**Document of**
**The World Bank**

**Report No.88543**

# PROJECT PERFORMANCE ASSESSMENT REPORT

## SOCIALIST REPUBLIC OF VIETNAM

## TRANSMISSION, DISTRIBUTION AND DISASTER RECONSTRUCTION PROJECT (IDA-30340, SIDA-22228, SIDA-50554)

## RURAL ENERGY PROJECT (IDA-33580, JPN-26489)

## SYSTEM EFFICIENCY IMPROVEMENT, EQUITIZATION AND RENEWABLES PROJECT (IDA-36800, IDA-47810, TF-51229)

**June 23, 2014**

**IEG Public Sector Evaluation**
*Independent Evaluation Group*

## Currency Equivalents (as of December 31)

*Currency Unit = Vietnam Dong (VND)*

| | | | | | |
|---|---|---|---|---|---|
| 2000 | US$1.00 | VND14,168 | 2007 | US$1.00 | VND16,114 |
| 2001 | US$1.00 | VND15,070 | 2008 | US$1.00 | VND16,977 |
| 2002 | US$1.00 | VND15,368 | 2009 | US$1.00 | VND17,941 |
| 2003 | US$1.00 | VND15,608 | 2010 | US$1.00 | VND18,930 |
| 2004 | US$1.00 | VND15,737 | 2011 | US$1.00 | VND21,036 |
| 2005 | US$1.00 | VND15,875 | 2012 | US$1.00 | VND20,828 |
| 2006 | US$1.00 | VND16,054 | 2013 | US$1.00 | VND21,036 |

## Abbreviations and Acronyms

| | |
|---|---|
| CPC | Central Power Corporation |
| DPO | Development Policy Operation |
| DSM | Demand side management |
| ERAV | Electricity Regulatory Authority of Vietnam |
| EVN | Vietnam Electricity (utility) |
| FY | Fiscal Year |
| GOV | Government of Vietnam |
| HV | High voltage |
| IEG | Independent Evaluation Group |
| LV | Low voltage |
| MVA | Megavolt ampere |
| M&E | Monitoring and evaluation |
| MV | Medium voltage |
| NPC | Northern Power Corporation |
| NPT | National Power Transmission Company |
| PC | Power company |
| PDO | Project development objective |
| PPAR | Project Performance Assessment Report |
| REP | Rural Energy Project |
| SCADA | Supervision Control and Data Acquisition |
| SDR | Special Drawing Rights |
| SPC | Southern Power Corporation |
| TA | Technical assistance |
| TDDR | Transmission, Distribution and Disaster Reconstruction (project) |
| T&D | Transmission and distribution |
| TTL | Task Team Leader |
| VDN | Vietnam Dong |

## Fiscal Year

Government: January 1 to December 31

| | | |
|---|---|---|
| Director-General, Independent Evaluation | : | Ms. Caroline Heider |
| Director, IEG Public Sector Evaluation | : | Mr. Emmanuel Jimenez |
| Manager, IEG Public Sector Evaluation | : | Ms. Marie Gaarder |
| Task Manager | : | Mr. Ramachandra Jammi |

# Contents



This report was prepared by Istvan Dobozi who assessed the projects in March/April 2014. The report was peer reviewed by Varadarajan Atur and panel reviewed by Fernando Manibog. Romayne D. Pereira provided administrative support.

**Tables**



**Figures**



**Boxes**

# Principal Ratings

### Transmission, Distribution and Disaster Reconstruction Project

| | ICR* | ICR Review* | PPAR |
|---|---|---|---|
| Outcome | Satisfactory | Satisfactory | Moderately Satisfactory |
| Risk to Development Outcome | Moderate | Moderate | Significant |
| Bank Performance | Moderately Unsatisfactory | Moderately Unsatisfactory | Moderately Unsatisfactory |
| Borrower Performance | Moderately Satisfactory | Moderately Satisfactory | Moderately Satisfactory |

* The Implementation Completion and Results (ICR) report is a self-evaluation by the responsible Bank department. The ICR Review is an intermediate IEG product that seeks to independently verify the findings of the ICR.

### Rural Energy Project

| | ICR | ICR Review | PPAR |
|---|---|---|---|
| Outcome | Satisfactory | Satisfactory | Satisfactory |
| Risk to Development Outcome | Low or Negligible | Negligible to Low | Significant |
| Bank Performance | Satisfactory | Satisfactory | Satisfactory |
| Borrower Performance | Satisfactory | Satisfactory | Moderately Satisfactory |

### System Efficiency Improvement, Equitization and Renewables Project

| | ICR | ICR Review | PPAR |
|---|---|---|---|
| Outcome | Moderately Satisfactory | | Moderately Unsatisfactory |
| Risk to Development Outcome | Moderate | | Significant |
| Bank Performance | Moderately Satisfactory | | Moderately Unsatisfactory |
| Borrower Performance | Moderately Satisfactory | | Moderately Unsatisfactory |

# Key Staff Responsible

**Transmission, Distribution and Disaster Reconstruction Project**

| Project | Task Manager/Leader | Division Chief/ Sector Director | Country Director |
|---|---|---|---|
| Appraisal | Darayes Mehta | Mohammad Farhandi (Acting) | Andrew Steer |
| Completion | Richard Spencer | Hoonae Kim | Ajay Chibber |

**Rural Energy Project**

| Project | Task Manager/Leader | Division Chief/ Sector Director | Country Director |
|---|---|---|---|
| Appraisal | Anil K. Malhotra | Yoshihiko Sumi | Andrew Steer |
| Completion | Hung Tien Van | Junhui Wu | Laurent Msellati (Acting) |

**System Efficiency Improvement, Equitization and Renewables Project**

| Project | Task Manager/Leader | Division Chief/ Sector Director | Country Director |
|---|---|---|---|
| Appraisal | Anil K. Malhotra | Peter Thompson | Andrew Steer |
| Completion | Ky Hong Tran | Jennifer J. Sara | Victoria Kwakwa |

**IEG Mission: Improving World Bank Group development results through excellence in independent evaluation.**

**About this Report**

The Independent Evaluation Group assesses the programs and activities of the World Bank for two purposes: first, to ensure the integrity of the Bank's self-evaluation process and to verify that the Bank's work is producing the expected results, and second, to help develop improved directions, policies, and procedures through the dissemination of lessons drawn from experience. As part of this work, IEG annually assesses 20-25 percent of the Bank's lending operations through field work. In selecting operations for assessment, preference is given to those that are innovative, large, or complex; those that are relevant to upcoming studies or country evaluations; those for which Executive Directors or Bank management have requested assessments; and those that are likely to generate important lessons.

To prepare a Project Performance Assessment Report (PPAR), IEG staff examine project files and other documents, visit the borrowing country to discuss the operation with the government, and other in-country stakeholders, and interview Bank staff and other donor agency staff both at headquarters and in local offices as appropriate.

Each PPAR is subject to internal IEG peer review, Panel review, and management approval. Once cleared internally, the PPAR is commented on by the responsible Bank department. The PPAR is also sent to the borrower for review. IEG incorporates both Bank and borrower comments as appropriate, and the borrowers' comments are attached to the document that is sent to the Bank's Board of Executive Directors. After an assessment report has been sent to the Board, it is disclosed to the public.

**About the IEG Rating System for Public Sector Evaluations**

IEG's use of multiple evaluation methods offers both rigor and a necessary level of flexibility to adapt to lending instrument, project design, or sectoral approach. IEG evaluators all apply the same basic method to arrive at their project ratings. Following is the definition and rating scale used for each evaluation criterion (additional information is available on the IEG website: http://ieg.worldbankgroup.org).

***Outcome:*** The extent to which the operation's major relevant objectives were achieved, or are expected to be achieved, efficiently. The rating has three dimensions: relevance, efficacy, and efficiency. *Relevance* includes relevance of objectives and relevance of design. Relevance of objectives is the extent to which the project's objectives are consistent with the country's current development priorities and with current Bank country and sectoral assistance strategies and corporate goals (expressed in Poverty Reduction Strategy Papers, Country Assistance Strategies, Sector Strategy Papers, Operational Policies). Relevance of design is the extent to which the project's design is consistent with the stated objectives. *Efficacy* is the extent to which the project's objectives were achieved, or are expected to be achieved, taking into account their relative importance. *Efficiency* is the extent to which the project achieved, or is expected to achieve, a return higher than the opportunity cost of capital and benefits at least cost compared to alternatives. The efficiency dimension generally is not applied to adjustment operations. *Possible ratings for Outcome:* Highly Satisfactory, Satisfactory, Moderately Satisfactory, Moderately Unsatisfactory, Unsatisfactory, Highly Unsatisfactory.

***Risk to Development Outcome:*** The risk, at the time of evaluation, that development outcomes (or expected outcomes) will not be maintained (or realized). *Possible ratings for Risk to Development Outcome:* High, Significant, Moderate, Negligible to Low, Not Evaluable.

***Bank Performance:*** The extent to which services provided by the Bank ensured quality at entry of the operation and supported effective implementation through appropriate supervision (including ensuring adequate transition arrangements for regular operation of supported activities after loan/credit closing, toward the achievement of development outcomes. The rating has two dimensions: quality at entry and quality of supervision. *Possible ratings for Bank Performance:* Highly Satisfactory, Satisfactory, Moderately Satisfactory, Moderately Unsatisfactory, Unsatisfactory, Highly Unsatisfactory.

***Borrower Performance:*** The extent to which the borrower (including the government and implementing agency or agencies) ensured quality of preparation and implementation, and complied with covenants and agreements, toward the achievement of development outcomes. The rating has two dimensions: government performance and implementing agency(ies) performance. *Possible ratings for Borrower Performance:* Highly Satisfactory, Satisfactory, Moderately Satisfactory, Moderately Unsatisfactory, Unsatisfactory, Highly Unsatisfactory.

# Preface

This Project Performance Assessment Report (PPAR), prepared by the Independent Evaluation Group (IEG), evaluates three power sector projects in Vietnam:

- The Transmission, Distribution and Disaster Reconstruction Project (IDA-30340; total costs: US$248.45 million). The project was approved on January 20, 1998 and closed on June 30, 2007.

- The Rural Energy Project (IDA-33580; total costs: US$203.47 million). The project was approved on May 30, 2000 and closed on December 31, 2006.

- The System Efficiency Improvement, Equitization and Renewables Project (IDA-36800, IDA-47819, TF-51229; total costs: US$419.50 million). The project was approved on June 25, 2002 and closed on December 31, 2012.

The three projects should be seen in the broader context of the Bank's long-term deep engagement in Vietnam's power sector. These operations and continuous policy dialogue with the Government of Vietnam (GOV) helped set the stage for the subsequent higher level and increasingly programmatic Bank engagement under the ongoing Power Sector Reform Development Policy Operations.

The operations assessed in this report share common and complementary issues related to poverty reduction, infrastructure development as well as policy and institutional developments. The implementation periods of the three projects also overlapped for the most part. These factors were taken into account when selecting the projects for assessment. The findings and lessons from this assessment are also likely to be a useful input to the ongoing IEG evaluation of the World Bank Group's contribution to electricity access in client countries.

IEG prepared this report based on an examination of the relevant Project Appraisal Documents, Implementation Completion and Results Reports, legal agreements, project files and archives, as well as other relevant reports, documents, memoranda and working papers. An IEG field mission visited Vietnam for two weeks in March 2014. Discussions were held with Bank staff in Washington and Hanoi, GOV officials in Hanoi, Ho Chi Minh City and various other locations in the country and some non-governmental organizations. The mission discussed the projects' experience and sustainability as well as the effectiveness of Bank assistance with sector stakeholders including transmission and distribution entities, rural communities and other project beneficiaries. Project site visits were undertaken in a number of locations covering rural households and power facilities.

IEG expresses its appreciation for the time and attention given by the Borrower, various implementing agencies and all concerned parties. A list of persons met by the field mission is in Annex C. Following IEG practice, copies of the draft report were sent to the government officials and implementing agencies, and no comments were received.

# Summary

This Project Performance Assessment Report (PPAR) covers three World Bank-supported projects that address the triple challenge in the power sector faced by Vietnam's rapidly growing economy over the past two decades: (i) ensuring universal electricity access; (ii) strengthening the reliability and efficiency of the Transmission and Distribution (T&D) network; and (iii) reforming the sector's institutional and regulatory frameworks. These challenges were interrelated: the success of rural electrification, an overriding national priority, depended crucially on the (i) timely expansion and reconstruction of the woefully inadequate T&D grid; and (ii) adoption of institutional and regulatory reforms to ensure efficient implementation of the Government of Vietnam's (GOV) ambitious electrification program as well as operational and financial sustainability of the power sector.

**Rapid Increase in Electricity Demand**. The rapid growth and diversification of Vietnam's economy, coupled with the vigorous rural electrification effort, dramatically increased the demand for electricity. The annual demand growth was as high as 14.5% in the decade between 2000 and 2010. There was a pattern of serious electricity shortages, power failures and associated massive load shedding. In addition to being undersized, the T&D network operated inefficiently. Network losses were extremely high and unsustainable.

**Inadequate Electricity Supply**. Faced with these challenges, the power industry struggled to expand and improve the country's power infrastructure, as evidenced by difficulties with developing new generation sources, expanding and reinforcing the T&D system, improving connectivity between Vietnam's regions, reducing excessive network losses, and improving the quality and reliability of power supply. In particular, the success of the rural electrification effort critically depended on the transmission system's ability to make available considerable additional power generation capacity to rural areas.

**Strategic Response**. Until the mid-1990s, Vietnam's state-owned, heavily centralized and vertically integrated power sector suffered from a number of institutional and regulatory shortcomings, which undermined the sector's financial and operational sustainability. In the wake of the *Doi Moi* reforms, in the mid-1990s, the GOV initiated a new power sector strategy aimed at gradual unbundling of the vertical monopoly, commercialization of sector enterprises, establishment of a legal and regulatory framework, including cost-reflective electricity prices to ensure the sector's financial viability and mobilization of resources to address the severe capacity crunch in power generation. As part of the structural reforms, the national electricity company, Electricity of Vietnam (EVN), was established and became the primary implementing agency for the GOV's rural electrification and power sector modernization plans, and a key partner for World Bank operations in the sector.

**World Bank Role**. The T&D grid, a sustained focus of Bank support, was a key leverage point at the heart of a functioning power market in Vietnam. Historically, the T&D system operated in a degraded and chaotic fashion; instead of being the engine for economic recovery and growth, it became a major impediment. Based on its experience with similar country situations in developing countries, the Bank was well positioned to

assist Vietnam with electricity sector projects in the three areas – T&D, rural electrification and sector reforms – that have mutually reinforcing objectives. In the Country Partnership Strategies, support for electrification, improvement of the efficiency and quality of the electricity infrastructure, and the advancement of sector reforms, were pivotal development objectives. All three projects assessed in this report carried a heavy reform and institutional development agenda.

Against this background, this PPAR assesses the development effectiveness of three power sector projects in Vietnam, as summarized below in terms of their outcomes, risks to the sustainability of these outcomes and the performance of the Bank, the Borrower and the implementing agencies.

The Transmission, Distribution and Disaster Reconstruction (TDDR) Project's objectives were: to (i) strengthen the high-voltage transmission network to facilitate evacuation of power from generating stations to the load centers; (ii) rehabilitate distribution systems to meet demand, reduce losses and improve reliability; (iii) support sector reform and restructuring; (iv) support institutional strengthening and commercialization; and (v) help normalize economic activity in the Typhoon Linda-affected areas.

The Rural Energy Project's (REP) objectives were: to (i) expand rural access to electricity through grid expansion to improve welfare, enhance income earning capacity and help alleviate poverty; (ii) develop appropriate institutional mechanisms for rural electrification to facilitate sustainable rural electrification and long-term viability of the power sector; (iii) advance the implementation of sector reforms; and (iv) promote local renewable energy sources in areas inaccessible to the national grid.

The System Efficiency Improvement, Equitization and Renewables (SEIER) Project's objectives were: to (i) enhance electric system efficiency; (ii) provide electricity in selected rural areas; (iii) sustain reform and institutional development in the power sector; and (iv) reduce greenhouse gas emissions by promoting renewable energy sources for electricity generation.

**Transmission, Distribution and Disaster Reconstruction Project, 1998-2007**

The TDDR Project was a highly relevant operation in the context of Vietnam's grossly inadequate and inefficient T&D infrastructure, systemic impediments to commercial operation of EVN, large needs for investments and inadequate sector regulation. Reinforcement of a series of transmission lines and substations was crucially required to serve as feeders for the rural distribution system to be greatly expanded under rural electrification.

While the project's development rationale and design were sound overall and responsive to GOV priorities in the power sector, several shortcomings impeded effective project implementation. Project preparation was not well advanced upon credit approval, which largely explains the need for five extensions of the closing date and the decade-long implementation period. The Bank's performance on the electricity tariff issue was another delaying factor from the outset. The political economy risks of adopting a tariff-level covenant were poorly assessed. While the financial performance indicators for

EVN that replaced the tariff covenants were a step forward, the Bank should have instead pushed for a sustainable systemic solution through a sound tariff methodology.

Despite these shortcomings, practically all of the numerous physical output targets were achieved or overachieved. In terms of outcomes, significant improvements in overall T&D system efficiency and some aspects of reliability were achieved. The actions supporting sector reforms were partially carried out. The landmark 2005 Electricity Law helped set the framework for significant subsequent restructuring measures and its provisions are still being implemented.

Development benefits of the project were mixed. Since project closure, the GOV has demonstrated strong commitment to carry on with the expansion and modernization of T&D in response to continued rapid growth in electricity demand. However, EVN Holding's current weak financial capacity may seriously constrain its ability to finance T&D investments on the required massive scale going forward. These financial concerns and prevailing issues with T&D reliability create a significant risk to the sustainability of the development outcomes.

During project preparation, the Bank team seriously underestimated the project's complexity and implementation time. During implementation, in several instances, the Bank was slow in addressing emerging issues thus contributing to implementation delays. The implementing agencies showed strong commitment but considerable delays were caused by GOV approval requirements. In later stages in project implementation, the GOV delegated more investment decisions to the implementing agencies.

***Ratings***

Overall project outcome is rated **Moderately Satisfactory** based on the **high** relevance of its objectives, **substantial** relevance of its design, its **substantial** efficacy and **modest** efficiency. On the performance under the five PDOs, achievement has been rated substantial for three (strengthening the transmission network; rehabilitating and expanding distribution systems; normalizing post-disaster economic activity) and modest for two (sector reforms; strengthening and commercializing institutions). Risk to development outcome is rated **Significant** due mainly to EVN's weak financial capacity to undertake T&D investments on the required scale going forward and prevailing serious issues with T&D reliability. Both Bank performance and Borrower performance are rated **Moderately Satisfactory.**

**Rural Energy Project, 2000-2006**

The project substantially contributed to the GOV's ambitious rural electrification program. The actual electrification of 976 communes under the project exceeded by 45% the level targeted at appraisal, including 278 of the poorest communes and more than 550,000 households (2.8 million people) in the most disadvantaged areas. Subprojects were designed to specifically target poor communes in rural and distant areas. Communes were selected after verifying that grid extension was the least cost option and economically viable.

The project contributed to capacity building for implementing agencies, including the development of technical specifications and standardization of the design and characteristics for rural electricity networks. These standards promoted better network quality, reduced technical losses and avoided the application of more expensive urban standards to rural areas. Subsequently, they were adopted as national standards. An innovative and effective service outsourcing ("service agents") model was introduced, which reduced operating costs and achieved high level of payments. The project was successful as a demonstration of the rural electrification program decentralized to local implementing agencies in terms of cost sharing, direct local participation and building local capacity for operation and management of the rural network. Based on survey results and feedback received during site visits under the IEG PPAR mission, the project had a significant impact on rural welfare. The mission found a disproportionately high value placed by the communes on educational gains.

