply; and (b) reduced cost of O&M due to system standardization and automation. The costs were taken as upfront investment costs and operation and maintenance costs—two percent of the investment cost per year. The benefits and costs were adequately identified for an investment project in electricity transmission, and they were sector standards. The



socio-economic benefits of improved electricity supply reliability were not included in the calculations; hence, the assumptions were rather conservative (In response to this, the project team in their email dated November 11, 2022 commented that such social benefits could not be claimed as the project was a transmission project, not an electrification or a distribution project, and that the economic benefit from the reduction of the expensive thermal energy dispatch from diesel and gas was included in the cost-benefit analysis). Using these costs and benefits, the economic analysis for transmission line investments and upgrading of substations resulted in an Economic Internal Rate of Return (EIRR) of 31.2 percent and an Economic Net Present Value (ENPV) of US\$1,168 million at a discount rate of 10 percent for a 20-year period.

At the time of project evaluation, a cost-benefit analysis was conducted using the same methodology used at appraisal with updated figures for actual investment costs, value of lost load under brownouts and blackouts in accordance with the trends in international fossil fuel prices, actual demand, and carbon emission factor. The calculations resulted in a post-completion EIRR of 52.6 percent, which is significantly higher than the EIRR estimated at appraisal. The main reason for this difference is the substantially lower investment costs compared to the estimates at appraisal*. While the re-estimated value of lost load and the energy demand were lower than those estimated at appraisal that would be expected to lower the EIRR, the reduction in the investment cost was large enough to offset the downward impact of those decreases on the EIRR. The post-completion ENPV was calculated at US\$1,089 million, which was lower than the ENPV estimated at appraisal because of the depreciation of Vietnamese dong against the US dollar.

* The investment cost was estimated using a rough conservative approach at US\$500 million at appraisal including US\$50 million for contingencies. The actual cost was US\$340 million. The reasons for this significantly lower investment cost were as follows: (a) Decrease in steel prices from US\$1,000 per metric ton to US\$400 that resulted in a saving of US\$30 million; (b) competitive bidding that is estimated to have resulted in a cost saving of US\$70 million; and (c) effective contract management practices that are estimated to have lowered the construction cost by US\$10 million. In total, the actual project cost was US\$160 million lower than the cost estimated at appraisal including the allocation for contingencies that was not used. The project cost was overestimated at appraisal.

Financial Analysis

At appraisal, a financial analysis was conducted to assess the financial viability and sustainability of the project from the perspective of the NPT and its holding company Vietnam Electricity (EVN). The financial benefits of the transmission infrastructure investments were defined as increased revenues from additional power transmitted because of improved system capacity and reliability and avoided cost of generation resulted from loss reduction in the transmission grid. The financial benefits of smart grid investments were defined as avoided load loss because of improved system reliability and lower O&M expenses. Costs were defined as capital costs, O&M costs estimated at two percent of investment costs, and inflation rate of 5 percent. The calculations resulted in a Financial Internal Rate of Return (FIRR) of 10.9 percent and a Financial Net Present Value (FNPV) of US\$403 million at the weighted average cost of capital of 6 percent for a 20-year period.

At the time of project evaluation, same methodology was used to calculate post-completion FIRR and FNPV with updated values for investment costs, electricity demand, loss rates, and the transmission charge of NPT. The calculations resulted in an FIRR of 14.2 percent and a FNPV of US\$446 million. Similar to the increase in the EIRR, the increase in the FIRR was mostly because of the significantly lower investment cost compared to the cost overestimated at appraisal.