The road map for power sector reform set milestones and schedule for the transition to a power sector based on market principles. The project substantially supported the development of the milestones to be carried out largely after project closure under follow-on Bank operations.

The GOV's decision to decentralize the project to the local implementation agencies facilitated the process of subproject preparation and implementation. The local governments at the levels of province, districts and communes took the responsibility for paying compensation to owners of sites affected by the project. The provinces also assisted poor families in the payment for the low voltage drop lines to their houses.

EVN and its subsidiary regional power companies (PCs) were the implementing agencies. The strong commitment of the PCs enabled the execution of hundreds of contracts for a large number of subprojects scattered in wide mountainous rural areas with difficult access. Overall, EVN displayed a good control of procurement through competitive bidding that contributed to significant cost reductions and allowed the electrification of a large number of additional communes.

The Bank responded to the GOV's urgent need to finance rapid rural electrification. The Bank task team effectively assisted the implementing agencies in the preparation of standard templates and the definition of clear responsibilities for all concerned agencies under a decentralized implementation approach. Most of the key task team were based in the field and carried out close supervision of the project. The Bank showed reasonable flexibility in resolving important issues during project implementation.

***Ratings***

The REP is rated **High** for relevance of project objectives and **Substantial** for project design. Overall project outcome is rated **Satisfactory** because of the project's substantial overachievement of the original rural electrification target and associated evidence-based welfare benefits. Despite the GOV's sustained focus on affordable electricity services to rural communities and EVN's strong technical capacity, the risk to development outcome is rated **Significant** due to EVN's recently deteriorating financial performance, which may constrain it ability to maintain and modernize the rural networks. Both Bank

performance is rated **Satisfactory.** and Borrower performance is rated **Moderately Satisfactory**.

**System Efficiency Improvement, Equitization and Renewables Project (SEIER), 2002-2012**

This was a very complex operation with multiple development objectives covering power system efficiency improvement, extension of rural electrification, utilization of renewable energy sources, institutional and capacity development as well as regulatory and policy reforms. The project was restructured three times and became even more complex during implementation, which took five years longer than originally planned.

The objective to sustain reform and institutional development of the electricity sector was only partially achieved by developing a number of policy and regulatory documents to implement the Electricity Law, such as tariff and market regulations, followed by a series of tariff increases but only slightly above the inflation rate, thus tariffs are still highly distorted and stand well below full cost recovery levels. Tariff setting is still done by the Prime Minister. Underpriced electricity continues to lie at the heart of the power sector's severe financial difficulties and is a key impediment to the sector's future growth.

The project was largely successful in enhancing electricity system efficiency by reducing transmission system loss and outage frequency. However, sustainability of these improvements is not fully assured, especially in view of the sector's deteriorating financial standing lately. For example, the duration of network interruptions has shown a deteriorating tendency recently and continues to be very high in international comparison.

The relevance of rural electrification based on renewable energy source-based, off-grid solutions was substantially overrated by the project. The performance indicators fell short of the target quite considerably because the investments were no longer needed since the rapidly expanding grid drastically reduced the need for off-grid generation. Moreover, there is a high risk to the operational and financial sustainability of the micro hydropower plants installed and rehabilitated under the project.

In designing this operation, relevant lessons learnt under a number of other power projects in Vietnam were not adequately internalized in the project design and implementation framework. Since the project included a range of sub-sectoral issues and implementing agencies, its design became overly complex. Implementation capacity was overestimated across the board. The applicability of the community-based off-grid approach should have been more thoroughly assessed, including risks to the sustainability of the off-grid hydropower stations. The Bank team did not anticipate the rapid growth in grid electrification and its serious adverse implications for the project's off-grid electrification targets. The financial and operational viability of the seven off-grid facilities installed/rehabilitated has been seriously compromised and two of them have already become non-operational and abandoned, falling into disrepair following grid arrival. Based on the IEG PPAR mission's site visits, there is a very high risk that most, if not all, of these facilities could be abandoned in a few years.

The GOV's ownership and commitment to the project was high. During implementation, the GOV streamlined the excessive centralization and control, and adopted more flexible implementation approaches. However, the GOV has not made any noticeable progress in the implementation of the equitization program and has showed reluctance to adjust power tariffs to cost recovery levels and, as a result, the power sector has continued to experience growing financial difficulties. The implementing agencies' commitment to the project was strong, except for the lack of local community interest in off-grid micro hydropower plant schemes in remote areas.

***Ratings***

The SEIER Project is rated **High** for relevance of project objectives but **Modest** for project design primarily because of its overly high complexity. Development Outcome is rated **Moderately Unsatisfactory**, mainly due to the largely unsuccessful renewable energy source-based electrification of remote rural communities and slow progress under a number of Technical Assistance activities including for equitization. carbon dioxide emission reductions significantly exceeded targets. Risk to development outcome is rated **Significant** given the slow progress in equitization and adoption of sound tariff and quality-of-service regulation, the increasingly unsustainable financial position of the power sector and the extremely high risk to the operational sustainability of the off-grid micro hydropower plants. The Bank's performance is rated **Moderately Unsatisfactory** due mainly to shortcomings in project design. Borrower performance is also rated **Moderately Unsatisfactory** due to insufficient progress in sector reforms including equalization, and unduly complex GOV approval processes, particularly at the early stages of the project, while the implementing agencies performed adequately.

**Lessons**

**In supporting the sector to move towards long-term financial viability and fiscal sustainability, the Bank should lay primary emphasis on broader institutional and policy measures for cost recovery. In contrast, specific target-oriented and time-bound measures in the form of tariff or financial performance covenants carry excessive political implementation risks and are prone to noncompliance by the Borrower.** Despite a number of financial performance measures that were included in their design, the three Bank operations were not effective in helping improve Vietnam's power sector finances, let alone place the sector on the road to sustained financial recovery. Considering this experience, the Bank should have pursued a more systemic solution to the sector's long-simmering financial crisis through the introduction of a sound tariff methodology to ensure sustainable cost recovery and the power sector's future operational/financial sustainability, while making the sector more attractive to much-needed external private finance.

**A national push for universal electricity access provision will primarily depend upon the pursuit of a least cost path for grid expansion backed by appropriate sector policies, complemented by off-grid electricity in the interim or for the long-term as needed.** In Vietnam, as the electricity grid expanded faster than expected, the decreasing necessity and relevance of off-grid electrification was not adequately foreseen, resulting in some off-grid facilities falling into disuse or neglect. This

experience points to the need for planning ahead, and making technical provision for integrating off-grid and mini-grid facilities with the grid when it arrives, so that the expected benefits are realized from the investments.

**Rapid growth in electrification can be accompanied by sub-optimal use of electricity especially in a situation of relatively low or subsidized tariffs. This calls for early and serious policy attention to improving Energy Efficiency and implementation of dedicated Energy Efficiency operations on a sizable scale.** The evidence shows that the Bank's program has essentially provided a supply-side support program for Vietnam's power sector, largely "following demand," as the GOV has done, with less attention to demand side management. The marginal Bank-supported Energy Efficiency efforts (typically a small demand side management-style component under various power sector operations) has not been effective in to making a material difference to the Energy Efficiency landscape, let alone nationwide scale-up. The Transmission & Distribution sector – continues to play catch-up with increasing demand which needs to be moderated through appropriate measures including tariffs that better reflect cost-recovery levels. The extremely large reservoir of untapped Energy Efficiency opportunities calls for the creation of a solid framework for energy-saving efforts, including sizable programmatic support for Energy Efficiency, extending well beyond the piecemeal approach applied to date.

**The Bank should work to develop an understanding with client countries over the role of key institutions before embarking on full-fledged support for them. Otherwise, weak understanding might result in less than desirable institutional performance and sub-optimal use of technical assistance resources.** In Vietnam, the Bank should have pushed for agreement on a more autonomous professional regulatory agency, before committing to a large amount of capacity building support to ERAV. In the absence of serious support from the Government in this respect, ERAV's regulatory role has weakened somewhat over the years, and some of its resources have been diverted to non-regulatory type activities (e.g., administration of the competitive generation market) instead of focusing on core regulatory activities such as tariff methodology and quality-of-service regulation, monitoring and enforcement. While ERAV's overall technical competency may have improved over the years with sustained support from the Bank, the outcomes from its efforts are weak – sector finances continue to deteriorate, and the quality and reliability of electricity service for consumers has seen a downward trend in recent years.

**In a rapidly evolving sector environment, a *de facto* flexible approach should be adopted to adjust to changing priorities as well as new institutional and on-the-ground developments. Even if the changing situation could not be foreseen at the project design stage, such an approach would enable more smooth and successful implementation of the project.** This aspect is illustrated in all three projects and particularly in the SEIER project where both the Bank and Borrower responded to changed circumstances through project restructuring to allow flexibility for investing in subprojects that took on greater priority.

**The project M&E framework should focus on identifying the direct causal links between project interventions and outcomes to the maximum extent possible. This is particularly important, albeit challenging, in large and rapidly evolving sector context in which Bank-supported interventions only partially influence but do not determine overall outcomes.** In addition to being unnecessarily complicated with too many performance indicators, several key outcome indicators related to improved T&D reliability and efficiency were defined at the national system level, which made an accurate outcome assessment for the T&D component largely impossible or tentative at best under the TDDR and SEIER projects. While they are usually more challenging to design, in similar situations project-level indicators or appropriate proxies should be used for the relevant project areas.

**The community's involvement in the design, construction and operation of new rural electricity supply networks, and cost-sharing can lead to successful implementation and a sense of ownership.** Ensuring local participation in all aspects of the project helped mobilize and maintain local support and commitment to rural electrification, while ensuring a rapid pace of the process, creating employment, building local capacity and thereby laying the foundation for the sustainable management and operation of the networks. Significant cost sharing by local governments and the communities was an important element of the Vietnamese financing model for rural electrification. Mobilization of local funds was essential to close the funding gap. This requires appropriate mechanisms and enabling institutional and legal frameworks, not only at national, but also at local levels.

Caroline Heider
Director-General
Evaluation

# 1. Background and Context

1.1 The three World Bank-supported projects covered by this report address the triple challenge faced by Vietnam's rapidly growing economy in the power sector over the past two decades: (i) ensuring universal electricity access; (ii) strengthening the reliability and efficiency of the T&D network; and (iii) reforming the institutional and regulatory frameworks. These challenges were interrelated: the success of rural electrification, an overriding national priority, depended crucially on the (i) timely expansion and reconstruction of the T&D grid; and (ii) adoption of institutional and regulatory (including tariff) reforms to ensure efficient implementation of the GOV's ambitious electrification program and sustainability of its economic and welfare benefits. Also, T&D, the focus of World Bank support, has been a key leverage point at the heart of the establishment of a functioning wholesale market in Vietnam. Historically, this system operated in a degraded and chaotic fashion, to the extent that, instead of being the engine for economic recovery and growth of the country, it became a major impediment.

1.2 Together the three World Bank-supported operations encompass a 14-year period (1998-2012) during which Vietnam's economy, after recovering from the ravages of war, witnessed a rapid transition from a formerly centrally planned rural economy to a market-based rapidly industrializing one and the implementation of a most rapid rural electrification program.

**Expanding and Improving the Electricity Infrastructure: Transmission and Distribution**

1.3 The sustained rapid growth and diversification of Vietnam's economy, coupled with the "big push" rural electrification effort, have dramatically increased the demand for electricity. The average annual demand growth was as high as 14.5% in the decade between 2000 and 2010, but even in the most recent years of relatively uncertain macroeconomic environment demand growth has been strong. There was a pattern of serious electricity shortages, power failures and associated load shedding.[1] In addition to being undersized, the T&D network operated inefficiently both for technical and managerial reasons. In 1992, T&D losses were very high at 25.6%.

1.4 Faced with this challenge, the power industry has struggled to expand and improve the country's power infrastructure, as evidenced by difficulties with developing new generation sources, expanding and reinforcing the T&D system and improve connectivity between Vietnam's three main regions, reducing excessive network losses, and improving the quality and reliability of power supply across the country. Expansion

[1] For example, in 2008 cumulative load shedding corresponded to 0.9% of Vietnam's annual power consumption (data provided to the IEG mission by the National Load Dispatch Centre). Power deficits occasionally force local manufacturers to halt production when EVN diverts power to residential areas. As a result, businesses have been investing in expensive backup generation capacity such as diesel generators. There were significant power shortages in 2010 due to extreme summer temperatures, drought conditions and delays in completion of construction and commissioning of new power plants. Load shedding was 0.7% in 2010.

and modernization of the T&D system has been also a critical infrastructural precondition for establishment of the national electricity market.

1.5 In particular, the success of the rural electrification drive critically depended on the transmission system's ability to make available considerable additional generation capacity to rural areas, predominantly through grid extension. In this regard, building the 500 kV North-South transmission line to transport electricity from the north to central and southern parts of Vietnam was of paramount importance. The interconnector, launched in 1994, linked all the isolated regional systems into an integrated grid and enabled the rapid expansion of rural electrification, particularly in the central and southern areas. However, the interconnector soon became strained and vulnerable and, despite its reinforcements with additional circuits, it has remained stressed because of sustained rapid demand growth in the south.

1.6 Many of the small LV distribution lines rapidly developed in rural communities, especially during the 1990s when the priority was to deliver simple connections to as many people as possible, remained relatively weak and needed to be rehabilitated later on in order to reduce losses and improve the reliability and quality of supply. A large number of the grids were poorly designed and constructed, leading to heavy technical losses varying from 20% to 50% in some cases.

1.7 Capacity and reliability of the MV network was also of concern in some rural areas, as the existing systems became unable to meet the rapidly growing load requirements. In some instances, the MV system became a bottleneck in the power flow from the HV transmission system to the LV grids in the communes.

1.7 Looking ahead, in the face of surging electricity consumption, tight generation capacity reserve margins and overloaded T&D networks, Vietnam continues to face the challenge of preventing further damaging power failures by vigorously expanding the power infrastructure and improving the reliability and efficiency of the grids. The investment requirements are staggering. According to the GOV's Seventh Power Development Master Plan (2010-2020), additional generation capacity of 4,100 MW a year will be required over the 2011-2015 period. The Plan requires about US$5 billion per year to be invested, of which two-thirds would be spent on new generation plants and the remainder on T&D development.[2] Given the parlous state of sector finances (including EVN's heavy indebtedness), issues with the existing build-own-transfer framework and considerable regulatory (including tariff) uncertainty, this is a hard challenge to meet and the GOV and EVN may need to adjust the investment program downwards.

1.8 Going forward, a major challenge to tackle is the need to markedly improve the reliability, quality and safety of power supply, particularly at the LV distribution levels. In part because of a strong past emphasis on quantitative network expansion, the number of service interruptions and in particular the duration of interruptions is extremely high

[2] The Master Plan aims to raise installed generation capacity to 75,000 MW from the current 24,000 MW - a very large, threefold increase within a decade.

and off-scale when compared with international benchmarks.[3] For example, as shown in Table 1, in 2012 under the Northern Power Corporation (NPC or PC1), there were 53 interruptions per customer, totaling 150 hours (6.3 days). The typical international value range is 0.5-10 interruptions per customer and 0.5-1.2 hours, respectively. The big variation in reliability performance among the power companies (PCs) points to a large improvement potential for the poorer performers (PC1 and PC2). However, even the best performer distributor (PC3) has much catch-up to do *vis-à-vis* international peers.

**Table 1: Reliability of Electricity Supply: Interruptions at Distribution Level in 2012**

| **Distribution Company** | **SAIFI (number of service interruptions per customer per year)** | **SAIDI (total hours of service interruptions per customer)** |
|---|---|---|
| PC Hanoi | 16.5 | 163.3 |
| PC Ho Chi Minh | 22.3 | 49.8 |
| Northern PC (NPC or PC1) | 53.0 | 150.1 |
| Southern PC (SPC or PC2) | 24.1 | 117.5 |
| Central PC (CPC or PC3) | 21.4 | 76.0 |
| *Typical international value range* | 0.5-10 | 0.5-1.2 |
| *ElektroPaulo (Brazil)* | 10.0 | 7.2 |

*Note:* SAIFI (System Average Interruption Frequency Index) and SAIDI (System Average Interruption Duration Index) are internationally commonly used reliability indicators.
*Source:* AF-Mercados EMI, "Strategic Options for Enhanced Financial Performance of EVN," Prepared for the World Bank and EVN, October 2013. Based on EVN-provided data.

1.9 In recent years, some of the PCs have experienced steadily deteriorating reliability performance on their 110 kV lines. For example, in the service territory of CPC, the transient (<5 minutes) and the lasting (>5 minutes) rates of faults (per 100 km/year) have risen by 19% and 121%, respectively, between 2008 and 2013. Under NPC, between 2008 and 2012 the average duration of interruption rose by 14%.[4]

1.10 The HV transmission system also faces considerable challenges to improve reliability, which has shown a mixed record in recent years. While the number of interruptions has fallen, the duration of interruptions has increased considerably (Table 2). Seen from this perspective, transmission reliability was weaker in 2013 than a half-decade earlier despite the massive investments undertaken. Apparently, the rapid growth in electricity consumption overwhelms much of the T&D networks, which, as revealed to the IEG mission by a number of stakeholders, continue to experience technical weaknesses such as partially installed SCADA/ Energy Management System and protective relaying, insufficient substation automation, single circuit lines and outdated equipment.

[3] However, it is difficult to assess whether these large interruptions are actually caused by underperformance of the distribution PCs or due, at least to some extent, to generation and transmission shortfalls. The IEG mission's discussions with the PCs suggest that both factors may be at play.

[4] During this period, among the three regional distributors only SPC (southern region) was able to consistently improve its reliability performance (both frequency and duration of interruptions). Data provided to the IEG mission by the PCs in a written questionnaire.

**Table 2: Interruptions on High-Voltage Transmission Lines**

| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|
| Frequency of interruptions (number of faults/100 km/year | 0.70 | 0.86 | 0.51 | 0.45 | 0.51 | 0.42 |
| Average duration of faults (minutes per year) | 51.1 | 62.4 | 62.9 | 51.5 | 53.4 | 76.2 |

*Source*: EVN data provided to the IEG mission.

1.11 Investment climate surveys for Vietnam frequently cite poor power quality as one of the top constraints. A recent World Bank survey[5] found that 19% of manufacturing firms surveyed still described electricity supply as a major or severe constraint for their business, although they had been connected to the electricity grid. In terms of quality of power supply, in the World Economic Forum's latest global competitiveness survey Vietnam ranks a mediocre 109th among 142 countries covered for 2010-2011.[6] All these point to continued need for sustained efforts to ensure satisfactory quality and reliability of electricity supply across the country.

1.12 Finally, more efficient use of electricity remains a major task to tackle going forward. Past efforts of the GOV aimed at improved energy efficiency, including those supported under World Bank-funded power projects,[7] have failed to make a dent in the steeply rising trend of electricity consumption and the electricity intensity of GDP (see Figure 1). While high income (GDP) elasticity of electricity demand is typical of developing economies in the "take off" stage of economic growth, Vietnam's largely underdeveloped energy efficiency framework,[8] including the implicitly subsidized retail tariffs, has played an important role in the uninterrupted rise of electricity intensity and exponentially growing per capita consumption. A comparison of the per capita electricity use with the Philippines also points to a possibly large reservoir of untapped electricity efficiency in Vietnam (see Figure 2). To considerable extent, the more than threefold power tariff differential between the two countries drives the markedly divergent consumption patterns.

[5] World Bank, "Vietnam: State and People, Central and Local Working Together. The Rural Electrification Experience," Washington, DC, March 2011, p. 25.

[6] World Economic Forum, "The Global Competitiveness Report 2011-2012," Geneva, 2012, p. 418.

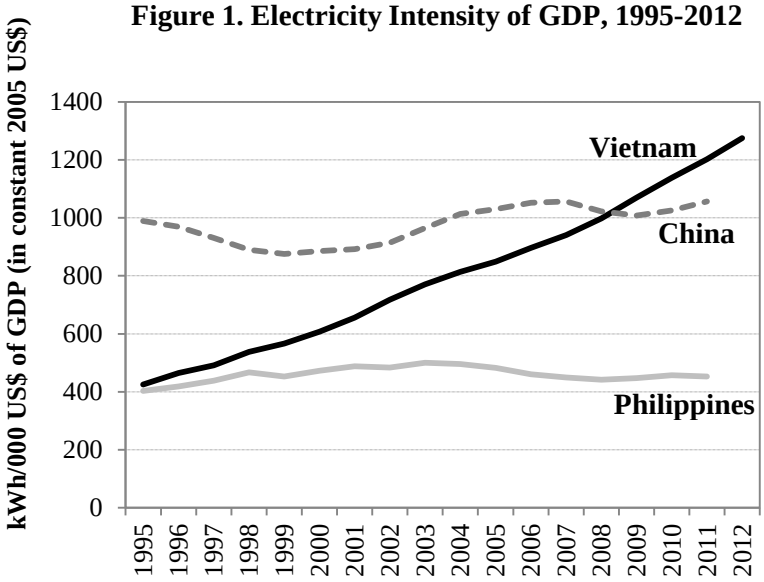
[7] Most of the World Bank-supported power projects since 1995 had a small energy efficiency component (usually a DSM pilot).

[8] The underdeveloped energy efficiency framework includes, *inter alia*, low electricity tariffs, weak financial incentives for both businesses and households to reduce electricity consumption due to underpriced electricity, unsophisticated and partially applied time-of-use tariff system, lack of tax incentives, inefficient energy performance legislation, unenforced energy efficiency standards, underdeveloped market for energy efficiency services and the lack of access to energy efficiency finance. Also, until the mid-2000s, energy efficiency was not high on the GOV's policy agenda and there is still no effective institutional focal point for energy efficiency policy and implementation support within the GOV.

1.13 As a result of the overriding past emphasis on quantitative dimensions of growth, Vietnam has now a potentially disproportionate large pent-up demand for energy efficiency. Vietnam lags behind its regional competitors, most prominently China, which embraced energy efficiency as a policy priority much earlier. International experience shows that energy efficiency is often the lowest cost means of increasing the reliability, affordability and sustainability of energy supply, but remains grossly unexploited.

1.14 Looking ahead, these point to opportunities for creating a solid framework for cost-efficient and market-oriented energy-saving efforts. These efforts could include sizable programmatic implementation and financial support for energy efficiency from the World Bank. Such an approach would go well beyond pilot programs and less effective piecemeal approaches so far (including under the projects assessed here), which have failed to create a market for energy efficiency.[9]

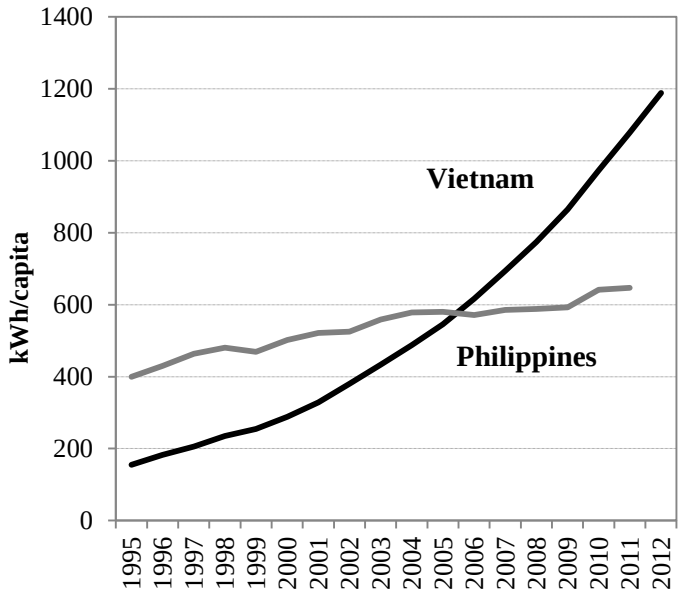
**Figure 1. Electricity Intensity of GDP, 1995-2012**




*Source*: *World Development Indicators*, World Bank, Washington, DC, and EVN for Vietnam's electricity consumption.

[9] In 2003, the IFC launched the "Vietnam Cleaner Production Energy Efficiency Project," a credit line facility channeled through several local banks. The operation has faced considerable challenges in building up an active project pipeline with only nine energy efficiency loans being committed to date. An IBRD energy efficiency Project (FY15) is planned for industrial enterprises. However, a number of sizable dedicated operations would be needed to help reach a critical mass of sustainability of commercial energy efficiency financing in Vietnam.

**Figure 2. Per Capita Electricity Consumption, 1995-2012**




*Source*: World Development Indicators, World Bank, Washington, DC, and EVN for Vietnam's electricity consumption.

## Rural Electrification: Top National Development Priority and Main Component of Poverty Reduction Strategy

1.15 During the postwar economic recovery period (1976-1985), when rural household electrification rate grew from 2.5% to 9.3%, the Vietnamese economy was in the process of recovering from 30 years of almost continuous war. The power system consisted of underdeveloped and isolated systems, and electricity supply was only available for cities and large industries. Providing electricity to rural households was secondary to electricity supply for productive uses, especially irrigation of agricultural areas.

1.16 With the launch of the *Doi Moi* economic reforms in 1986, Vietnam has witnessed a rapid transition from the rigidities of a centrally planned economy to a market-based social economy. Rapid economic growth experienced at all levels of society has been the result of the government's strong commitment to liberalizing markets and investing in social sectors, infrastructure and rural development. The power sector was considered by the GOV as a foundation for dynamic economic growth.

1.17 In the 1990s, Vietnam's power sector was facing the challenge of meeting the needs of a fast growing and rapidly industrializing economy. Electricity demand was growing at an annual rate of 13% to 15%. The GOV's targets for economic and social growth required increasing electricity supply at a rate of 1.7 times faster than that of GDP. In the early 1990s, only slightly more than half of the rural communes and less than 15% of the rural households had access to electricity. In response, the GOV made

rural electrification a key component of its development strategy and poverty reduction program which would address imbalances in economic development and enhance overall welfare levels by providing reliable lighting sources and improving health care, education and economic opportunities for households.

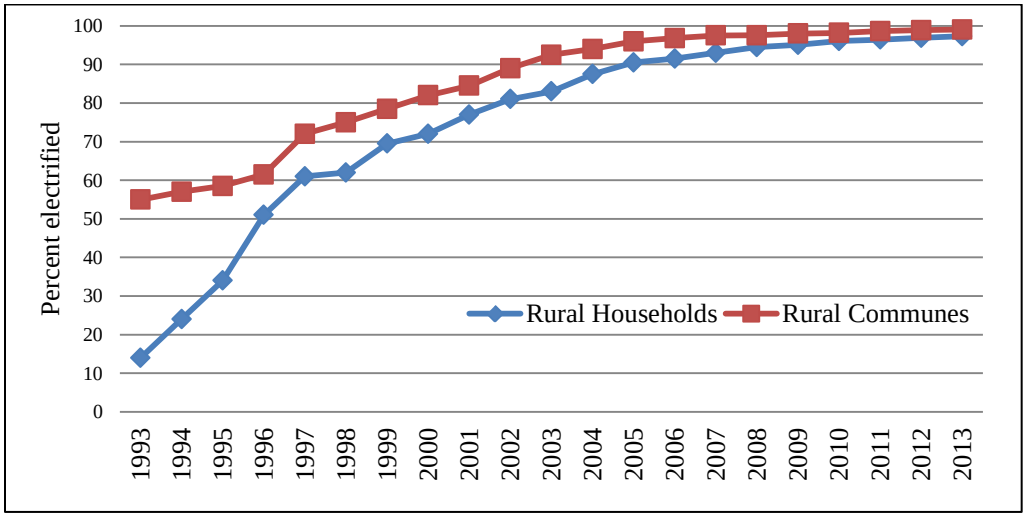
1.18 Initially, the rural electrification program was hampered by weak institutional arrangements and lack of sufficient capital. Almost 90% of rural electricity distribution was carried out by commune-level electricity groups that had no legal status, minimal technical competence, and little financing. Regulation of the power sector was grossly inadequate, suffering from several drawbacks, including a lack of effective legal/regulatory framework and technical standards for rural electrification.

1.19 In this context, the GOV formulated a staged long-term electrification plan that focused during the initial years on the main objective of physically connecting rural communes rapidly and attracting broad local participation. This goal was successfully accomplished. Starting in the mid-2000s, a second and still ongoing phase of the plan has focused on improving efficiency and reliability of electricity supply through more efficient technical operation and establishing an enabling environment to guarantee the sustainability of the program. With a proper design and management setup, and the use of adequate technical standards, technical losses in rural LV distribution systems dropped from 30% in the late 1990s to 10% in 2009.

1.20 As Figure 3 shows, electrification of rural households has increased rapidly since the early 1990s. With 97.3% of Vietnam's rural households having access to electricity in 2013, the country is now in the "last mile" of its electrification program. Even among the poorest households (bottom 10%), more than 85% are connected to electricity.[10] About two million people, mainly in mountainous areas and islands, are still without access to electricity. The GOV's development strategy envisages that all rural households will have access to electricity by 2020.

[10] World Bank, "Project Document for Third Power Sector Reform Development Policy Operation," Report No. 77606-VN, Washington, DC, January 27, 2014.

**Figure 3. Rural Electrification Rates**




Source: EVN

1.21 The GOV aimed to address the daunting financing challenges of its long-term electrification program through multiple means, including by (i) raising and restructuring electricity tariffs to increase internally generated funds; (ii) promoting energy efficiency; (iii) increasing private investment in power generation and developing natural gas; (iv) equitization (partial privatization of state-owned enterprises) of distribution companies; and (v) meeting the funding gap using donor-financed programs, particularly for rural electrification and reconstruction of the T&D infrastructure.

**Reforming the Institutional and Regulatory Framework of the Power Sector**

1.22 Until the mid-1990s, Vietnam's state-owned, heavily centralized and vertically integrated power sector suffered from a number of institutional and regulatory shortcomings: (i) there was no effective legal and regulatory framework; (ii) the government's oversight and regulatory functions were not separated from the non-commercially oriented operation of the entire sector as a vertically integrated monopoly; and (iii) power tariffs were set administratively by the GOV well below costs.

1.23 In the wake of the *Doi Moi* reforms, in the mid-1990s, the GOV initiated a new power sector strategy. Key elements of the strategy included (i) establishment of EVN as a national holding, comprising a general corporation and five distribution PCs, and putting the latter directly in charge of managing rural networks; (ii) commercialization of the sector enterprises; (iii) setting up of a legal and regulatory framework; (iv) gradually moving toward cost reflectivity of electricity prices and introducing cost-based bulk transfer price for power sales to the PCs; and (v) introduction of private sector participation.

1.24 In 2005, the Electricity Law went into effect, the first law to comprehensively govern Vietnam's power sector. The law's primary objective is to develop a national power market following a long-term and gradual approach based on the principles of transparency and competition that achieves economic efficiency and attracts public and

private investments. State monopoly in the sector is to be limited to power transmission, national load dispatch and strategically important large power plants, leaving power distribution and non-strategic power generation to potential private investors. Pursuant to the law, the Electricity Regulatory Authority of Vietnam (ERAV) was established, the first electricity regulator in the country. Since then, the GOV has been implementing reform which aims at (i) ultimately unbundling EVN; (ii) establishing competition in generation; (iii) reforming the transmission and retail tariff setting mechanisms on market-based principles; (iv) gradually adjusting electricity tariffs towards cost recovery levels to ensure the financial viability of efficiently operated companies and to attract private investors; and (v) protecting the poor families through social tariffs and cash relief.

1.25 In 2006, the GOV approved a road map for establishing a competitive power market under a phased approach. The first phase comprises the establishment of a competitive generation market. In this phase, a Single Buyer (currently an EVN affiliate) purchases electricity from the participating generators and sell it to the distribution companies and large consumers at regulated prices. The next phase will entail a competitive wholesale market where sellers and buyers will competitively transact in a power pool. The final stage is a competitive retail market, where retail consumers will be allowed to choose their suppliers.

1.26 Most recent achievements under the GOV's reform program include the following: (i) since 2010, average electricity tariffs have increased significantly, but even so they do not reflect all cost items, such as foreign exchange losses and financing costs;[11] (ii) establishment of the National Power Transmission Company (NPT) as an autonomous EVN subsidiary; (iii) establishment of five regional PCs as independent subsidiaries of EVN; (iv) creation of generation companies with accounting, management and functional separation from EVN; and (v) the commercial launch of the Vietnam Competitive Generation Market as a bid-based pool including bilateral contracts and a spot market.

1.27 Despite these positive developments, financial sustainability of the power sector continues to remain a major concern. Underpriced electricity lies at the heart of the power sector's financial difficulties. In 2012, retail electricity tariffs stood more than 40% below estimated productions costs[12] - an implicit electricity subsidy equivalent to 2.4% of GDP. In particular, EVN Holding has faced serious financial challenges given

[11] In August 2013, the average approved retail tariff was 7.6 US cent/kWh equivalent compared to 4.7 US cent/kWh in March 2009. The tariff structure is still highly distorted, with both urban and residential rates being cross-subsidized by higher rates for industry, commerce and foreign consumers. Electricity prices are implicitly subsidized through the provision of underpriced coal for the power generators (using revenues of coal exports and other coal sales by Vinacomin, the national coal company). Therefore, transition to market-based pricing would greatly reduce the scope for cross-subsidies to the power sector. This transition is all the more urgent because the GOV expects the country to move from a net coal exporter to net importer as early as 2015. This implies that the coal and power sectors face a massive cost shock if coal imports increase owing to the exposure of international coal prices.

[12] *Energy Economist*, November 2012, p. 18. An in-depth diagnostic report (AF-Mercados EMI, "Strategic Options for Enhanced Financial Performance of EVN," October 2013) prepared for the World Bank and EVN includes an estimate of US cent 9.5/kWh for the Long Run Marginal Cost of retail electricity.

that the underlying disparity between the company's costs and prices remains rather substantial. During 2008-2011, the company posted growing financial losses. For example, in 2011, the after-tax losses amounted to 13% of the company's net sales revenue.[13] EVN Holding has accumulated large debts with the coal and natural gas suppliers. Furthermore, EVN's subsidiary PCs have also displayed generally weak financial performance in recent years. For example, SPC (southern region) posted financial losses in three of the past six years (2008-2013).[14] Due to overall poor financial performance, in recent years EVN Holding, NPC and the PCs have been frequently in breach of the financial covenants applied under ongoing World Bank and Asian Development Bank loans.

1.28 The financially weak and unviable Local Distribution Utilities servicing rural areas are being transferred to the PCs to ensure rehabilitation and upgrade of the local distribution systems.[15] As a result, a significant consolidation of the rural electricity distribution and retail business has taken place in recent years.

1.29 Increased private sector participation in power generation has been a GOV objective since the mid-1990s. As part of this process, in 2007 an "equitization plan" was approved for partial privatization of most of EVN's operating units in generation and distribution, with EVN keeping more than 50% of the share capital. However, the equitization program has not been carried out, with only an insignificant amount of EVN assets privatized to date.

1.30 EVN is the dominant generator. In 2011, non-EVN state-owned enterprises accounted for about a fifth of power generation. The share of foreign investor build-own-transfer power plants was about 5% under US$-pegged power purchase agreements. Under these power purchase agreements, EVN is forced to buy any amount generated at the exchange-rate adjusted price.

1.31 With is limited market share, Vietnam's build-own-transfer sector has not kept up with the country's soaring electricity consumption. To date, a number of foreign investors have shown interest in developing build-own-transfer projects in Vietnam, yet few projects have been realized due to obstacles including legal and regulatory issues, low electricity purchase prices by EVN, the lack of a truly competitive market and inadequate coordination among related GOV agencies. If the GOV wishes to attract international lenders to finance a new wave of build-own-transfer projects, it has little choice but to offer a robust guarantee package, which explicitly supports the obligations of EVN and addresses lender and sponsor concerns surrounding the macroeconomic framework.

---

[13] However, in 2012, EVN recorded a net profit due mostly to favorable hydrological conditions and the resulting increase in low-cost hydropower in the generation mix.

[14] Data provided to the IEG mission by the company in a written questionnaire.

[15] At present, PCs sell generated electricity to the Local Distribution Utilities at the SS level at a wholesale price set by the GOV. From the SS level, Local Distribution Utilities distribute electricity at the retail level also at a GOV-set price.

**World Bank Contribution to Vietnam's Transmission and Distribution Modernization, Rural Electrification and Power Sector Reform**

1.32 With the lifting of the trade embargo in 1994, the World Bank began providing support to the GOV's various economic development programs. Since the mid-1990s, the Bank has financed a long series of power projects focusing on T&D system expansion and modernization, rural electrification as well as sector reforms (see the full list of projects in Annex B). Total value of World Bank credit and loan commitments between 1995 and 2014 is rather high at nearly US$3.9 billion (including the proposed DPO3 and the Transmission Efficiency Project – both under advanced preparation). The Bank has been in a unique position to assist Vietnam with projects in these areas that have mutually reinforcing objectives. The vigorous growth of rural electrification and the resulting dramatic increase in electricity consumption have made reinforcement of the national and regional T&D networks a top priority. T&D is crucial to ensure that key sector reforms, such as the competitive national power market, have a good chance of success.

1.33 The World Bank shared the GOV's view that the electricity sector was a key driver of economic growth and poverty reduction. In Country Partnership Strategies during the assessment period, support for electrification, improvement of the efficiency/quality of the electricity infrastructure and the advancement of sector reforms were pivotal development objectives. Most recently, with the 2000 launch of the a programmatic DPO series, the Bank supports the GOV in the design and implementation of a competitive market for electricity generation, restructuring of the power sector, and reform of the tariff system to facilitate competition, timely investments in generation, improved power system efficiency and more efficient use of electricity.

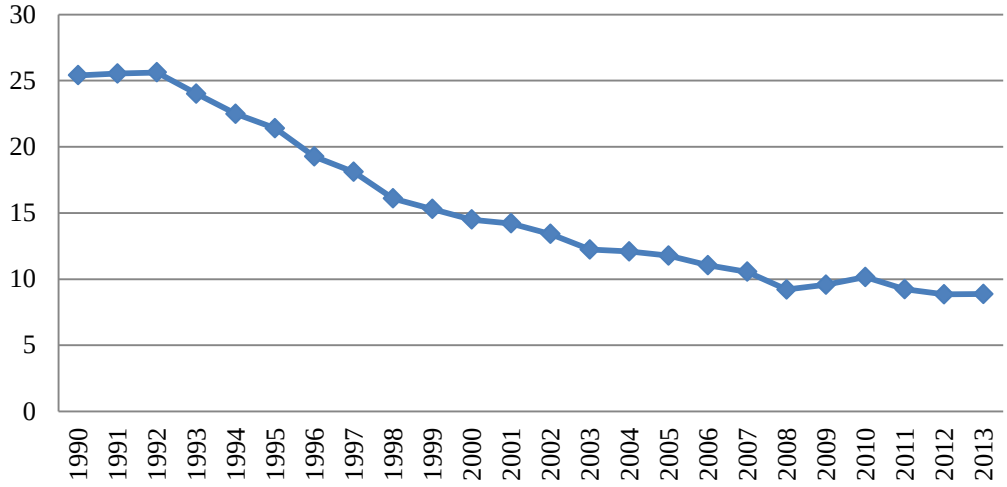
1.34 From the outset, the fundamental principle underlying the partnership of the GOV and the World Bank in the power sector was support to the GOV's key objectives as part of a programmatic approach. For example, at the outset of cooperation in the rural energy sector, four major projects were planned to assist the implementation of Vietnam's ambitious rural electrification program. The GOV, EVN and the Bank worked together in formulating a series of projects for the realization of the GOV's electrification priorities and identifying solutions to the problems including financing. The cooperation began with addressing the most urgent issues (rapid delivery of simple first connections to households) while preparing for the subsequent and more difficult interventions (improving reliability and quality of electricity supply). A similar program-driven approach was adopted for the T&D sector and sector reforms, particularly under the DPOs.