Administrative and Operational Efficiency

The implementation of project activities for upgrading substations with smart grid technology was delayed because of the Ministry of Industry and Trade's (MoIT) lengthy "review of the technical design of the subproject due to concerns regarding the need to disconnect the substations to be upgraded" (Project Paper, Report No.: RES39002, p.3). The time required to decide on the smart grid technology to be used and the preparation of the regulation that would cover the whole transmission network contributed to the delay. At the time of project restructuring in December 2019, there was limited progress in these activities, and this delay led to a two-year project closing date extension, although 16 out of 20 project activities under the first component had already been completed. The risk of lengthy approval procedures was not identified at appraisal (ICR, p.25). The implementation could only start in April 2020. Regarding loan savings, although the discussions started in July 2016 on how to use the loan savings of around US\$150 million, the amount could not be used under the project because new subprojects would have required an approval process that would last four to five years according to the government laws and decrees (ICR, p.20). A project closing date extension could have been considered in 2016, but the World Bank conditioned the financing of new subprojects submitted by the NPT to satisfactory progress of activities under the second and third components, which eventually prevented the utilization of the loan savings (Implementation Status and Results Report, No:7, p.4). Parties eventually agreed to prepare a new project to use these loan savings for continued transmission investment. The project, which will finance some of the subprojects that were proposed in the third group, is now known as Vietnam Renewable Energy Accelerating Change Project (P174460). The project will be presented to the World Bank Board in October 2023 for approval. (It should be noted that the cost savings came from a rough conservative cost overestimation at appraisal.) While the restrictions imposed on travel because of the onset of COVID-19 pandemic caused disruptions to project implementation starting from March 2020, the contractors were able to make up for the lost time by increasing their efforts when restrictions were eased. On revised project closing date, except one transmission line, all other project activities were completed. Project's efficiency was also adversely affected by the issues related to the implementation of the Involuntary Resettlement safeguard policy. At project closing, implementation of this policy was not completed because of the ongoing Nho Quan-Phu Ly-Thuong Tin transmission line, rerouting of which affected 100 new households just six months before revised project closing date. A Post Closure Action Plan was prepared, and the project team will continue to monitor the implementation of this safeguard policy until the expected completion of the line in June 2023.

Overall, the project's efficiency in achieving the project objectives is rated Substantial with some minor shortcomings in administrative and operational efficiency.

Efficiency Rating

Substantial

a. If available, enter the Economic Rate of Return (ERR) and/or Financial Rate of Return (FRR) at appraisal and the re-estimated value at evaluation:

Rate Available?	Point value (%)	*Coverage/Scope (%)
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Appraisal	✓	31.20	96.60 <input type="checkbox"/> Not Applicable
ICR Estimate	✓	52.60	98.70 <input type="checkbox"/> Not Applicable

* Refers to percent of total project cost for which ERR/FRR was calculated.

6. Outcome

The alignment of the project objectives to the World Bank strategy and the country context was high. Therefore, the relevance of objectives is rated High. The project's efficacy in achieving the project objectives is rated High. The project successfully achieved the targeted transmission capacity increase that led to improved reliability and efficiency of electricity transmission services. Lastly, while the project achieved significantly higher economic and financial rates of return, because of significantly lower project cost mostly due to overestimation at appraisal, the project's efficiency in achieving the project objectives is rated Substantial because of shortcomings in administrative and operational efficiency that led to a two-year project closing date extension and non-utilization of loan savings of around US\$150 million during project implementation. Overall, as per the World guidance (p.38), the project's outcome is rated Highly Satisfactory.

a. Outcome Rating

Highly Satisfactory

7. Risk to Development Outcome

Financial viability of the NPT: The NPT charges a transmission fee set by the Ministry of Industry and Trade (MoIT) and the Ministry of Finance according to the Electricity Law. If transmission fees fall short of covering the NPT's operating costs, this might have an adverse effect on the operation and maintenance of the transmission network. Furthermore, without sufficient revenues, the NPT might not continue with planned investment projects. Currently, the credit rating of the NPT enables the utility to borrow from national and international capital markets, but for the NPT's financial viability further rationalization of tariff regime and price level is required. The NPT is in talks with the EVN and the MoIT for changes in the tariff-setting regulations. Overall, the financial viability risk of the NPT is low to moderate.

Insufficient investment to meet increasing demand: Because of sustained economic growth, electricity demand in Vietnam has been increasing. The project-financed transmission infrastructure investments and upgrading of substations coupled with other transmission infrastructure investments completed by NPT under the Seventh Power Development Plan (PDP7) resulted in an increase in the transmission capacity improving reliability of electricity supply. If transmission infrastructure investments do not keep up with the pace of electricity demand increase, the transmission capacity might once again become insufficient to meet demand. However, the NPT will continue implementing transmission infrastructure investment projects planned for the next five to ten years, assuming that financing will be secured. Therefore, the risk of insufficient investment is low to moderate.