1.35 The rapidly changing sector environment—due to strong economic growth, surging electricity demand and sector reforms—required the adoption of a de facto flexible programmatic approach in the implementation of specific projects to adjust to changing priorities and new physical and institutional developments through project restructurings and explicitly shifting to a programmatic approach to ensure that the projects meet the development objectives. For example, under the SEIER Project, a programmatic approach was successfully adopted at the 2005 restructuring to allow flexibility to invest in priority subprojects which constantly changed during the implementation period of a rapidly expanding sector.

1.36 All three projects assessed here share common issues and complementarity relating to sector policy, regulation, institutional development and reinforcement of critical power sector infrastructure. The implementation periods of the three operations overlapped for the most part during the assessment period of 1998-2012.

1.37 With the lifting of the trade embargo in 1994, the GOV first sought the Bank's support to rehabilitate and expand the T&D sector, which was in technically highly unsatisfactory condition to support a rapidly growing population and economy. Given the T&D sector's central importance in advancing rural electrification, power market development and easing widespread power shortages, most of the Bank-supported power projects in the 1990s and 2010s included a T&D component to assist the (i) timely evacuation of power from new generation plants to load centers; (ii) improvement of power system security (especially the critical HV transmission system) and service quality; and (iii) transition to an organized national electricity market. Altogether, these operations accounted for about 51,900 km of constructed or rehabilitated T&D lines – the largest Bank-supported T&D program in the client countries in the FY2000-FY2013 period. As a key achievement, the excessively high T&D network losses were drastically reduced to 8.9% in 2013, which now stands reasonably close to a sustainable level (see Figure 4).

**Figure 4. Transmission and Distribution Losses (%)**




*Note:* In percentage of total domestic generation plus net imports. About one-fourth of the combined losses are incurred in the HV transmission network and the balance in the LV distribution system.
*Source:* Based on EVN data.

1.38 There were several dedicated T&D projects (see Table 3) totaling nearly US$1.5 billion in World Bank credit/loan commitments, including the TDDR Project (approved in 1998) assessed in this report. During its implementation, this operation was followed up by a Second T&D Project (2005) and the Additional Financing (AF) for the Second T&D Project (2011). In 2012, the Distribution Efficiency Project was approved and the Transmission Efficiency Project is under advanced preparation and planned for FY2015 approval.

**Table 3: Dedicated World Bank Projects Supporting the T&D Sector**

| Project | Fiscal Year | Development Objectives | Credit/ Loan (US$ million) | Project Cost (US$ million) |
|---|---|---|---|---|
| Transmission, Distribution and Disaster Reconstruction (P045628) | 1998 | Strengthen the high voltage transmission network to facilitate evacuation of power from generating stations to load centers and rehabilitate distribution systems. | 149.57 | 248.46 |
| System Efficiency Improvement, Equitization and Renewables (P066396) | | Enhance electricity system efficiency, provide electricity to selected rural areas and support sector reform. | 299.70 | 419.50 |
| Second T&D Project (P084871) | 2006 | Improve the efficiency and reliability of the T&D system. | 200.00 | 200.00 |
| Second T&D Project: Additional Financing (P114875) | 2011 | Improve the efficiency and reliability of the T&D system. | 180.00 | 180.00 |
| Distribution Efficiency Project (P125996) | 2013 | Improve the quality and reliability electricity services and reduce greenhouse gas emissions through demand-side response and efficiency gains. | 448.9 | 800.00 |
| Transmission Efficiency Project (P131558) | 2014 (under preparation) | Increase the capacity of the electricity transmission grid, improve the efficiency and reliability of electricity services and strengthen the institutional capacity of the NPT. | 500.00 | 700.00 |
| **Total** | | | **1,778.17** | **2,547.96** |

1.39 In the following stage, the GOV requested Word Bank support for one of the highest national priorities – rapid nationwide rural electrification. By the time the Bank got involved in this sector in 2000 with a dedicated operation (REP, assessed in this report), rural electrification in Vietnam was already well into the "cruising" stage, benefiting from the GOV's policy decisions in the preceding periods, which resulted in (i) an increase in rural income under the Doi Moi reforms; (ii) rehabilitation and construction of several large power plants across the country; (iii) the building up MV networks; and (iv) the construction of the North/South 500 kV transmission line. The foundations laid by these important developments enabled rapid progress in rural electrification in the subsequent periods.

1.40 Under the Banks's first dedicated lending operation for rural electrification, the REP, the GOV sought support to cover the financing gap for rural electrification and pilot institutional arrangements, including decentralization of the rural electrification program and building local capacity. This operation was followed by three IDA credits totaling US$720 million. The IDA credits covered 72% of the total cost of the projects. Table 4 presents a summary of the World Bank projects dedicated to rural electrification. Over time, there has been a gradual shift in alignment with the changing focus of the country's

electrification program, from increasing access through grid extension to improving T&D system efficiency and reliability through rehabilitating and upgrading the existing systems. The Bank has been the main donor supporting Vietnam's rural electrification effort. Other donors included Japan, Sweden, OPEC and, more recently, the Asian Development Bank. In recent years, donor coordination has become substantive and more organized, with the World Bank in the lead particularly on the reform side. The IEG mission has received positive feedback on coordination from the Hanoi country office of Asian Development Bank, the second largest power sector donor to Vietnam.

**Table 4: Dedicated World Bank Projects Supporting Rural Electrification**

| **Project** | **Fiscal Year** | **Development Objectives** | **IDA Credit (US$ million)** | **Project Cost (US$ million)** |
|---|---|---|---|---|
| Rural Energy Project (P056452) | 2000 | Expand rural access to electricity, define and establish institutional mechanisms for rural electrification and promote renewable energy sources. | 150.00 | 201.30 |
| Second REP (P074688) | 2004 | Improve access to good-quality, affordable electricity services to rural communities in an efficient and sustainable manner. | 220.00 | 341.00 |
| Second REP: Additional Financing (P113495) | 2009 | Improve access to good-quality, affordable electricity services to rural communities in an efficient and sustainable manner. | 200.00 | 250.60 |
| Rural Distribution Project (P099211) | 2009 | Improve the reliability and quality of MV service to targeted retail electricity distribution systems. | 150.00 | 207.20 |
| **Total** | | | **720.00** | **1,000.10** |

Source: WB Business Warehouse

1.41 From 2000 onwards, the GOV has increasingly sought Bank support for a multi-phased transition to an organized national electricity market. During this period, practically all Bank-supported power sector operations, including the TDDR and SEIER projects, have carried a substantial reform agenda. These operations and continuous policy dialogue with the GOV have set the stage for the subsequent higher level programmatic Bank engagement under the ongoing DPOs to support the GOV in the design and implementation of a competitive electricity market, further sector restructuring and tariff reform.

# 2. Transmission, Distribution and Disaster Reconstruction Project

## Objectives, Design, and their Relevance

### OBJECTIVES

2.1 The project development objectives (PDOs) of the TDDR Project were to: (i) strengthen Vietnam's HV transmission network to facilitate evacuation of power from generating stations to the load centers; (ii) rehabilitate distribution systems to meet demand, reduce losses and improve reliability; (iii) support power sector reform and restructuring through separation of transmission and generation functions, implementation of regulatory and tariff reforms; (iv) support institutional strengthening and commercialization through securing greater autonomy for the distribution companies and introducing planning capabilities for DSM; and (v) help normalize economic activity in the Typhoon Linda-affected areas through the reconstruction of the electricity distribution network. The Development Credit Agreement is the source of the PDOs and the basis for the assessment.

### RELEVANCE OF OBJECTIVES

2.2 ***Relevance of the PDOs is rated High***. The project context at appraisal was characterized by grossly inadequate and inefficient T&D infrastructure, systemic impediments to commercial operation of EVN, large needs for investments and inadequate sector regulation. Reinforcement of a series of transmission lines and substations was crucially required to serve as feeders for the rural distribution system to be greatly expanded under the GOV's Rural Electrification Master Plan (2000-2010) completed in 1999 with technical support from the World Bank under the Power Development Project (1996-1999). The Bank's 1995 Country Assistance Strategy and 1996 Progress Report emphasized support for infrastructure development, including financing of power T&D infrastructure expansion and development. Against this background, the relevance of the project's investment and reform PDOs was high at the time of project closing (2007) and has continued to remain so to the present. AF was approved for the project in FY2005 to scale up the transmission expansion and reinforcement subcomponent. With Vietnam's continued rapid economic growth and the virtually universal household access to electricity, the need for a reliable and resilient power infrastructure has remained very strong. Even after project closure, electricity consumption has continued to grow at a double-digit rate. As a result, the T&D system, while expanded and partially modernized, has remained vulnerable and overloaded, especially during periods of peak demand. In addition to the tight generation capacity margin, persistent bottlenecks in the T&D network have been the main cause of the power blackouts and brownouts experienced up to the present.

2.3 Since project closure, significant expansion and upgrade in the T&D segment of the power infrastructure has remained a GOV priority. Under the Power Sector Master Plan for 2011-2020, about one-third (US$1.6 billion per year) of total power sector investments is planned for T&D expansion and reinforcement. Considering that the

expansion and modernization of the power infrastructure in a rapidly growing economy is a long-term process, the Bank's current (FY2012-2016) Country Partnership Strategy priorities in the power sector emphasize support for improved quality of basic infrastructure services, including electricity. Most of the Bank's follow-on power projects in Vietnam (see Annex B) included a T&D development component. Relevant operations currently under implementation include the Second T&D Project and the Distribution Efficiency Project. In addition, a large Transmission Efficiency Project is under advanced preparation (approval planned for FY2015).

2.4 Relevance of the reform-related PDOs pursued under the project has also remained high. Sector reform is still being actively pursued by the GOV in a phased manner and driven by a long-term vision for the establishment of an efficient and competitive national power sector. Also, partly because of the delayed implementation of the reform and institutional PDOs included in this operation, most of the subsequent Bank-supported power projects have carried a substantial reform and institutional development agenda, most prominently the ongoing DPOs, including DPO3 under preparation (approval planned for FY2014).

**DESIGN**

2.5 The project comprised the following components:

- **Component 1: Transmission and Distribution** (estimated cost at appraisal: US$415.49 million; actual cost at completion: US$259.04 million). It had six subcomponents: (i) construction of the second circuit of the Pleiku-Phu Lam 500 kV transmission line and associated substations to strengthen and expand the transfer capacity of the North-South interconnector; (ii) construction of the Ha Tinh 110/220/500 kV substation; (iii) construction of the 220 kV Nha Be to Tao Dan circuit and 110/220 kV gas-insulated switchgear Tao Dan substation in Ho Chi Minh City; (iv) rehabilitation of distribution networks in the cities of Halong, Vinh and Vung Tau; (v) consultant services for the Pleiku–Phu Lam 500 kV line and the 220 kV Nha Be to Tao Dan circuit and substation; and (vi) TA for improving the regulatory framework and the DSM program. An associated TA component, financed by Japan, initiated the work on sector reform and restructuring, and carried out studies to improve the T&D functions. This component supported the PDOs by strengthening the HV transmission network, rehabilitating distribution systems, advancing sector reform, restructuring, commercialization and institutional development.

- **Component 2: Disaster Reconstruction Component** (estimated cost at appraisal: US$10.94 million; actual cost at completion: US$8.73 million). This component consisted of the reconstruction of 180 km of LV and 160 km of MV distribution lines as well as 320 distribution substations with an aggregate capacity of 25 MVA. The component supported the PDO of normalizing activity in the Typhoon Linda-affected area.

2.6 The project beneficiaries were the Ministry of Industry, EVN and its subsidiary regional Power Companies (PCs), specifically PC1 and PC2, which were responsible for

electricity distribution in the northern and southern parts of the country (including Ho Chi Minh City), respectively.

2.7 The project was restructured in May 2005. The PDOs were not changed but outcome targets were modified to allow the financing of urgent investments in priority EVN subprojects, using the substantial project cost savings that had accumulated between 2000 and 2005.

### RELEVANCE OF DESIGN

2.8 ***Relevance of the project design is rated Substantial.*** The inputs provided through the project components can be grouped into physical interventions for constructing and rehabilitating the T&D network, and technical assistance for improving the regulatory framework and the DSM program. These inputs and corresponding outputs were expected to serve multiple objectives that were geared to improved technical performance, institutional restructuring, regulatory and tariff reforms, and for normalizing economic activity in the typhoon-affected areas. The strongest link is to be seen between the physical interventions and the corresponding intermediate outcomes in the form of restored connectivity and reduced system losses. The combination of technical assistance activities was logically connected to improved institutional and financial outcomes. However, these linkages were not as well represented in the system level indicators as discussed in the section of monitoring & evaluation. Normalization of economic activity can be seen as the overall outcome resulting from all these outputs and intermediate outcomes.

## Implementation

### PLANNED VS. ACTUAL COSTS

2.9 The total project cost at appraisal was estimated at US$427.13 million equivalent, of which the IDA credit amounted to US$199 million equivalent. The actual project cost was US$268.46 million equivalent (63% of the appraisal estimate), of which the IDA credit was US$149.57 million equivalent (76% of original amount). These figures include US$700,000 of project preparation TA provided by the Government of Japan for work on sector reforms and a study on T&D functions. The Borrower's contribution was estimated at US$45.60 million at appraisal, while the actual figure was higher at US$107.56 million.

2.10 **Cost savings**. There was a significant depreciation of the US$ against the SDR (in which the credit was denominated) in the latter stages of the project. After the May 2005 restructuring, EVN and the PCs were unable to identify sufficient subprojects to use the balance of the credit amount. Further savings were incurred on the subprojects that were actually implemented, thus resulting in successive cancellations of SDR 27 million (US$40 million equivalent) and SDR 11.4 million (US$17 million equivalent).

## IMPLEMENTATION EXPERIENCE

2.11 The project was approved on January 20, 1998 and became effective more than a year later on February 12, 1999. The project closed after five extensions on June 30, 2007, five years later than the original closing date.

2.12 Two main shortcomings hampered effective implementation. First, project preparation was not well advanced upon credit approval, thus requiring first the hiring of consultants to complete the preparation of the major investment components before they could be implemented. This partly explains the eventual need for five extensions of the closing date. Second, the Bank's performance on the tariff issue, in addition to being questionable, was a delaying factor from the outset. The risks of adopting a tariff covenant were poorly assessed, as noted above.

2.13 A mid-term review was carried out in December 2000. By that time, the project experienced serious delays. The credit's Closing Date was extended multiple times: the first two ones were to allow the completion of portions of Component 1, which had experienced slow implementation; the third extension was to allow completion of project restructuring; the fourth one was given at the May 2005 restructuring to allow implementation of the new subprojects; and the fifth one was to permit completion of contracts that were delayed or had to be rebid.

2.14 **Safeguards**. The project was classified as Environmental Category B for Environmental Assessments. An Environmental Management Plan and Resettlement Plan (RP) were required to be prepared. Implementing agencies were required to engage independent consultants for implementation monitoring. With the exception of the major North/South 500 kV transmission line (Pleiku-Phu Lam) for which an Environmental Assessment/ Environmental Management Plan was carried out, it was not clear what level of Environmental Assessment was carried out for the remaining subprojects, according to the project ICR. The ICR cites evidence that the subprojects that were appraised after the restructuring in May 2005 followed agreed guidelines for the Environmental Assessment. Ethnic Minority Development Plans were prepared for the three subprojects and were implemented satisfactorily. The ICR and IEG/PPAR mission discussions suggest that resettlement was on the whole well implemented by the responsible implementing agencies. No grievances or complaints were brought to the attention of the Bank staff during implementation supervision, which included site visits, or during the IEG mission. Independent monitoring of the RPs revealed no major issues. **Procurement**. At project start-up, a dedicated management group comprised of Ministry of Industry and EVN officials supported the executing agencies of EVN and the PCs, which were not fully familiar with complex procurement processes. Procurement was slow overall, since large packages in particular required multiple levels of approval all the way up to the Prime Minister. While there were four complaints (two dropped, one invalidated and one resulting in rebidding), no instances of procurement irregularities were reported.

2.15 **Financial Management**. While generally satisfactory, there were two recurrent issues: (i) late submission of financial management reports and audit reports; and (ii) slow processing of disbursement requests within the GOV and delayed payments, which

in some cases had a noticeable effect on the financial performance of the PCs which for the most part had to pay their suppliers before the GOV review of the disbursement request was complete. Financial reporting improved toward the end of the project. The project team reports that audits were satisfactory throughout and were generally unqualified.

## Achievement of the Objectives

2.16 **PDO 1: Strengthening of high voltage transmission network. Rated Substantial.** Practically all of the numerous physical output targets (T&D construction, substation upgrades and meter installation) were achieved or overachieved as a result of the 20 subprojects added to the project scope at the May 2005 restructuring.

2.17 In terms of key outcomes, the 500 kV transmission component strengthened the HV transmission network by enabling the evacuation of considerable incremental power from the generation stations, thus alleviating the power deficit in the south.[16] The central-south power flows upon project completion were in the targeted range (1,300–1,400 MW), which subsequently have been increased to reach 2,200 MW at present, and 2,700 MW by end-2014 with the completion of Pleiku-Mi Fuoc-Can Bong transmission line under construction.[17] In terms of reliability and efficiency of transmission, there were considerable gains: both fault frequency and grid losses in the 500 kV transmission system was lower than the revised targets and were much lower than the appraisal targets. While exact attribution of these system-level benefits to a specific project is not possible in such a dynamically changing large system, it is plausible that the subject operation made a contribution given its size and the nature of the interventions directly targeting key bottlenecks in the transmission system.

2.18 Overall, given the size and rapid growth of Vietnam's transmission system, the development impact of this component was necessarily limited. Therefore, during project implementation another Bank-supported operation (Second T&D Project) was approved to sustain and strengthen the gains obtained under the TDDR project and to further expand the transmission infrastructure in response to continued vigorous growth in demand for electricity. However, the overall reliability landscape has remained mixed. While the frequency of interruptions has followed a declining trajectory to the present, the duration of interruptions, as shown in Table 2, has displayed a deteriorating tendency in recent years due to the reasons noted (see paragraph 1.11) and continues to be rather high in international comparison.

[16] The IEG mission visited the 500 kV Phu Lam SS in Ho Chi Minh City to which the Bank-financed 550 km 500 kV transmission line (Pleiku-Phu Lam) was connected in 2004 under the TDDR Project. This second circuit of the North-South interconnector doubled the transfer capacity and improved stability. The mission found the SS in good operating condition, with advanced primary and secondary equipment installed, including SCADA/ Energy Management System. More recently, a third circuit was added to further expand the transfer capacity in the face of rapidly growing power consumption in the southern regions.

[17] Information provided to the IEG mission by NPT.

2.19 **PDO 2: Rehabilitation and expansion of distribution systems to meet demand reduce losses and improve reliability. Rated Substantial.** The key output targets (distribution lines, substations, meter installation) were substantially achieved or overachieved because of the additional subprojects under the 2005 restructuring. In terms of outcomes, significant improvements in overall distribution reliability and efficiency, well over targeted values, were observed upon project closure. System-wide losses were reduced from 21.4% in 1995 to 11.8% in 2005. While the frequency of supply interruption also decreased substantially, the average duration (in minutes) of the interruptions increased markedly over the targeted levels, showing continued weaknesses in a distribution system experiencing frequent network overload amid rapidly growing demand for electricity. [18,19] However, the above-mentioned project-specific attribution problem applies here too. Only anecdotal evidence is available that there has been some improvement in the quality of supply as a result of the project.

2.20 The post-project sustainability of the reliability gains – in terms of interruption frequency and in particular interruption duration – has remained tenuous. In fact, as discussed above (paragraph 1.9), recently distribution reliability has worsened in major regions (e.g., NPC and CPC) under the impact of relentlessly rapid load growth and other factors.

2.21 **PDO 3: Support for power sector reforms. Rated Modest.** In 2005, the Electricity Law went into effect, setting the stage for significant restructuring measures. The law's primary objective was to develop a competitive power market following a gradual approach. The law also states that the state monopoly in the sector should be limited to power transmission, national load dispatch and strategically important large power plants.

2.22 Pursuant to the Law, the restructuring process was initiated with the establishment of EVN as a holding company in 2006. EVN was reorganized into financially independent subsidiaries that include seven power companies, including five regional distribution companies. In 2008, EVN set up the NPT as a separate autonomous legal entity responsible for the operation of the transmission network. The financially autonomous generation companies started commercial operation in January 2013. The GOV's gradual approach to full competition envisages the removal of cross-ownership after 2015 among market players participating in the different segments of the electricity supply chain.

2.23 A sector regulator (ERAV) was created in 2005, which, however, even today lacks meaningful autonomy in performing the required regulatory functions, including tariff setting. Therefore, subsequent Bank operations have provided continuous

[18] The IEG mission visited the 110/220 kV Tao Dan SS in Ho Chi Minh City where a gas-insulated switchgear was installed in 2004 under the TDDR Project. The mission found the SS in well-maintained, good operating condition. Since project closure, SS capacity was substantially increased to accommodate rapid demand growth and prevent overloading.

[19] In view of the persistent serious power supply quality problems, the Bank has supported with considerable financing (US$448.9 million) a dedicated Distribution Efficiency Project aimed at further substantial improvements in reliability and efficiency of the PCs. The project is under implementation.

regulatory support, including under the DPOs. After meeting with senior ERAV staff in Hanoi, the IEG mission is not convinced that, at this juncture, ERAV has the full capacity for high quality tariff and quality-of-service regulation. Currently, the agency is engaged in non-regulatory type activities, such as administration of the Vietnam Competitive Generation Market, which distracts it from the core regulatory tasks such as quality-of-service regulation, monitoring and enforcement.

2.24 During project implementation, retail tariffs were increased by 25% in national currency terms, about the same amount as originally envisaged in US dollar terms. In the post-project period, electricity tariffs have remained tightly controlled by the GOV and while in local currency terms they have been raised repeatedly in recent years, slightly above the rate of inflation, the average retail tariff continues to be substantially lower than the real cost of supply, hence end-users (other than those in the commercial sector) are effectively subsidized even today. As a result, EVN is, in some respects, in a more difficult financial situation today than any time during the course of the project, which impedes its ability to invest sufficiently to meet the rapid growth in demand for electricity. In US dollar terms, the average retail tariff reached the targeted level (7 US cent/kWh) only in 2012 (see Table 5). Furthermore, the tariff structure has remained highly distorted by cross-subsidies. For example, commercial users pay almost 80% more for electricity than residential and industrial users, which is not justified on a cost-of-supply basis. Clearly, the tariff issue has remained a *de facto* permanent policy issue to address under subsequent Bank operations, including the DPOs. For example, the DPO3 under preparation includes substantial electricity tariff reform aimed to establish a framework for periodic and transparent setting and adjustment of retail tariffs, and the phase-out of cross-subsidy between different consumer tariff categories. However, based on the Prime Minister's recent tariff decision,[20] even in 2015 the average retail tariff should not exceed US cent 8.7 per kWh equivalent, implying that in the next two years tariff adjustments would essentially follow the inflation, with no step increase in real terms.

**Table 5: Average Electricity Retail Tariffs (as approved)**

| **Date Approved** | **March 2009** | **March 2010** | **March 2011** | **Dec. 2011** | **June 2012** | **Dec. 2012** | **August 2013** | **2015 (plan)** |
|---|---|---|---|---|---|---|---|---|
| VND/kWh | 948.5 | 1,058 | 1,242 | 1,304 | 1,369 | 1,467 | 1,509 | 1,437-1,835 |
| US cent/kWh | 4.7 | 5.3 | 6.2 | 6.5 | 6.8 | 7.3 | 7.6 | 6.8-8.7 |
| Increase (%) | - | 11.5% | 17.4% | 5.0% | 5.0% | 5.0% | 5.0% | 14.5% |

*Note:* The 2015 tariff bracket was approved by the Prime Minister on November 11, 2013. In 2015, the average retail tariff should not exceed VND 1,835/kWh (or 8.4 US cent/kWh at the current exchange rate). The 14.5% increase is the 2015 approved ceiling tariff over the actual tariff of August 2013.

2.25 **PDO 4: Support for institutional strengthening and commercialization. Rated Modest.** This PDO was specifically aimed at the PCs, which have become commercially and managerially more independent over the life of the project. Their

[20] No. 2165/QD-TTg dated November 11, 2013.

accounting systems have also continuously improved. With respect to the DSM activities, a DSM cell was established within EVN with five full-time staff and DSM working groups were created within each PC. A DSM policy framework and an initial DSM program was carried out by EVN, including 30 energy audits, five pilot lighting programs and a pilot load research program and a pilot time-of-use metering program. After project closure, these energy efficiency pilot efforts have been pursued under other power projects and the DPOs. Altogether, based also on the IEG mission's discussions with the PCs and GOV officials, DSM activities to date have largely remained stuck either in a permanent pilot mode (e.g., dissemination of Compact Fluorescent Lamps, energy-efficient public lighting) or in a partially rolled-out mode (time-of-use metering), with relatively limited impact on the overall efficiency of electricity use.[21] For example, the mission found that time-of-use meters are applied only to large consumers (>2,000 kWh per month) despite demand responsiveness, reported savings in electricity use, and some shift of electricity use from on-peak to off-peak hours.

2.26 **PDO 5**: **Normalization of economic activity following Typhoon Linda. Rated Substantial.** This component was completed under difficult circumstances and in reasonable time. No indicators are provided in the project documents to assess the scale of economic activity at the time of Typhoon Linda in 1997 and after project completion. However, the outputs indicate one-for-one replacement of LV and MV systems and equipment. From this it can be reasonably surmised that households as well as businesses and other activities had access to at least a similar standard of service as was available before the typhoon, allowing economic activity to return to prior levels. For some perspective, overall growth GDP Growth Rate in Vietnam averaged 6.19 Percent from 2000 until 2013, reaching an all-time high of 8.46 Percent in the fourth quarter of 2007 and a record low of 3.14 Percent in the first quarter of 2009.[22]

## Efficiency

2.27 ***The efficiency of the project in meeting its objectives is rated Modest.*** The economic analysis at appraisal and completion was carried out using standard methodology used in similar power projects. The analysis covered all sub-projects, accounting for 88 percent of the final project costs, the main items excluded being consultant services and technical assistance. Yhe same methodology was followed at appraisal and completion. The project's economic benefits at closing were higher than the appraisal estimate. At completion, the Economic Internal Rate of Return was estimated for the original scope of components at 38.9% vs. 27.2% at appraisal. The difference is due largely to substantial cost savings (about 30%). Clearly, at appraisal, the costs of the original subprojects were overestimated. The Economic Internal Rate of Return for the additional subprojects is also satisfactory at 20.5%. Finally, with the economic benefits of the disaster reconstruction component included, the overall Economic Internal Rate of Return for the project was 27%. At 20.1%, the overall Financial Internal Rate of Return is higher than the appraisal estimate of 13.3%. However, the project experienced five

[21] For example, CPC (central region) claims in its report provided to the IEG mission that in 2012 it saved 112.4 million kWh or 1.09% of total electricity sales. Considering this modest, the company plans to increase the savings by 50% in coming years. (EVN CPC, "Corporate Profile 2011-2024," p. 39.)

[22] General Statistics; Government of Vietnam

extensions resulting in a time overrun of five years, doubling the implementation period estimated at appraisal. A significant portion of this delay can be attributed to procedural requirements for procurement and disbursement required by GOV as discussed under "Implementation Experience" above.

## Ratings

### OUTCOME

2.28 ***Overall project outcome is rated Moderately Satisfactory*** based on the *high* relevance of its objectives, *substantial* relevance of its design, its *substantial* efficacy and *modest* efficiency. On the performance under the five PDOs, achievement has been rated substantial for three (strengthening the transmission network; rehabilitating and expanding distribution systems; normalizing post-disaster economic activity) and modest for two (sector reforms; strengthening and commercializing institutions). The reform agenda supported was broad. In particular, the country's first Electricity Law (2005) set a framework for pursuing gradual reforms over the long term, well beyond project closure. However, while many of the essential steps toward electricity sector reforms were initiated and partially carried out under this operation, the project's overall reform objectives were too ambitious, thus several tasks (most notably, the regulatory and tariff reform) have not been completed until the mid-2000s or even today.

2.29 Expansion and modernization of a large national T&D system like that of Vietnam is a long-term process. This project was only the first important milestone in this process that set the stage for a sustained Bank engagement in the subsector to the present.

### RISK TO DEVELOPMENT OUTCOME

2.30 ***The risk that the achieved development outcomes will not be sustained is rated Significant.*** Since project closure, the GOV has demonstrated strong commitment to carry on with the expansion and modernization of the T&D system in response to continued rapid demand growth and strong consumer pressure for higher quality power supply. The performance efficiency indicators of the T&D sector have continued to improve after project closure (as shown in Figure 4). However, T&D reliability leaves much to be desired because of the recently deteriorating record of network interruptions (interruption duration in particular) as discussed above. Under the GOV's Power Sector Master Plan for 2011-2020, T&D expansion and reinforcement are of high priority. However, EVN Holding is increasingly challenged to raise funds for the planned T&D investments (about US$1.6 billion per year between 2011 and 2020) given the company's deteriorating financial performance. While the GOV has recently substantially increased the electricity tariffs, further real-term increases are required to achieve full cost recovery that would improve EVN Holding's financial capacity and ability to attract private investors to the sector. In large part, these financial concerns and prevailing issues with T&D reliability account for rating the risk "Significant" that the achieved development outcomes will not be maintained.

**BANK PERFORMANCE**

2.31 ***The quality at entry for the project is rated Moderately Unsatisfactory.*** The project was technically reasonably well prepared and far-reaching in its policy and institutional development dialogue, which continues up to the present. However, there were three main shortcomings. First, project preparation was not well advanced upon credit approval, thus requiring first the hiring of consultants to complete the preparation of the major investment components before they could be implemented.[23] This may partly explain the eventual need for five extensions of the credit closing date for a total of five years. Second, given the scale and high complexity of the project (with numerous project sites scattered across the country) and EVN's insufficient experience with Bank operations at the time (late 1990s), the implementation schedule (four years) was significantly underestimated by the Bank's team. (Actual implementation time was more than nine years.) Third, the Bank's performance on the tariff issue showed weaknesses. In the political economy context of the time, a target tariff level as high as 7 US cent/kWh equivalent (based on a long-run marginal cost estimate) was not fully justified. The risks of adopting a tariff-level covenant were not adequately assessed. The Bank had to weigh the options of waiving the tariff covenant or suspending credit disbursement. Eventually, the Bank had to agree to replace the tariff covenant with covenants for EVN to maintain specific financial performance targets. Further, there were some shortcomings in M&E design in terms of tracking project-specific outcomes in contrast to system-wide outcomes and clearer definitions of some indicators as discussed in the section on M&E.

2.32 ***The Bank's quality of supervision during the project is rated Moderately Unsatisfactory*** for the following reasons:

(i) There was a lack of candor in the Bank's reports on the progress of the much drawn-out implementation process.

(ii) Although financial supervision was satisfactory overall, the tariff issue was not resolved: progressive increases were covenanted with EVN, which was unable to act directly without GOV approval. Shortly after the January 1998 Board approval of the project, the GOV changed its mind on the agreed level of 7 US cent/kWh by December 31, 1999, thus causing a delay in the signing of the legal agreements. Further negotiations resulted in delaying the deadline to March 1, 2000, which was reflected in the Credit Agreement, finally signed one year after Board approval. Slippages occurred during project implementation and tariff concerns led to the downgrading of the PDO progress indicator to "Unsatisfactory" on three occasions.

(iii) The Bank was slow in addressing the issue of large cost savings, e.g., the first closing date extension being processed only six months before the original closing date of June

[23] Concerning this issue, feedback from former Bank staff in Vietnam suggests that this was earlier a systemic problem affecting all Bank projects in Vietnam. This feedback suggested that under the then-applicable GOV regulation, IDA credit beneficiaries were not allowed to perform project preparation prior to credit approval. However, based on feedback received from current country staff during the mission, this view was only partially confirmed and several counterparts claimed that EVN was less impacted by this restriction now, given its considerable in-house technical capacity.

2002 with only 13% of the credit disbursed. The latter meant that the Bank missed a much-needed opportunity to conduct a systematic and substantial review of performance years earlier. At credit closing, the tariff issue remained unresolved.

(iv) Bank resources also dropped significantly in the FY immediately following major restructuring of the project to allow financing of EVN subprojects, each of which had to comply with Bank safeguard and fiduciary requirements. There were three TTLs and many changes of team members performing the same specialty.

2.33 Based on the above ratings, ***the overall Bank performance is rated Moderately Unsatisfactory.***

**BORROWER PERFORMANCE**

2.34 ***The Government's performance is rated Moderately Satisfactory.*** The GOV did delegate more investment decisions to EVN and the PCs pursuant to the Electricity Law, initiated the separation of T&D from EVN and engaged in reform dialogue. However, it remained unresponsive to adjusting electricity tariffs to levels agreed with the Bank. While the Bank's target level may have been too steep, the GOV did not follow a transparent process to allow a meaningful dialogue with the Bank regarding the basis on which the tariffs should be set.

2.35 ***The performance of the project's implementing agencies is rated Satisfactory.*** EVN and the PCs showed strong commitment to the project and implemented the components, albeit with considerable delays due to procedural requirements not entirely within their control. Their performance on technical, safeguards and fiduciary aspects was satisfactory overall. Professionalism and the quality of work among their ranks improved during the life of the project. However, their ability to undertake long-term investments to meet high levels of projected power demand and long-term sustainability of their finances depend almost entirely on GOV approval of tariff increases.

2.36 Based on the above considerations, ***the Borrower's overall performance is rated Moderately Satisfactory.***

**MONITORING AND EVALUATION**

2.37 **M&E Design**. The M&E framework contained a wide range of indicators to address the scope of project objectives and baseline values were provided. The indicators for investment components were specific and measurable (e.g. additional transmission lines constructed and new generation capacity connected through them to the existing 500 kV North-South interconnector, number and duration of interruptions in the transmission system, etc.) and could make use of the existing performance monitoring system of EVN and the PCs. However some of the indicators were set for the T&D system as a whole rather than for the project. The indicators for the sector reform were loosely defined ("some" and "substantial" evidence for "development of a functioning internal power market"). There were no indicators for the emergency recovery component. Another design-related shortcoming of the Results Framework was the quantified (and unmet) target for tariff increases as a means of ensuring EVN's adequate financial performance.

Retrospectively, the tariff target should not have been included in the Results Framework but, more importantly, it should not have been specified as a legal covenant.

2.38 **M&E Implementation**. Implementation progress data was gathered quarterly and financial indicators annually. Independent monitoring consultants were hired for monitoring compliance and implementation of environmental and social safeguards. Whereas data quality on investment components was acceptable, data on environmental and social performance was of mixed quality mainly due to lack of field-based monitoring using rigorous techniques.

2.39 **M&E Utilization**. Data from monitoring were used to assess project implementation progress based on agreed timetables, which were adjusted when necessary. However, several key outcome indicators related mostly to improved reliability and efficiency of the T&D system operation (including frequency and duration of network interruptions and grid losses) were generally set and measured at the overall system level, hence it proved difficult to disaggregate specific project impacts from other non-project related factors, including large-scale other investments taking place simultaneously in the sector. This became more problematic as the national power sector grew rapidly in response of soaring electricity demand, which made the system impact of one single project less pronounced, let alone precisely identifiable. Data from monitoring the tariff covenant became a sensitive subject of discussion between the GOV and the Bank, without reaching a satisfactory agreement.[24] In consequence, the tariff covenant was replaced by financial ratio covenants[25] for EVN. Subsequent Bank operations in the sector in Vietnam have learnt from this project design experience and have avoided specific tariff-level covenants.

2.40 Overall, ***M&E is rated Modest***.

[24] Reflecting tariff-adjustment concerns, during implementation, the PDO progress indicator was downgraded to “unsatisfactory” on several occasions.

[25] Self-financing, debt-service, and debt-equity ratios.

# 3. Rural Energy Project

## Objectives, Design, and their Relevance

### OBJECTIVES

3.1 The PDOs as stated in the Development Credit Agreement were to: (i) expand rural access to electricity to 671 communes in 32 provinces of Vietnam through grid extension, where economically justified, to improve welfare, enhance income-earning capacity and alleviate poverty; (ii) develop appropriate institutional mechanisms for rural electrification to facilitate a sustainable program of rural electrification and long-term viability of the power sector; (iii) continued implementation of power sector reforms; and (iv) promote local renewable energy sources in areas inaccessible to the national grid.

### RELEVANCE OF OBJECTIVES

3.2 ***Relevance of the project development objectives is rated High***. The project context was characterized by relatively low rural access to electricity, limited capacity for utilizing renewable energy sources for electricity supply, weak sector institutions, lack of comprehensive legal and regulatory framework, including for rural electrification, and a need for large investments. Rural electrification was a critical component of the GOV's long-term program to eliminate poverty. In 1998, about 30 million people still had no access to electricity and less than half of the rural households were electrified.

3.3 Against this background, the project's objectives were, and some of them still are, highly relevant to the development of Vietnam's electricity sector. The project's rural electrification objective is now much less relevant given that with 98% of the households connected nationwide, the electrification agenda is substantially complete. However, even in the current context, reinforcement of the existing distribution systems to improve the reliability and quality of power supply and, in particular, completion of the considerable unfinished sector reform agenda continues to remain highly relevant. The Bank's current (FY2012-2016) Country Partnership Strategy priorities in the power sector under Pillar 1 ("promoting a more efficient and reliable provision of infrastructure services") emphasize support for improved quality of basic infrastructure services, including electricity, and the design and implementation of a competitive power market, sector restructuring consistent with competition, tariff reform and improved sector financial viability. Overall, progress has been made on the power market restructuring and reform agenda since the DPO series were launched in 2010, although at a slower pace than expected.

### DESIGN

3.4 ***Relevance of the project design is rated Substantial.*** The project was designed with four components: one for each of the three regional PCs and a fourth to ensure sustainability by providing TA for capacity building, project management and technical design.

- **Component 1** (estimated cost at appraisal: US$77.8 million; actual cost at completion: US$87.2 million)**:** Electrification of communes in PC1 area (northern) to expand access to electricity to 147,150 households in 347 communes in 13 provinces.

- **Component 2** (estimated cost at appraisal: US$37.0 million; actual cost at completion: US$52.1 million): Electrification of communes in PC2 area (southern) to expand access to electricity to 201,851 households in 120 communes in 10 provinces.

- **Component 3** (estimated cost at appraisal: US$41.0 million; actual cost at completion: US$52.9 million)**:** Electrification of communes in PC3 area (central) to expand access to electricity to 81,184 households in 204 communes in 9 provinces.

- Component **4** (estimated cost at appraisal: US$3.3 million; actual cost at completion: US$1.9 million): TA and capacity building for EVN and the PCs for institutional development.

3.5 The rural electrification subprojects financed had to meet certain basic design principles, which required that they:

(i) involve local participation and cost-sharing between consumers, local government and the utility;
(ii) be economically viable;
(iii) comprise project components that were cost-effective and required no subsidies;
(iv) be built according to technically sound specifications;
(v) were accompanied by consumer willingness to connect and pay; and
(vi) involve local participation in operations and maintenance after construction.