Technical capacity: NTP has evolved into an effectively operating transmission company. It has a proven record in the operation and maintenance of transmission assets. The Asset Management System installed under the project should be expected to contribute to the technical capacity of the company along with other various capacity building activities financed by other donors and NPT. A worsening of electricity transmission services because of technical capacity issues is a low risk.

8. Assessment of Bank Performance

a. Quality-at-Entry

Increasing electricity transmission capacity and improving reliability and efficiency of electricity supply was of high strategic relevance for the sustained economic growth and development hampered by frequent and lengthy electricity outages. The project benefited from lessons learned in World Bank's prior projects in Vietnam and other countries, such as supporting investments in additional infrastructure (i.e., transmission line investments) along with introduction of technologies to improve the use and reliability of existing and future assets (i.e., upgrading of existing substations with smart grid technology). Therefore, the project's approach was straightforward consisting of construction or rehabilitation of transmission lines and upgrading of substations with smart grid technology that would directly lead to an increase in the transmission capacity. The project was designed to support the NPT's investment program – PDP7, Seventh Power Development Plan. Therefore, the first group of sub-projects were already identified at appraisal with feasibility studies completed and ready for bidding. The project's readiness for the implementation transmission line infrastructure investments was high. However, the implementation of the upgrading of substations with smart grid technology was not ready. A decision on which smart technology was to be used that required a lengthy technical review and approval process was not made prior to project's start. This later led to a significant project implementation delay and resulted in a two-year project closing date extension. Safeguards aspects of the project were adequate to ensure compliance with relevant policies including those related to indigenous people, involuntary resettlement, forests, natural habitats, and physical cultural assets. Economic and financial analyses were conducted based on sector-specific assumptions with a robust methodology. The NPT and its three Project Management Boards (Northern PMB, Central PMB, and Southern PMB) were assessed to have sufficient capacity to implement the project as these PMBs, which are professional project management units, had been implementing other donor-funded projects prior to the appraisal of the project. M&E system as designed, and later implemented, was adequate to capture the outcomes of the physical investments and substation upgrading activities, but not the outcomes expected from the implementation of capacity building technical assistance activities. Major risks were sufficiently identified and mitigation measures were in place, but the risks related to time required for technical review of smart grid technologies and completion of approval procedures that delayed the implementation of project activities under the second component by four years were not identified. The materialization of these risks resulted in a project closing date extension by two years.

Overall, the quality at entry is rated Satisfactory.



Quality-at-Entry Rating

Satisfactory

b. Quality of supervision

Supervision missions were held every six months until the onset of COVID-19 in March 2020 after which virtual missions were held. There was continuity in the project team; one of the task team leaders stationed in Hanoi was with the project from appraisal through to project closing. All other members of the project team were stationed in Hanoi that facilitated frequent contacts with the Vietnamese counterparts. The project team was efficient in reviewing and clearing 80 goods and works procurement packages that enabled quick start of activities and processing of loan disbursements as planned. The project team's focus on the development impact of the transmission infrastructure investments was sufficient. However, there were shortcomings in the project team's focus on the implementation of the upgrading of substations with smart grid technology. Almost four years after the loan became effective, there was no progress in the implementation of these project activities because of the time required for the technical review of the technology to be used in the upgrading of the substations and approval procedures, which led to a project closing date extension by two years. This was mostly because of the shortcomings at entry (see Quality at Entry above). This time extension could have been used to complete the construction of a new set of sub-projects proposed by the government in 2016 to utilize significant loan savings, but the project team's conditioning of this financing on progress in upgrading of the substations under the second component eliminated any possibility of such financing. The project team's focus on fiduciary aspects was adequate; the project closed without any known misuse of funds or fraud although this was identified as a risk at appraisal. The project team's focus on the implementation of safeguard policies was adequate. The project team carried out ad-hoc missions to help local authorities to address land acquisition issues including those that emerged towards the end of project implementation because of the rerouting of a transmission line (see Safeguards in section 10. Other Issues). The project team's supervision of the safeguards policies will continue until the completion of the rerouted transmission line expected in December 2022. Despite the delay in the implementation of project activities under the second component and the restrictions imposed as a result of the onset of COVID-19 pandemic, the project team supported the project implementing agencies in contract management and safeguard implementation to complete the project activities before the revised project closing date. Except on transmission line, all other project activities had been completed by the revised project closing date.

Overall, the quality of supervision is rated Satisfactory.