3.6 Project components for the PCs were designed to specifically target poor communes in rural and distant areas, taking into account the recommendations of the 1995 OED review of rural electrification.[26] Communes were selected after verifying that grid extension was the least cost option and economically viable. TA was designed to support standard technical specifications for rural electrification, templates for economic and financial evaluation of project subcomponents and formats for feasibility studies.

## Implementation

### PLANNED VS. ACTUAL COSTS

3.7 The project cost at completion (US$203.22 million) was 1% higher than the appraisal estimate (US$201.60 million).[27] The funds were invested in materials,

[26] OED, "Rural Electrification: A Hard Look at Costs and Benefits," World Bank, Washington, DC, May 1995.

[27] The slightly higher completion cost is due largely to the fact that the US$ weakened during the implementation period. The IDA credit was denominated in SDR.

equipment and services for rural electrification as well as TA for capacity building. The IDA credit financed US$150.92 million (SDR99.9 million equivalent). At project closure, the undisbursed portion of the IDA credit SDR5.7 million (US$9 million) was cancelled.[28]

3.8 The Credit Agreement was declared effective in November 2000 or six months after Board approval. The credit closing date was extended twice for a total of 2.5 years to allow the financing of two additional phases of rural electrification. The project was closed in December 2006. Overall, the project was successful in implementation, much exceeding the number of communes electrified and rural households connected. EVN was the implementing agency for the project. EVN through its PCs was in charge of implementing the MV and LV network up to the customer's meter. Provincial authorities were in charge of resettlement and land acquisition costs. Rural consumers financed the household connections.

3.9 In order to achieve the desired local participation and ownership required for successful implementation and to maximize the number of communes connected, project implementation was based on two key principles: decentralization to local authorities and cost-sharing by all parties. Given the large number of subprojects and the concept of decentralized implementation as well as the need to assure quality, EVN standardized, with assistance from the Bank (i) the technical specifications for rural electrification to ensure network efficiency; (ii) a template for the economic and financial evaluation of the subcomponents; and (iii) a format for the feasibility studies.

3.10 **Safeguards**. The project was classified as Environmental Category B because the rural electrification component included land acquisition and rights-of-way for transmission line s. An Environmental Management Plan was prepared, duly assessed and successfully implemented in accordance with environmental procedures of the Bank. There was a large number of affected households but for most of them the impacts were small and aggregate impacts in each of the PC areas low. There was no relocation and land owners were adequately compensated. The project was reported to be in substantial compliance with the Bank's safeguard policies.

3.11 **Financial Management**. Disbursement was the main weakness of project implementation. A significant lag was observed between the work performed and the payment to contractors for completed works. Causes for delays included the low capacity of contractors to complete documents and drawings required for payment and to return unused equipment, which was compounded by a slow review of disbursement processes by GOV comptrollers. This was a systemic shortcoming at the time common to many Bank projects in Vietnam. The project team reports that there were no qualified financial audits.

3.12 **Procurement**. The project involved the procurement of goods and services for a large number of contracts. The project team reports that competitive procurement

[28] After the second extension of the credit closing date to December 31, 2005, the time left for the implementing agencies to prepare new subprojects was limited and this led to the GOV's request of cancellation.

procedures using Bank procurement policies and guidelines were effectively managed and led to prices lower than estimated at appraisal.

## Achievement of the Objectives

3.13 **PDO 1: To expand rural electrification through grid extension to alleviate rural poverty. Rated High.** As Table 6 shows, the actual electrification of 976 communes exceeded by 45% the level targeted at appraisal, including 278 of the poorest communes and more than 550,000 households (2.8 million people) in the most disadvantaged areas (41% higher than the appraisal target). At US$363, the actual cost per household was 28% lower than estimated at appraisal. The project substantially contributed to the GOV's National Rural Electrification Program through which access to rural households increased from 51% in 1996 to 99%in 2013. As a result, nearly all rural households are now experiencing a substantial positive impact on their living standards by having access to electricity. Under the Global Tracking Framework of "Sustainable Energy for All," Vietnam was placed among the 20 "fast-moving" developing countries with the greatest annual increases towards universal access to electricity over the period of 1990-2000.[29]

**Table 6: Communes and Households Connected under Rural Energy Project**

| **Components** | **Number of Communes Connected** | | **Number of Households Connected** | | **Cost per Household** | |
|---|---|---|---|---|---|---|
| | **At appraisal** | **At completion** | **At appraisal** | **At completion** | **At appraisal** | **At completion** |
| PC1: Northern | 347 | 529 | 147,150 | 232,955 | 674 | 392 |
| PC2: Southern | 120 | 187 | 166,667 | 184,472 | 281 | 297 |
| PC3: Central | 204 | 260 | 81,184 | 137,900 | 645 | 400 |
| **Total** | **671** | **976** | **395,001** | **555,327** | **502** | **363** |

*Source:* Implementation Completion Report, Report No: ICR0000485, World Bank, Washington DC, June 25, 2007, pp. 11-12. These numbers were validated during the IEG/PPAR mission.

3.14 For estimating outcomes, a longitudinal survey of the project beneficiaries was undertaken under this operation in 2007 to assess the poverty impact and welfare benefits of the project based on panel data collected in 2002 and 2005 for some 1,100 households from six regions of Vietnam.[30] This survey was followed up by an empirical study aimed at tracking the changes in peoples' lives resulting from electricity service.[31] According to the surveys, there were multiple welfare benefits of the project and rural electrification, including:

[29] Sustainable Energy for All, "Global Tracking Framework," Washington, DC, May 2013, p. 40.

[30] The survey methodology and results are presented in detail in World Bank, "Vietnam: State and People," *op. cit.*, pp. 48-56.

[31] Shahidur R. Khandker, Douglas F. Barnes, Hussain Samad and Nguyen Huu Minh, "Welfare Impacts of Rural Electrification: Evidence from Vietnam," World Bank Policy Research Paper, No. 5057, 2009.

i. increased school enrollment by about 10% and increased number of completed school years (by 52% for boys and 15% for girls);
ii. improved primary health care and increased awareness of personal hygiene;
iii. reduced housework for women and children, improved home comfort and increased time for leisure such as watching TV and reading;
iv. increased security due to night-time lighting;
v. better communication;
vi. improved quality of learning due to better conditions for studies and teacher lesson preparation;
vii. increased farm and non-farm income;
viii. increased job opportunities for local people;
ix. higher rural productivity; and
x. reduced poverty rates.

3.15 In addition to positively affecting farm and non-farm income, rural electrification appears to have the strongest impact on school attendance by children. This impact obviously has a long-term influence on the welfare of the country as a whole as these children move into the workforce both at higher skill and more productive levels. While rural households use grid electricity mostly for lighting, about 9% of them use electricity for business or productive purposes.[32]

3.16 **PDO 2: Develop appropriate mechanisms for rural electrification to ensure continued sustainable electrification and long-term viability of the power sector. Rated Substantial.** The project contributed to capacity building for the implementing agencies: EVN and PCs. Moreover, a substantial contribution was the development of technical specifications and standardization of the design and technical characteristics for rural electricity networks. The standards developed as part of the project promoted better network quality, reduced technical losses and avoided the application of urban standards to rural areas, which were too expensive for low-density areas. The standards later on were adopted as national ones. Overall, EVN's financial performance was satisfactory based on the three financial indicators agreed with the Bank in 2004, replacing the electricity tariff covenant.[33]

[32] In the Muong Te district (Lai Chau province), the IEG mission visited a grid-connected commune (Nam Khao) electrified under the REP and an off-grid commune (Pa U, which consists of extremely poor ethnic households in a remote mountainous area) electrified under the SEIER Project. Leaders and members of these communes especially strongly emphasized educational benefits, including: (i) gradual improvement in student performance as a result of better quality and partially computer-based instruction as well as more homework; and (iii) higher percentage of students proceeding to high school (up to 76% from 50% in the Nam Khao commune). (On the downside, the headmaster of the Pau U primary school complained about the extensive damage to school computers and other electric equipment caused by poor quality off-grid electricity supply provided by a mini hydropower plant [Pau U] which is in poor operating condition.) Health benefits from better equipped primary healthcare facilities were also prominently mentioned. There was no evidence in these particular communes that electricity is used for business or productive purposes to a significant extent.

[33] The three financial ratios were debt service coverage, self-financing and debt-to-equity.

3.17 Institutional strengthening of rural electrification. The Rural Electrification Departments established in EVN and the PCs as well as the Rural Electrification Units set up in each Provincial Power Service [34] of EVN contributed to the overall success of the rural electrification program, improving coordination between the central government and communes in remote rural areas. The technical specifications developed by the project standardized the design and technical characteristics of rural networks, promoted better network quality, reduced technical losses and avoided the application of expensive urban standards. The retail Service Agent model whereby the Provincial Power Service signs service contracts with local staff for procedures such as meter reading, bill collection and minor repair of in-house wiring was applied in most project communes. This effective service outsourcing model reduced operating costs considerably and resulted in high levels of payment. The primary features of the Service Agent model are described in Box 1.

**Box 1. Retail Service Agents**

Retail-level Service Agents are commune residents hired and trained by PCs to handle collections and inspect the status of the local distribution infrastructure, such as meters and lines, monitor rights-of-way and perform minor repair of in-house wiring.

Service Agents are used by the PCs in communes where the LV system is owned, managed and operated by the PCs.

One Service Agent can be in charge of 300-1,000 customers and paid about US$160 fees per month (by the NPC in 2012).

The use of Service Agents reduces PCs' operating costs for meter recording, bill collection and safety inspection by 30-50%.

*Source: Vietnam: State and People, Central and Local Working Together, p. 35; and information provided to the IEG mission by the PCs.*

3.18 **PDO 3: Advance the implementation of power sector reforms. Rated Substantial.** The major milestones of power sector reform included the issuance of: (i) a 1999 decree to allocate responsibility for rural electrification; (ii) a 2001 decree to set out the GOV's sector strategy; (iii) the Electricity Law of 2005 to set the framework for the power sector for the next 20 years; and (iv) the road map for power sector reform, approved in 2006, to set milestones and schedule for the transition to a power sector based largely on market principles. Thus, at the upstream stage, the project contributed to subsequent progress in sector reforms (see paragraphs 1.25-1.27) including the commercialization of sector entities and establishment of a competitive generation market.

3.19 **PDO 4: Promote local renewable energy in areas inaccessible to the national grid and also to supplement grid supply. Rated Substantial.** The project supported the Ministry of Industry in the preparation and adoption of the Renewable Energy Action Plan (REAP) which outlined a program for the connection of renewable energy sources

[34] Provincial Power Services were province-level subsidiaries of EVN. In 2010, they were renamed to Provincial Power Companies and became provincial subsidiaries of the regional PCs established in 2010.

to the electric grid and for non-grid electricity supply in remote areas. A pilot scheme in Son La province, in an area outside the reach of the grid at that time, and the preparation of standardized power purchase agreements for renewable energy source-based generators were the first implementation steps of the REAP. This activity was subsequently continued and scaled up under the SEIER Project.

## Efficiency

3.20 ***Efficiency of the project is rated Substantial.*** The project's high economic benefits at closing (Economic Internal Rate of Return: 21%) were somewhat lower than the appraisal estimate (Economic Internal Rate of Return: 29%). Although actual investment costs were lower than appraised,[35] the lower Economic Internal Rate of Return at closing is explained by rural consumption of electricity that was lower than appraised (non-household consumption was significantly overestimated at appraisal). The costs of connections were also spread over several years while the appraisal assumed payment at the beginning of the project. Finally, actual willingness to pay of non-household consumers was lower than the appraisal estimate. These factors also affected the financial benefits (FIRR: –3.0% vs. -3.3% at appraisal) because the tariff set by the GOV for rural areas was lower than the actual cost of service.

## Ratings

### OUTCOME

3.21 ***Overall project outcome is rated Satisfactory*** based on the project's *high* relevance of objectives, *substantial* relevance of design, *substantial* efficacy, and *substantial* efficiency. Actual electrification rates exceeded appraisal estimates, e.g., 41% higher for the poorest and most disadvantaged areas. The project strengthened the capacity of EVN and PCs. The sustainability of the expanded networks was enhanced through significant improvements in institutional capacity for local management of networks that reduced distribution losses and costs. The project contributed to the commercialization of sector entities and the establishment of a competitive generation market. A renewable energy action plan was also adopted.

### RISK TO DEVELOPMENT OUTCOME

3.22 ***The risk that the achieved development outcomes will not be sustained is rated Significant***. On the positive side, the completed electrification schemes were transferred to the Provincial Power Services for decentralized operation and maintenance. The local capacity of the Provincial Power Services for the operation of the rural networks in the communes is well assured through technical training and technical and management manuals. At a higher level, EVN has strong technical capacity to maintain and operate the rural networks in a safe and efficient way for their design lifetime. The Bank-supported follow-on projects have focused on the rehabilitation of rural networks and

[35] The national average connection cost per households at closing was US$363 vs. US$502 at appraisal. Thus the actual cost of grid connection was significantly lower than the estimated cost of off-grid electrification.

further improvement of their institutional and management arrangements.[36] On the downside, EVN's (including its PCs) recently deteriorating financial performance (see paragraphs 1.28-1.29) may constrain the company's ability to mobilize adequate resources in a timely manner to maintain and modernize the rural networks. This is the main reason why the risk to the development outcomes is rated as Significant.

3.23 By the mid-1990s, the electrification rates of the rural households was over 90%, therefore the GOV and the Bank started to direct efforts to improve access to good-quality, affordable electricity services to rural communities in an efficient and sustainable manner. In addition, under REP2, there was a major overhaul of the previously *ad hoc* management and operational arrangements (most of them unregistered) for rural networks by converting them into LDUs as registered legal entities. From an institutional perspective, this has been a major step forward toward a more sustainable management and operation of the rural electricity networks.[37]

**BANK PERFORMANCE**

3.24 ***The quality at entry for the project is rated Satisfactory***. A PHRD grant was obtained for the Borrower to ensure adequate project preparation. Bank teams were fielded together with EVN staff to explain to stakeholders in the provinces the project design and their role in it, and to mobilize their interest and cooperation. A similar exercise was done by the project team at the provincial and district levels and in selected communes. This approach ensured commitment and adequate understanding of all stakeholders for effective project implementation. In particular, the Bank assisted the implementing agencies in the preparation of standard templates and the definition of clear responsibilities for all concerned agencies after an intensive consultation process. M&E was adequately designed.

3.25 ***The Bank's quality of project supervision is rated Satisfactory***. The TTL and most of the key task team members were based in the field and carried out close supervision of the project. This was complemented once a year with headquarters specialists during comprehensive supervision missions. Potential problems were

[36] This shift of focus was also driven by the generally weak technical condition of the rural networks built during the earlier periods when the overriding priority was to deliver simple first connections to as many households as possible. Over time, these networks became obsolete, as they were unable to meet increasing demand, had rather high technical losses and were in poor shape in terms of safety performance.

[37] Three types of Local Distribution Utilities were formed and exist today: (i) EVN's PCs; (ii) rural cooperatives, which cover mostly a single commune; and (iii) joint stock companies, which provide power to one or more communes in the given area. However, as discussed above (paragraphs1.28-1.29) many of the Local Distribution Utilities are "too small to succeed" financially given their small service area and low retail tariffs. Under these circumstances, strong consolidation of the LV networks has taken place since 2008 by transferring a large number of unviable Local Distribution Utilities to the PCs. The IEG mission visited a Local Distribution Utility cooperative serving the Cao Minh commune of 3,150 households (11,200 people) in Xuan Hoa township, Vinh Phuc province, located near Hanoi. The Local Distribution Utility received technical upgrade and training support under REP2, which resulted in more efficient operation and higher quality electricity supply. However, amid rapidly growing demand, service reliability is still inadequate (three service interruptions per month per customer, each lasting for 30 minutes on average). While the cooperative is moderately profitable, its long-term sustainability is doubtful given its inability to undertake sizable network modernization programs.

promptly addressed and timely advice given to the implementing agencies. The Bank showed flexibility in resolving important issues raised during project implementation. For example, the Bank agreed with the GOV request that significant savings on procurement through ICBs (international competitive bidding) be used for the electrification of more households. This also involved a change to the project schedule and an extension of the credit closing date. Also, the Bank realized that it was more appropriate to waive the covenant on the politically controversial retail tariff level, and replaced it with standard indicators for EVN's financial performance. The continued direct face-to-face contacts and discussions built the confidence of the implementing agencies and allowed the task team to share successful implementation practices across provinces. M&E was adequately supervised.

3.26 Based on the above ratings, ***overall Bank performance is rated Satisfactory***.

**BORROWER PERFORMANCE**

3.27 ***Government's performance is rated Moderately Satisfactory.*** Project preparation was done by the GOV in close cooperation with the Bank. The GOV's decision to decentralize the project to the local implementation agencies facilitated the process of preparation and implementation. A GOV Steering Committee in each province guided and supervised project implementation. Local governments at the levels of province, districts and communes paid compensation to owners of sites affected by the project and for clearance of sites. The provinces also assisted poor households in the payment for the LV drop lines to their houses. However, the approval and clearance of procurement documentation was slow, particularly the review and clearance of payments by the financial controllers, because of a lack of clear procedures.

3.28 All the key conditions of the Bank loan were fulfilled except the electricity tariff. However, the Bank agreed to gauge EVN's finances based on standard financial indicators. Financial performance of EVN was generally satisfactory during the implementation period

3.29 ***Implementing Agency Performance is rated Satisfactory***. The strong commitment of the regional PCs enabled the Project Management Units to manage the execution of about 600 contracts for a large number of subprojects scattered in wide mountainous rural areas with difficult access. EVN displayed a good control of procurement, even in the period of strong fluctuation of prices, through competitive bidding that contributed to significant cost reductions, which allowed the electrification of a large number of additional communes. There were delays and cost increases out of control of EVN, most of them caused by low capacity of local contractors and a surge in prices during the implementation of some contracts.

3.30 Based on the above considerations, ***overall Borrower Performance is rated Moderately Satisfactory***.

**MONITORING AND EVALUATION**

3.31 **M&E Design**. The straightforward Results Framework was well designed. Overall, the results chain was simple, clear and appropriate, linking the PDOs to inputs

(budget for each component), the key project outputs and outcomes in a largely measurable and monitorable manner. The indicators (e.g., number of households electrified, financial performance indicators for EVN and the PCs) for the primary investment component—rural electrification in three main regions of Vietnam—were appropriate, specific and measurable. However, some of the indicators under the small (US$3 million) TA component were loosely defined (e.g. "institutional arrangements defined," "guidelines adopted," "consultants support new rural electrification institutions in place."). No intermediate indicators were defined at appraisal.[38]

3.32 **M&E Implementation**. EVN set up an adequate system, collecting and compiling the required monitoring data every six months. Key indicators were regularly monitored and progress evaluated compared with targets. Bank supervision mission did not flag any concerns with the M&E implementation. Implementation of the Environmental Management Plan was regularly monitored and Bank supervision missions included social and environmental experts.

3.33 **M&E utilization**. EVN set up adequate systems for collecting and compiling data on key performance indicators every six months. The key performance indicators were regularly monitored and progress was evaluated by comparing them with targets. However, despite the fact that the project was extended by two years and more than achieved the original electrification targets, the relevant outcome targets were not revised, thus the M&E framework lost much of its practical relevance in the last two years of project implementation.

3.34 Overall, ***M&E is rated Substantial***.

[38] However, the project ICR regards the original target values (2004) as intermediate indicators as distinct from the actually achieved values at completion (2006) following the two-year extension of the credit closing date.

# 4. System Efficiency Improvement, Equitization and Renewables Project

## Objectives, Design, and their Relevance

### OBJECTIVES

4.1 The objectives of the project, as defined in the Development Credit Agreement, were to assist the Borrower to: (i) enhance electricity system efficiency; (ii) provide electric power in selected rural areas; and (iii) sustain reform and institutional development of the energy sector. In addition, the PAD included also a longer term objective of poverty alleviation.

### RELEVANCE OF OBJECTIVES

4.2 ***Relevance of the project development objectives is rated High***. The objectives were relevant to the needs of the country's power sector at project appraisal and continue to be relevant at present except for rural electrification, which has largely been completed by now. The major sector issues at time of appraisal (2002) included: (i) needs for large sector investments and improvement in overall power system efficiency; (ii) a relatively low rate of rural access to electricity; (iii) limited capacity to utilize renewable energy sources; (iv) weak management of sector institutions; (v) financial sustainability of the power sector, (vi) and lack of a comprehensive legal and regulatory framework to underpin sector reform. The project was part of a broader program of investments agreed to between the GOV and the Bank to address the above sector issues.

4.3 The project was in line with the Bank's Country Assistance Strategy for 1999-2002, which identified the Bank's role for the power sector as filling a niche not covered by others and assisting the GOV in its poverty alleviation efforts. The project was consistent with the Country Assistance Strategy focus on reducing poverty, promoting equitable growth and raising productivity through provision of infrastructure. The project was also consistent with the Bank's current (FY2012-2016) Country Partnership Strategy priorities in the power sector which emphasizes support for improved quality of basic infrastructure services, including electricity. The renewable energy source subcomponents addressed the Global Environmental Facility Operational Program 6 on Climate Change: promotion of renewable energy sources by removing barriers and reducing implementation costs. The project aimed to support a long-term programmatic approach to strategically develop renewable energy sources based on the 1999 Renewable Energy Action Plan (REAP), jointly developed by the Bank and EVN as a framework for renewable energy source development, with hydropower and solar power identified as the sources with the highest growth potential.

## DESIGN

4.4 The project had three components:

- **Component 1: System Efficiency Improvement** (estimated cost at appraisal: US$177.80 million; actual cost: US$183.60 million), focusing on upgrades of 220 kV and 500 kV transmission systems and DSM.

- **Component 2: Improving Rural Access** (estimated cost at appraisal: US$122.20 million; actual cost: US$151.2 million), including upgrading of 110 kV sub-transmission systems, rehabilitation of small hydro and development of off-grid power supply using renewable energy sources.

- **Component 3: Sustaining Reforms and Institution Building** (estimated cost at appraisal: US$14.0 million; actual cost: US$31.4 million), including capacity building, support to equitization and improvement of EVN's Management Information System.

4.5 The core components were not revised but some subcomponents and activities were either revised or cancelled as a result of implementation progress or agreements reached during project supervision. Most of the changes were affected through project restructurings and AF. The key changes included:

(i) Components 1 and 2 were made more programmatic in the selection of subprojects to be financed. For Component 1, additional subprojects included 423 km of 220 kV single and double circuits and 13 substations, and an additional subcomponent of commercial metering at the transmission system interface with generation and distribution was introduced. Component 2 included further investments of 122 km of 110 kV single and double circuit lines and 18 substations.

(ii) The focus of the subprojects financed under the Remote Areas Renewable Electricity component was changed from off-grid renewable energy sources to grid-connected renewable energy sources.

(iii) Component 3 added more activities, including capacity building of ERAV, institutional development of the natural gas sector, establishment of corporate financing units in EVN and NPT and associated training.

## RELEVANCE OF DESIGN

4.6 ***Relevance of project design is rated Modest.*** For the first project objective – enhancement of system efficiency – the Results Framework clearly links the project's activities to its expected outputs and outcomes. For the second objective – extension of rural electrification – the off-grid subcomponent was made largely irrelevant by the rapidly moving grid extension. This subcomponent was not properly assessed during project preparation and appeared to be largely Bank-driven. For the third objective –

sustaining reform and institutional development – the causal linkage between the overly general objective and the large number of diverse and relatively limited impact interventions was tenuous.

4.7 Since the project components included a wide range of sectoral issues (T&D, renewable energy sources, rural electricity access, community-based approach to off-grid electricity supply, equitization, number of sector reforms, etc.), it ended up being overly complex, involving a large number of implementing agencies, including those at the provincial level, dispersed across the country. This design approach was significantly more complex than what was adopted for other power projects in Vietnam.

4.8 Despite similar experience obtained under previous and then-ongoing Bank-supported sector operations, the project design overestimated implementation capacity across the board, resulting in serious implementation delays. In particular, the time required to prepare and implement a large number of additional subprojects was underestimated, including that needed to prepare and approve feasibility studies, technical designs and procurement documents. Lack of technical and management capacity of some of the implementing agencies caused delays or cancellation of several subprojects, especially during the early years of project implementation. For the T&D improvement subprojects, there was inexperience in substation control systems, poor coordination between equipment suppliers and civil contractors, delays in compensation of affected persons and prolonged contracting processes. The applicability of the community-based approach under the Remote Area Renewable Electricity component should have much more thoroughly assessed during project preparation. Although the Remote Area Renewable Electricity attempted to decentralize project implementation responsibilities to the community level, the results were generally poor. The communes, that were the direct beneficiaries, seemed to lack enthusiasm to assume any responsibilities for these facilities. After this deficiency was realized, the project switched from the community approach to a district approach. However, the latter, particularly the district operation & maintenance company in charge of the off-grid hydro plants, was still not performing as expected. Supervision mission site visits pointed to grossly deficient financial aspects of operation & maintenance and very poor conditions of the mini-hydro power plants newly installed or rehabilitated under RARE.

4.9 The above-discussed serious design issues were largely responsible for the fact that the project was repeatedly restructured and the closing date was extended three times for a cumulative period of five years.

## Implementation

### PLANNED VS. ACTUAL COSTS

4.10 The project's actual cost was US$423.6 million, about 20% higher than the estimated cost of US$352.4 million at appraisal. IDA financed US$299.7 million (71%) of the final cost, significantly higher than planned (US$220.0 million) due to the 2010 AF. The Borrower contributed US$119.8 million, somewhat less than the US$122.9 planned at appraisal.

**IMPLEMENTATION EXPERIENCE**

4.11 The project was approved on June 25, 2002 and became effective on February 19, 2003 as scheduled. It was restructured three times as Level Two restructurings according to the current definition and obtained AF. The first restructuring occurred in June 2005 through introducing a programmatic approach for the selection of subprojects. During the second restructuring in November 2007, ERAV was added to further support the ongoing sector reform. Also, the evolving sector environment and implementation delays required changing the focus of activities from off-grid renewable energy sources to grid-connected renewable energy sources. During the third restructuring in May 2009, the Credit Agreement was amended to include preparation of the Renewable Energy Development Project and simplify the disbursement categories. The AF was approved in June 2010 to meet a financing gap resulting from cost overruns and to scale up reform support, including assistance to ERAV and capacity building of EVN and NPT. The project closed on December 31, 2012, five years later than originally planned.

4.12 The Socialist Republic of Vietnam was the Borrower and the Ministry of Industry and Trade, ERAV, EVN and its subsidiaries, NPC, CPC, SPC, PC Dong Nai and PCHai Duong were the implementing agencies.[39]

4.13 **Environmental Safeguards.** The project's environmental safeguard category was B. Safeguards triggered included Environmental Assessment, Natural Habitats and Forestry. Independent external monitors oversaw the Environmental Management Plan. At a later stage of the project, it was found that insufficient environmental protection measures in micro hydropower sites under the Remote Area Renewable Electricity and the T&D system improvement components resulted in marginally satisfactory safeguard performance, however these issues were resolved toward the end of the project.

4.14 **Social Safeguards**. Indigenous Peoples and Involuntary Resettlement were triggered. A resettlement policy and ethnic minority framework was developed. Adequate institutional and financial arrangements for Resettlement Action Plan and Indigenous People Development Plan (IPDP) implementation were made. Independent external monitors oversaw the Resettlement Action Plan and Indigenous Peoples Development Plan implementation and provided a quarterly report to the Bank. At a later stage of the project, there were delays in compensation and completion of a resettlement plan under the the Remote Area Renewable Electricity program, but these were resolved by the end of the project. As with the environmental safeguards, all implementing agencies underwent a learning process. Overall, the project was reported to be in substantial compliance with the Bank's environmental and social safeguard policies.

4.15 **Financial Management**. The project had an adequate financial management system in place to meet the Bank's fiduciary requirements. The financial management arrangements of the project were fully integrated with that of EVN, which made project financial management more effective. The budgeting, fund flows, staffing, accounting and financial reporting, internal control systems and external audit, and maintenance of supporting documents at the implementing agencies were generally adequate. With the

[39] In 2010, PC Dong Nai and PC Hai Duong were merged into SPC and NPC, respectively.

exception of non-compliance with some financial covenants,[40] which was a sector/corporate issue rather than specific to the project, the implementing agencies were proactive in dealing with the recommendations by Bank missions.

4.16 Audits were qualified since 2007 due mostly to non-compliance with a number of IFRS International Financial Reporting Standards (IFRS). However, the qualifications were not regarded to have a substantial impact on the capacity of the implementation agencies since the qualification points were on technical accounting treatments and disclosures pertaining to IFRS.

4.17 **Procurement**. Overall, procurement activities appear to have been carried out in accordance with Bank guidelines. At early stages in the project, some implementing agencies delayed the procurement process in large part due to their unfamiliarity with the Bank's procurement process, such as training packages, but also due to uncertainty related to the sector reform. Another delaying factor was the complex approval processes, but this was a systemic issue not specific to the project or the power sector. However, this situation improved over time as the implementing agencies learned from experience and received support from the Bank. The Bank's oversight and close involvement in all phases helped to ensure the transparency and effectiveness of procurement and contributed to the implementing agencies' ability to procure quality goods and services at competitive prices.

## Achievement of the Objectives

4.18 **PDO 1: To enhance electricity system efficiency in Vietnam. Rated Substantial.** The key outputs under this PDO were upgrades of the 220 kV and 500 kV transmission line s and associated substations, including installation of capacitors to selected substations. Total length of the transmission lines upgraded and constructed was 490 km (a 7% contribution to the national system increase during the project implementation period of 2002-2012). Total capacity of the 200 kV transformers installed was 3,313 MVA (21%). Total capacity of the 500 kV transformers installed was 900 MVA (8%).

4.19 In terms of the system efficiency data reported in the Project ICR[41] are not entirely consistent with those received by the IEG mission from EVN and tend to somewhat overstate the reliability gains, especially concerning interruption duration. In 2012, at 2.33%, transmission losses were significantly lower than the project performance target of 3.75%. The target for the number of interruptions on transmission lines (see Table 2, paragraph 1.11) was overachieved. However, these key performance indicators were defined at the overall system level, thus cannot be directly, let alone wholly, attributed to the project. In comparison to the data provided in the ICR, the duration of transmission interruptions has worsened to some extent as shown in Table 2 based on system level data provided to the IEG mission by EVN. This data is consistent with that received by the mission from the regional PCs.) It is noted however, that in an

[40] Examples are tariff increases, financial performance ratio, carrying out time-bound action, and EVN to complete and incorporate a current valuation of all fixed assets.
[41] Implementation Completion Report No. ICR2603, June 27, 2013 (p. v).

interconnected grid, a sophisticated SCADA system would be needed to measure efficiency parameters for parts of the network, and such systems are only now being developed in Vietnam. Meanwhile, the network-wide parameters can be accepted as a reasonable proxy for estimating the impact of the project activities.

4.20 **PDO 2: To provide electric power in selected rural areas. Rated Modest.** The key outputs under this PDO aimed at improving rural access included upgrades of the 110 kV sub-transmission systems, rehabilitation of small hydro plants and development of off-grid power supply using renewable energy sources and connecting six additional communes to mini-grids.

4.21 There were five PDO-level outcome indicators. However, three of them (number and average duration of interruptions at 110 kV level and distribution losses) were measured at the national system level, thus cannot be directly attributed to specific project interventions. A major key performance indicator (number of new households electrified from commune-based off-grids) fell deeply (95%) short of the target because the unanticipated rapid grid connections reduced the need for off-grid projects. For the same reason, the target for rehabilitation of small hydro power plants was underachieved by nearly one-third. Furthermore, there is a substantial risk to the operational and financial sustainability of the seven micro hydropower plants newly installed or rehabilitated under the project. These plants serving extremely poor households whose ability to pay for electricity appears to be very limited, unless the purchasing tariffs are increased and the operating company (Muong Te HPco) receives further financial and capacity-building support to improve its operational record. However, an even more powerful force undermining the viability of these power plants is the ongoing rapid extension of the grid to their service areas.

4.22 During project supervisions, issues about the sustainability of these plants were raised in terms of insufficient revenue collection and working capital as well as unrealistic previous assumptions about the cost and stocks of spare parts. Therefore, upon project closure, it was agreed with the Bank that the Ministry of Industry and Tradeand Lai Chau province will continue to provide adequate support to the operating company and the PPA between Muong Te HPco and NPC will be amended to increase the purchasing tariff thereby improving the financial position of the company. The support was to include also providing office, equipment, variable capital and capacity building to the company. However, this agreement has not been carried out and the power purchase agreement has not been revised, as confirmed to the IEG mission by management of Muong Te HPco.[42] As a result, the company has remained stuck in extremely weak financial standing, unable to provide for proper facility maintenance, let alone any technical modernization.

4.23 The mission visited in the Muong Te district (Lai Chau province) and three micro hydropower plants and associated mini-grids funded under the project: Nam Si Luong (500 kW) and Ban Giang (26 kW), both rehabilitated, and Pau U (25 kW) newly constructed. The mission found the Nam Si Luong and Pau U facilities were in poor

[42] The average tariff is very low at about US cent 2.2/kWh equivalent. Widespread nonpayment (about 50%) is further compounding the financial hardship.

operating condition after years of neglect.[43] The Ban Giang plant has been non-operational since grid arrival in April 2013 and has fallen into total disrepair. The mission was informed by company management that the Na Hu plant (27 kW, rehabilitated) has been in similar non-operational condition since 2013. The mission is of the view that about 10 years after their installation/rehabilitation, all of the micro hydro plants may face abandonment upon grid arrival, with the possible exception of the largest one (Nam Si Luong, 500 kW), which has survived the recent grid extension by providing of-grid power to two business customers by offering a very competitive tariff. However, this facility is also in poor operating condition, performing well below design capacity, and its future depends crucially on significant upgrades (including for grid compatibility to allow the plant to sell power into grid) and/or availability of off-grid customers. In discussions with GOV officials, both at the national and provincial levels, the mission has not seen a credible commitment to "save" these plants by upgrading them to grid compatibility, thereby preventing them from halting operation and an eventual fall into disrepair.[44]

4.24 **PDO 3: To sustain reform and institutional development of Vietnam's energy sector. Rated Modest.** Most of the objectives to sustain reform and institutional development of the electricity sector were only partially achieved. Most important, despite a series of recent tariff increases (but only slightly above the inflation rate) there is still no sound procedure of formula-based tariff setting in place and electricity tariffs are still highly distorted and stand well below true cost recovery levels, resulting in an increasingly poor financial performance of the power sector. Establishment of Vietnam Competitive Generation Market, which was launched in July 2012, is a significant step forward, but it was inappropriate to assign the administration of this market to the regulatory agency ERAV. This assignment has only distracted ERAV from its core responsibility of tariff and quality-of-service regulation. Key performance indicators for evaluation of accounts of newly formed joint stock and equitized companies did not achieve the target as the activity was hardly implemented. Key performance indicators for reduction of time and complexity for PPAs to get approved was substantially achieved. The IEG mission was informed that the approval procedure has been streamlined on the basis of the non-negotiable standardized power purchase agreement and the annually updated "avoided cost tariffs" – both approved by the Ministry of Industry and Trade. Evidence has been provided under the ongoing Bank-supported Renewable Energy Development Project where the streamlined procedure has been successfully applied for nine small (<30 MW) hydropower plants under construction.

[43] In this particular case (the Pau U Company, newly constructed), the equipment appeared to be inadequately maintained and in poor condition.

[44] On the positive side, the mission has received evidence from the regional PCs that the five small on-grid hydro power plants (An Diem, Kon Dao, Ankroet, Chieng Dan and Thac Bay) rehabilitated under the project are in good and sustainable operating condition.

**GLOBAL ENVIRONMENT OBJECTIVE:** TO REDUCE GREENHOUSE GAS EMISSIONS BY PROMOTING ELECTRICITY PRODUCTION USING RENEWABLE ENERGY.

4.25 **Outcomes.** The project achieved reductions in carbon dioxide emission primarily through rehabilitation of on-grid hydro power plants and to a limited extent from the newly installed and rehabilitated off-grid micro-hydro plants. As shown in Table 7, the targeted reduction of carbon dioxide emissions was over-achieved by about 30%.

**Table 7. Reduction of Greenhouse Gas Emissions: Status of Outcome Indicator**

| PDO Indicator | Baseline Value | Target Value | Actual Value |
|---|---|---|---|
| $CO^2$ emission reduced (tons) | 0 | 208,350-219,140 | 278,164 |
| Date achieved | 04/01/2005 | 12/31/2007 | 12/31/2012 |

*Source*: EVN

## Efficiency

4.26 ***Efficiency is rated Modest***. Economic analysis employed standard methodology applied in similar project situations and covered the full scope of the project. The project's estimated Economic Internal Rate of Return was 36%, which is higher than the appraisal estimate of 31%. The net present value at completion was US$408 million, which is lower than the appraisal estimate of US$460 million due mostly to the substantial delays in completion. The Financial Internal Rate of Return at completion was 25.5%, which is higher than the Financial Internal Rate of Return of 15% at appraisal. The financial net present value at completion was US$628 million versus US$274 million at appraisal. Project financial indicators improved since electricity prices were substantially raised during the project period compared to the assumption set out at appraisal.

4.27 While economic and financial rates of return were acceptable upon project completion, efficiency is rated *modest* due to the project experiencing three extensions resulting in a time overrun of five years, more than doubling the implementation period estimated at appraisal. A significant portion of this delay can be attributed to procedural/approval requirements required by GOV, especially at the early stages of the project as discussed under "Implementation Experience" above.

## Ratings

### OUTCOME

4.28 ***Overall project outcome is rated Moderately Unsatisfactory.*** The relevance of the project objectives is rated *high* given the continuing need for system efficiency improvements and further sector reforms. Relevance of project design is rated *modest* due to excessive complexity from multiple components and involvement of several implementing agencies that, in retrospect, were not fully justified in terms of the project objectives and outcomes. The first PDO of improving system efficiency was achieved to a *substantial* extent by meeting targeted transmission system losses and frequency of

interruptions (although duration of interruptions has increased lately). The second PDO of providing electric power in selected rural areas - an effort that was on a much smaller scale compared to that of improving system efficiency under the first PDO - is rated *modest* as key targets related renewable energy source-based off-grid electrification were missed by a large margin. The third PDO of sustaining reforms and institution building is rated *modest* due to a lack of demonstrated evidence of progress concerning a number of TA activities (e.g., Small Power Producer regulation, ERAV capacity, equitization program, road map for gas market reform, corporate financial management strengthening). Efficiency is rated *modest* due to the project experiencing three extensions resulting in a time overrun of five years, for reasons that were largely under the control of the GOV.

**RISK TO DEVELOPMENT OUTCOME**

4.29 ***The risk that the achieved development outcomes will not be sustained is rated Significant***. The GOV's commitment continues to be strong to follow a long-term and gradual approach to sector reforms which were incrementally further advanced under this operation, including development of the Vietnam Competitive Generation Market. However, no significant progress has been made in equitization, sound tariff and quality-of-service regulation. The power sector's service reliability performance is still subpar by a large margin. The Bank has since remained engaged in promoting sector reforms under several ongoing operations, particularly the DPOs, aimed to ensure (i) sustainability of the partial reform gains achieved to date; and (ii) substantial completion of GOV's gradualist reform program within a reasonable period of time.