Quality of Supervision Rating

Satisfactory

Overall Bank Performance Rating

Satisfactory

9. M&E Design, Implementation, & Utilization



a. M&E Design

The theory of change was sufficiently explained in the project appraisal document showing how project activities would be expected to lead to the achievement of expected outcomes and project objectives (PAD, pp.6-8). The theory of change for investment activities was adequately reflected in the result framework. The objectives were clearly specified but they were closer to the output level, rather than outcome; transmission capacity increase is a direct output of project activities, and improvement of reliability and efficiency of electricity transmission services are intermediate results. The indicators were sufficient to encompass the project's expected results in the project objective statement, and the results expected from the project's intervention were adequately captured in the ToC. Intermediate results indicators were sufficient to capture the project outputs of transmission lines constructed or rehabilitated and substations upgraded with smart grid technology. Because of the straightforward approach of the project consisting of mostly the construction or rehabilitation of transmission lines and upgrading of substations with expected results of improved transmission capacity, reliability, and efficiency, the indicators measuring the achievement of these activities and results were sector specific, measurable, achievable, relevant, and time-bound. Baselines were defined for relevant indicators. All indicators had target values defined. Sampling methods, data collection methods, and analysis were electricity sector specific and commonly implemented in the sector. The M&E design and arrangements were well-embedded, and the NPT and PMBs were assessed to have sufficient capacity to implement M&E. However, the M&E design did not sufficiently capture the outputs and outcomes expected from the implementation of technical assistance activities.

b. M&E Implementation

The NPT and PMBs regularly measured and reported the indicators in the results framework. The M&E were found to be good quality as they were produced from the EVN's internal data system supplemented by project implementation progress reports (ICR, p.27). The ICR does not report any issues with M&E implementation. The weakness in the M&E design in capturing the outputs and outcomes of technical assistance activities was not addressed during implementation. However, it should be noted that except the implementation of Asset Management System, most of the other technical assistance were financed by EVN and NPT by their own funds, and one activity was cancelled because it was decided that the upgrading of the data system was not needed as it was found to be operational after an assessment. Since the M&E system is institutionally embedded in EVN and NPT, the M&E functions and processes are highly likely to be sustained after project closing.

c. M&E Utilization

The ICR (p.27) reports that M&E findings were "shared and discussed with relevant parties." The M&E findings were used to provide evidence of achievement of project's results in improving electricity transmission capacity, efficiency, and reliability, rather than solely focusing on the achievement of the physical transmission infrastructure built, rehabilitated or upgraded under the project. The utilization of M&E findings about the significant delay in the implementation of project activities under the second component was insufficient to restructure the implementation direction of the project earlier, which could have provided an opportunity to use loan savings from lower infrastructure investment costs to finance additional subproject under the first component. But these findings led to a subsequent intervention to continue supporting the transmission network in Vietnam and to facilitate the integration of renewable



energy; the Vietnam Renewable Energy Accelerating Change Project is currently under preparation to be submitted for the board approval in October 2023.

Overall, the M&E quality is rated Substantial. The M&E system as designed and implemented was sufficient to assess the achievement of project objectives and test the links in the results chain, but there were moderate shortcomings in the design in capturing the outcomes of technical assistance activities and in utilization to shift the project's direction to increase its scope and development impact.

M&E Quality Rating

Substantial

10. Other Issues

a. Safeguards

At appraisal, the project was classified as Category B under Environmental Assessment (OP/BP 4.01) and triggered Natural Habitats (OP/BP 4.04), Forests (OP/BP 4.36), Physical Cultural Resources (OP/BP 4.11), Indigenous Peoples (OP/BP 4.10), and Involuntary Resettlement (OP/BP 4.12) safeguard policies.

Environmental Assessment (OP/BP 4.01): The project was classified as Category B because of the project site specific potential small to moderate negative impacts such as increased levels of dust, noise, and other emissions from construction activities, waste generation, traffic disturbance and road damage, health and safety issues for workers and community. An Environmental and Social management Framework (EMSF) was prepared establishing the requirements for sub-project safeguard screening, impact assessment and development of mitigation measures. Environmental Impact Assessments (EIAs) and Environmental Management Plans (EMPs) for sub-projects that were already identified for financing under project were prepared. After consultations with the project-affected people and communities and incorporating their feedbacks in the safeguard documents, all final environmental and social safeguards instruments triggered by the project were disclosed in Vietnam on April 14, 2014 and on the World Bank's InfoShop on April 15, 2014. EIAs and EMPs for the sub-projects identified during project implementation were prepared and publicly disclosed. During project implementation, dedicated staff were appointed responsible for environmental safeguard management. Bidding documents included environmental provisions. The safeguard compliance reports were submitted periodically with occasional delays. The project closed without any accident or major environmental issue.

Natural Habitats (OP/BP 4.04): This safeguard policy was triggered as a precautionary approach in case sub-projects to be identified for financing during project implementation could have involved natural habitats. The project was not to finance any sub-project located in critical natural habitats or that will convert or degrade such habitats. The ICR does not report a need to implement this safeguard policy. The project team reported that the project did not finance any subproject passing through cultural habitats.

Forests (OP/BP 4.36): For the right of way of the transmission lines, some sub-project could have required acquisition of forest land; therefore, this safeguard policy was triggered. The impact of sub-projects and mitigation measures were included in the sub-project EIA and EMP. The ICR does not report the implementation of this safeguard policy. The project team reported that three subprojects had affected some commercial forests. The project did affect any conservation areas, national forests or natural forests.



Compensations were made according to the Environmental Management Plans based on the surveys that evaluated the number of trees and forest product reserves to have been lost. Afforestation plans were prepared, and compensations were used for afforestation of an area equal to the size of the affected forests.

Physical Cultural Resources (OP/BP 4.11): This safeguard policy was triggered to address the potential impacts of some sub-projects on temples, religious or spiritual sacred places, and graves. Mitigation measures were included in the sub-project RPs and EMPs, including change fid procedures. The ICR does not report the implementation of this safeguard policy. The project team reported that a total of 37 graves were affected by three subprojects, and these graves are relocated to new cemeteries in accordance with local regulations. There were no other physical cultural resources affected by subprojects.

Indigenous Peoples (OP/BP 4.10): Because of the possibility that project activities could have negative impacts on ethnic minorities given the large geographical area and the scattered distribution of the ethnic minority population, this safeguard policy was triggered. The application of this safeguard policy was to be identified at the sub-project level on a case-by-case basis. Before the start of project implementation, an Ethnic Minority Planning Framework (EMPF) and an Ethnic Minority Development Plan (EMDP) for Hoa Binh-Tay Ha Noi transmission line sub-project were prepared. In the Hoa Binh-West Ha Noi sub-project 115 ethnic minority households were affected by land acquisition for the construction of tower foundations. The ethnic minority people in these houses were consulted and provided full project information and had access to grievance redress mechanism in their native language. Trainings were provided to ethnic minority people including children on inclusive safety. The ICR (p.28) reports that activities associated with ethnic minorities were compliant with the requirements of this safeguard policy.

Involuntary Resettlement (OP/BP 4.12): This safeguard policy was triggered because of the potential requirement of land acquisition and temporary or permanent relocation of people because of the construction of transmission lines under the first component. A Resettlement Policy Framework (RPF) was prepared. Before the start of the project implementation, eight individual Resettlement Action Plans (RAPs) were prepared for sub-projects that were already identified to be financed under the project. RAPs for the sub-projects identified during project implementation were prepared and publicly disclosed. In total, 2, 500 households were affected by the project resulting in relocation of 80 households and severe impact on the productive lands of 290 households. The land acquisition activities were implemented in compliance with the requirements of the safeguard policy, but the project closed with one household affected by the Quang Ngai-Quy Huon transmission line not accepting the proposed compensation package. Furthermore, the rerouting of a part of the Nho Quan – Phu Ly –Thuong Tin transmission line changed the project affected area. According to the Addendum RAP prepared in November 2021, it was estimated that 100 households would be affected by this transmission line rerouting. Since the construction of the transmission would continue beyond project closing, an Environmental and Social Action Plan was prepared after project closing for this section. The World Bank project team will continue monitoring the implementation of this safeguard policy until the completion of the transmission line construction expected in December 2022.

b. Fiduciary Compliance

Financial Management



The ICR (p.29) reports that the project was in compliance with the World Bank's financial management policies and procedures. The NPT and three project management boards were responsible for project financial management. The NPT submitted quarterly interim financial reports on time. An independent auditor audited the project's financial statements annually, and the audit reports were submitted on time with unqualified opinions. There were no known issues of corruption or misuse of funds associated with the project. The project team confirmed that all project funds were accounted for at project closing.

Procurement

Procurement was implemented under international competitive bidding and national competitive bidding for World Bank-financed goods and works contracts amounting to US\$324 million. Implementation of procurement was compliant with the requirements of the World Bank procurement guidelines. Procurement of the sub-projects that were identified during appraisal started soon after the signing of the loan agreement. Procurement was completed on time but implementation of contracts, specifically for those activities under the second component, was significantly delayed because of lengthy technical audits and land acquisition and site clearance issues. The ICR (p.29) reports that no cases of fraud or corruption were detected during project implementation, which was identified as a risk at appraisal.

c. Unintended impacts (Positive or Negative)

None.

d. Other

None.

11. Ratings

Ratings	ICR	IEG	Reason for Disagreements/Comment
Outcome	Highly Satisfactory	Highly Satisfactory	
Bank Performance	Satisfactory	Satisfactory	
Quality of M&E	Substantial	Substantial	
Quality of ICR	---	Substantial	

12. Lessons

This review has drawn three lessons based on the information in the ICR.



Readiness of sub-projects in transmission infrastructure investments before project start can accelerate project implementation and facilitate earlier achievement of project objectives. The first group of eight sub-projects to be financed under the first component had already been selected with feasibility studies and bidding documents ready at the time of project appraisal. This readiness was mostly because of the sub-projects being a part of the NPT's investment program, and it ensured the start of the bidding process even before loan effectiveness. All of the eight sub-projects were completed by the original project closing date of December 31, 2019. Four of the twelve sub-projects that were selected during implementation were incomplete by the original project closing date.

Inadequate preparation of a major technology that is being introduced for the first time can adversely affect project implementation and the achievement of project objectives. At appraisal, only a roadmap was prepared for the introduction of smart grid technology in transmission substations. The kind of the smart grid technology to be used was not decided at appraisal. During project implementation, the discussions on the type of the smart technology to be used in the project that would have a system wide impact took a long time. Once a decision was made on the type of the technology, the preparation of the regulations required an additional 12 months. Overall, the approval process lasted for more than four years, and at the time of the original project closing date, there had been no progress in the implementation of upgrading of substations with smart grid technology under the second component. This led to a two-year project closing date extension.

Overestimation of project cost at appraisal can lead to cancellation of large loan savings. A very conservative methodology was used during appraisal that led to a significant overestimation of the project cost. The actual project cost was much lower than the cost estimated at appraisal, partly because of the sharp decrease in steel costs. A loan saving of around US\$150 million (around 30 percent of the loan amount) was put on hold and could not be used for other sectors and priority activities as they were committed to this project. The amount was cancelled at project closing. The ICR (p.32) states that this "constrained the Bank's resources as well as the Government's sovereign guarantee capacity." Such approach was observed in similar transmission projects in other countries, all of which led to no-use or inefficient use of loan savings from cost overestimation at appraisal.

13. Assessment Recommended?

Yes

Please Explain

The project significantly improved the electricity transmission network including smart grid technology that should be expected to allow more reliable and efficient transmission of electricity from generation stations to load centers and facilitate the integration of scaled-up variable renewable energy to the grid. An assessment of this project would provide more information and possible new evidence on these two impacts of such projects and support a Project Performance Assessment Report Cluster on transmission and distribution.



14. Comments on Quality of ICR

The ICR is candid and concise. It provides a detailed overview of the project. Including its annexes, the report presents a complete evidence base to support the achievements of the project. The interrogation of evidence is sufficient, and the report clearly links evidence to findings. It focuses on what occurred as a consequence of the project. There is a logical linking and integration of various parts of the report; hence, the ICR is internally consistent. The report follows the majority of the guidelines but it does not report the implementation of three safeguard policies out of six triggered at appraisal. The narrative supports the ratings, but minor shortcomings in administrative and operational efficiency were not adequately reflected in the efficiency rating. The entries in the “Lessons and Recommendations” are mostly based on specific experiences of the project, but they are mostly in the form of findings rather than lessons or recommendations. Overall, the quality of the ICR is rated Substantial.

a. Quality of ICR Rating Substantial