4.30 Some of the system efficiency gains (in particular, network losses) to which the project contributed in the past decade are considered sustainable and in fact some additional moderate improvements can be expected given the GOV's commitment to further strengthen the national networks and the Bank's continued strong engagement in the T&D sector under ongoing (Distribution Efficiency Project) and proposed operations (Transmission Efficiency Project). Clearly, there is a very substantial scope for improvement in network reliability. Network loss reductions are expected to follow a long-term decline trajectory albeit at a much slower rate as diminishing returns have set in given the already relatively low level of the combined nationwide T&D losses (8.9% in 2012), which are reasonably close to acceptable levels.

4.31 There is a high risk to the operational and financial sustainability of the micro hydropower plants installed and rehabilitated under the the Remote Area Renewable Electricity component. With the purchasing tariffs not increased and the national grid being rapidly extended to its service area, sustainability of the operating company (and its seven off-grid plants) is at a real and serious risk, as noted above (paragraphs 4.28-4.29). In large part, this substantially failed component, slow progress with some of the sector reforms and serious concerns about the general financial standing of the power sector account for rating the risk as Significant that the achieved development outcomes will not be maintained.

**BANK PERFORMANCE**

4.32 ***The quality at entry for the project is rated Moderately Unsatisfactory***. The project's conceptualization and initial design was based on recommendations of a major sector study,[45] which served as a sound rationale of the Bank intervention: extend access to electricity in rural areas, increase efficiency in the entire energy chain, create creditworthy institutions, improve corporate governance, rationalize sector management, facilitate private participation and advance sector reforms through advisory services. However, by trying to address so many objectives, the project became too ambitious and very complex. Also, despite the considerable experience obtained under other Bank operations in Vietnam, the project overestimated implementation capacity across the board, which led to serious implementation delays. In particular, there was a lack of realism regarding the actual capacity of the local organizations. In retrospect, the growth potential for grid-connected rural electrification could have been more carefully assessed and projected than done during project preparation thus preventing a major restructuring and associated extension of the credit closing date. In general, relevant important lessons learnt under a number of Bank-funded power projects in Vietnam were not adequately internalized in the overall project design and implementation framework. The above-mentioned Quality at Entry issues were largely responsible for the fact that the project was repeatedly restructured and the losing date was extended for a total of five years.

4.33 ***The Bank's quality of supervision during the project is rated Moderately Satisfactory***. Sufficient budgetary and staff resources were allocated to project supervision. Close supervision and monitoring was made possible by a highly decentralized Bank team in Vietnam. The latter made strong efforts to adjusting project activities in a rapidly changing sector environment. Safeguards and fiduciary aspects received adequate attention and appropriate actions were taken in a timely manner. The mid-term review of the project identified weak management by Ministry of Industry and Trade's Project Management Board for power projects in rural areas. It was also found that the Bank's supervision of the rural and renewable energy source-based projects in isolated remote areas needed to be strengthened. The Bank's supervision team addressed the need for improvement of the economic and financial analyses of feasibility studies of subprojects by hiring a consultant to assess the problems and develop guidelines and training for the implementing agencies. However, some problems remained and the Bank ended up approving some subprojects with incorrect economic and financial analyses. Candor and quality of performance reporting was also an issue, especially during the early stage of the project regarding implementation delays and achievements.

4.34 In the course of implementation, an already complex project became even more complex, involving an unusually large number of implementing agencies dispersed across the country. Under these circumstances, the Bank properly reacted by adopting a more programmatic approach to allow a pragmatic response to a rapidly evolving

[45]"Fueling Vietnam's Development: New Challenges for the Energy Sector," Report No. 19037-VN, December 1998.

situation (priority subprojects constantly changing) in the T&D sector and by reallocating the funding to those activities that yielded stronger development impacts. However, since the project was restructured three times, indicators for cancelled activities (e.g., FMIS/MMIS) and activities with reduced relevance (e.g., off-grid mini hydropower) should have been cancelled or revised accordingly. PDO-level indicators that measured the whole national T&D system rather than the project areas should also have been revised during project restructuring.

4.35 Overall Bank performance is rated ***Moderately Unsatisfactory***.

**BORROWER PERFORMANCE**

4.36 ***The Government's performance is rated Moderately Unsatisfactory***. The GOV's ownership and commitment to achieving the PDOs was high. It was strongly committed to improving the efficiency of operations of EVN and the PCs and expanding rural electrification. During implementation, the GOV streamlined the excessive centralization and control, and adopted more flexible approaches to project implementation, including delegation of investment decisions and day-to-day investment management to EVN and the PCs.

4.37 Provision of counterpart funding was adequate. The GOV demonstrated continuing commitment by approving the additional financing to the project. However, the GOV showed strong reluctance to adjust power tariffs as required under the Credit Agreement and, therefore, the tariff covenant was later dropped. Despite recent GOV-approved tariff increases (slightly over the inflation rate), the power sector continues to experience serious and growing financial difficulties with power tariffs standing well be below true cost-recovery levels. The Local Distribution Utilities face particularly severe financial challenges. The GOV has not made any noticeable progress to date in the implementation of the equitization program supported under the project's institutional development component. In the initial stages of implementation, the project suffered from excessive GOV centralization and control, including complex and time-consuming approval processes involving hundreds of subprojects and procurement actions. This was a major implementation shortcoming for a project with an unusually high number of subprojects. Subsequently, this issue was addressed by the GOV through relaxing the centralized control by delegating more approval decisions to EVN and the PCs.

4.38 ***Implementing agency performance during the project is rated Satisfactory.*** The commitment of implementing agencies to achieving the PDOs was consistently strong, except for the lack of local community interest in off-grid micro hydropower plant schemes in remote areas due to the anticipated rapid grid extension. EVN and the PCs demonstrated technical and professional competence in carrying out project activities. Beneficiary and stakeholder consultations and involvement during project preparation were adequate, including implementing agencies' outreach to local communities and civil society organizations. The record in terms of implementation readiness, arrangements and capacity was mixed, especially for the subcomponents MIS/MMIS, the Remote Area Renewable Electricity programand equitization of community or district-based power utilities. However, these subcomponents constituted a relatively small part of the overall investment operations under the project.

4.39 There was a close working relationship between the implementing agencies and the Bank team and most of the implementation issues were openly discussed. For a number of implementing agencies and local governments the project was a learning experience in project implementation and management to comply with Bank policies.

4.40 Overall Borrower performance is rated ***Moderately Unsatisfactory***.[46]

**MONITORING AND EVALUATION**

4.41 **M&E Design**. The M&E system was overdesigned and too complicated. It included sector-related Country Assistance Strategy-level indicators (e.g., power sector investment ratio of GDP) that were not directly attributable to the project. In addition, there were too many (30) performance indicators. Indicators for the T&D systems were set for the entire national EVN national system, rather than for the parts benefiting from the project. Given the relatively small contribution[47] of the project to the rapidly expanding national system, this made it difficult to assess actual project outcomes. In retrospect, the project should have selected indicators more directly attributable to project interventions. M&E design did not examine data sources, reliability and collection carefully, relying instead on reports by national and local GOV agencies. Data on T&D systems relied on EVN's and the PCs' own performance management data. However, since these data pertain to EVN's entire national system, it was difficult to measure the specific contribution of the project. Use of the power system-level key performance indicators were not specific to the subject project but also were used in other T&D projects such as the TDDR Project and the Second T&D Project. Data reported by the implementing agencies for subprojects were also believed to be unreliable.

4.42 **M&E Implementation**. During the restructurings and the AF, the M&E indicators were significantly revised: Country Assistance Strategy-level indicators were dropped; indicators for sector reform were almost entirely modified; and those for the system efficiency improvement and rural electricity access components were also revised. Outcome-level indicators were to be reported at the end of the project, except for system efficiency improvement, which required annual reporting. Annual or biannual reporting would have been more appropriate. All intermediate and component level indicators were reported quarterly, which placed a burden on GOV agencies. Clearly, the M&E arrangements were difficult to implement due to hundreds of subprojects implemented by multiple implementing agencies which had not yet had M&E competency. However, some implementing agencies demonstrated commitment to improving M&E and providing requested data and compensated their capacity gap by allocating their own resources to hire consultants to help with data collection and analysis.

---

[46] Based on the Bank's Operational Policy and Country Services (OPCS) and IEG's harmonized evaluation guidelines, the overall borrower performance is the lower of the government and implementing agency's performance ratings, when the outcome rating is *moderately unsatisfactory* or lower.

[47] The project's contribution to the incremental growth of the entire EVN system during 2002-2012 was as follows: 220 kV transmission line: 7%, 200 kV transformers: 21%, 500 kV transformers: 8%.

4.43 **M&E Utilization**. Despite the original design shortcomings, M&E data on project progress were utilized to inform the 2007 restructuring and the 2010 additional financing. The data were used to inform decisions and reallocate resources. M&E data on T&D system are still being routinely collected after the closing of the project since these data have been integrated into the EVN and PCs' own performance management. However, the Bank should have made more efforts during project restructurings and the AF to replace the PDO-level indicators for the whole national power system by more relevant project-level indicators. Also, there was a lack of adequate attention to the need to follow up on activities for which key performance indicators and intermediate indicators were set (e.g., capacitor, corporate financing unit and gas market reform) partly due to too many indicators and activities, which were changed frequently.

4.44 Overall, ***M&E is rated Modest***.

# 5. Lessons

**In supporting the sector to move towards long-term financial viability and fiscal sustainability, the Bank should lay primary emphasis on broader institutional and policy measures for cost recovery. In contrast, specific target-oriented and time-bound measures in the form of tariff or financial performance covenants carry excessive political implementation risks and are prone to noncompliance by the Borrower.** Despite a number of financial performance measures that were included in their design, the three Bank operations were not effective in helping improve Vietnam's power sector finances, let alone place the sector on the road to sustained financial recovery. Considering this experience, the Bank should have pushed for a more systemic solution to the sector's long-simmering financial crisis through the introduction of a sound tariff methodology to ensure sustainable cost recovery and the power sector's future operational/financial sustainability, while making the sector more attractive to much-needed external private finance.

**A national push for universal electricity access provision will primarily depend upon the pursuit of a least cost path for grid expansion backed by appropriate sector policies, complemented by off-grid electricity in the interim or for the long-term as needed.** In Vietnam, as the electricity grid expanded faster than expected, the decreasing necessity and relevance of off-grid electrification was not adequately foreseen, resulting in some off-grid facilities falling into disuse or neglect. This experience points to the need for planning ahead, and making technical provision for integrating off-grid and mini-grid facilities with the grid when it arrives, so that the expected benefits are realized from the investments.

**Rapid growth in electrification can be accompanied by sub-optimal use of electricity especially in a situation of relatively low or subsidized tariffs. This calls for early and serious policy attention to improving Energy Efficiency and implementation of dedicated Energy Efficiency operations on a sizable scale.** The evidence shows that the Bank's program has essentially provided a supply-side support program for Vietnam's power sector, largely "following demand," as the GOV has done, with less

attention to demand side management. The marginal Bank-supported Energy Efficiency efforts (typically a small demand side management-style component under various power sector operations) has not been effective in to making a material difference to the Energy Efficiency landscape, let alone nationwide scale-up. The Transmission & Distribution sector – continues to play catch-up with increasing demand which needs to be moderated through appropriate measures including tariffs that better reflect cost-recovery levels. The extremely large reservoir of untapped Energy Efficiency opportunities calls for the creation of a solid framework for energy-saving efforts, including sizable programmatic support for Energy Efficiency, extending well beyond the piecemeal approach applied to date.

**The Bank should work to develop an understanding with client countries over the role of key institutions before embarking on full-fledged support for them. Otherwise, weak understanding might result in less than desirable institutional performance and sub-optimal use of technical assistance resources.** In Vietnam, the Bank should have pushed for agreement on a more autonomous professional regulatory agency, before committing to a large amount of capacity building support to ERAV. In the absence of serious support from the Government in this respect, ERAV's regulatory role has weakened somewhat over the years, and some of its resources have been diverted to non-regulatory type activities (e.g., administration of the competitive generation market) instead of focusing on core regulatory activities such as tariff methodology and quality-of-service regulation, monitoring and enforcement. While ERAV's overall technical competency may have improved over the years with sustained support from the Bank, the outcomes from its efforts are weak – sector finances continue to deteriorate, and the quality and reliability of electricity service for consumers has seen a downward trend in recent years.

**In a rapidly evolving sector environment, a *de facto* flexible approach should be adopted to adjust to changing priorities as well as new institutional and on-the-ground developments. Even if the changing situation could not be foreseen at the project design stage, such an approach would enable more smooth and successful implementation of the project.** This aspect is illustrated in all three projects and particularly in the SEIER project where both the Bank and Borrower responded to changed circumstances through project restructuring to allow flexibility for investing in subprojects that took on greater priority.

**The project M&E framework should focus on identifying the direct causal links between project interventions and outcomes to the maximum extent possible. This is particularly important, albeit challenging, in large and rapidly evolving sector context in which Bank-supported interventions only partially influence but do not determine overall outcomes.** In addition to being unnecessarily complicated with too many performance indicators, several key outcome indicators related to improved T&D reliability and efficiency were defined at the national system level, which made an accurate outcome assessment for the T&D component largely impossible or tentative at best under the TDDR and SEIER projects. While they are usually more challenging to design, in similar situations project-level indicators or appropriate proxies should be used for the relevant project areas.

**The community's involvement in the design, construction and operation of new rural electricity supply networks, and cost-sharing can lead to successful implementation and a sense of ownership.** Ensuring local participation in all aspects of the project helped mobilize and maintain local support and commitment to rural electrification, while ensuring a rapid pace of the process, creating employment, building local capacity and thereby laying the foundation for the sustainable management and operation of the networks. Significant cost sharing by local governments and the communities was an important element of the Vietnamese financing model for rural electrification. Mobilization of local funds was essential to close the funding gap. This requires appropriate mechanisms and enabling institutional and legal frameworks, not only at national, but also at local levels.

# References

AF Mercados EMI, “Strategic Options for Enhanced Financial Performance of EVN. Draft report on overall diagnosis of EVN,” Prepared for the World Bank and EVN, October 2013.

AF Mercados, “Strategic Options for Enhanced Financial Performance of EVN,” Draft report prepared for the World Bank and EVN, February 2014.

Barnes, Douglas F., editor, “The Challenge of Rural Electrification. Strategies for Developing Countries,” Resources for the Future, Washington, DC, 2007.

EVN Central Power Corporation, “Corporate Profile 2011-2014,” Da Nang, 2014.

“Global Energy Assessment. Toward a Sustainable Future,” Cambridge University Press, 2012.

Khander, Shahidur R., Douglas Barnes, Hussain Samad and Nguyen Huu Minh, “Welfare Impacts of Rural Electrification: Evidence from Vietnam,” World Bank Policy Research Working Paper No. 5057, 2009.

Nguyen, Anh Tuan, “A Case Study on Power Sector Restructuring in Vietnam,” Institute of Energy, Hanoi, 2012.

OED, “Rural Electrification: A Hard Look at Costs and Benefits,” World Bank, Washington, DC, May 1995.

Siyambalapitiya, Tilak and Vu Quang Dang, “System Efficiency, Equitization and Renewables (SEIER) Project Remote Area Rural Electrification (RARE) Program and Renewable Energy Small Producers’ (RESPP) Program. Report on Lessons Learnt,” December 2010.

Sustainable Energy for All, “Global Tracking Framework. Overview,” Washington, DC, 2013.

Thomas, Stephen, David Hall, Tue Anh Nguen, “Vietnam’s Electricity Sector: Is Competition the Answer?,” Public Services International Research Unit, University of Greenwich, London, March 2013.

Vagliasindi, Maria and John Besant-Jones, “Power Market Structure.Revisiting Policy Options,” World Bank, Washington, DC, 2013.

World Bank, “Addressing the Electricity Access Gap,” Background Paper for World Bank Group Energy Sector Strategy,” Washington, DC, June 2010.

World Bank, “Doing Business 2013,” Washington, DC, 2013.

World Bank, ‘Fueling Vietnam’s Development: New Challenges for the Energy Sector,” Report No. 19037-VN, December 1998.

World Bank, “One Goal, Two Paths. Achieving Universal Access to Modern Energy in East Asia and the Pacific,” Washington, DC, 2011.

World Bank, “Project Document for Third Power Sector Reform Development Policy Operation,” Report No. 77606-VN, Washington, DC, January 27, 2014.

World Bank, “State and People, Central and Local, Working Together: The Vietnam Rural Electrification Experience,” Washington, DC, 2011.

World Bank, “The World Bank Energy Sector Engagement in Vietnam: An Overview,” SN Power, October 23, 2013.

World Bank, “Toward a Sustainable Energy Future for All: Directions for World Bank Group’s Energy Sector,” Washington, DC, 2013.

World Bank, ASTAE, “Vietnam: Expanding Opportunities for Energy Efficiency, March 2010.

World Bank, “World Development Indicators,” Washington, DC.

World Economic Forum, “The Global Competitiveness Report 2011-2012,” Geneva, 2013.

# Annex A. Basic Data Sheet

**Transmission, Distribution and Disaster Reconstruction (P045628)**

**Key Project Data (amounts in US$ million)**

| | Appraisal estimate | Actual or current estimate | Actual as % of appraisal estimate |
|---|---|---|---|
| Total project costs | 426.4 | 268.5 | 63 |
| Loan amount (IDA) | 199.0 | 149.4 | 76 |
| Grant (Global Environmental Facility | - | - | - |
| Cofinancing | 16.6 | 11.5 | 69 |
| Cancellation | - | - | - |

**Cumulative Estimated and Actual Disbursements**

| | FY98 | FY99 | FY00 | FY01 | FY02 | FY03 | FY04 | FY05 | FY06 | FY07 | FY08 | FY08 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appraisal estimate (US$M) | 4.9 | 104.2 | 172.7 | 187.6 | 197.7 | 197.7 | 197.7 | 197.7 | 197.7 | 197.7 | 197.7 | 197.7 |
| Actual (US$M) | 0 | 2.9 | 10.8 | 17.4 | 25.2 | 72.9 | 96.2 | 109.1 | 117.9 | 137.9 | 149.4 | 149.4 |
| Actual as % of appraisal | 0 | 3 | 6 | 9 | 13 | 37 | 49 | 55 | 60 | 70 | 76 | 76 |

Date of last disbursement: 10/30/2008

**Project Dates**

| | Original | Actual |
|---|---|---|
| Appraisal | 10/06/1997 | 10/06/1997 |
| Board approval | 01/20/1998 | 01/20/1998 |
| Effectiveness | 02/12/1999 | 02/12/1999 |
| Closing date | 06/30/2002 | 06/30/2007 |

**Staff Time and Cost**

| Stage of Project Cycle | Staff Time and Cost (Bank Budget Only) | |
|---|---|---|
| | No. of staff weeks | USD ‘000 (including travel and consultant costs) |
| Lending | | |
| FY96 | | 8.74 |
| FY97 | | 164.94 |
| FY98 | | 108.63 |
| **Total:** | | **283.35** |
| **Supervision/ICR** | | |
| FY98 | | 52.02 |

| Stage of Project Cycle | Staff Time and Cost (Bank Budget Only) | |
|---|---|---|
| | No. of staff weeks | USD '000 (including travel and consultant costs) |
| FY99 | | 94.92 |
| FY00 | 31 | 81.40 |
| FY01 | 19 | 54.53 |
| FY02 | 25 | 86.26 |
| FY03 | 21 | 60.78 |
| FY04 | 23 | 57.14 |
| FY05 | 29 | 61.23 |
| FY06 | 12 | 48.53 |
| FY07 | 9 | 52.78 |
| FY08 | 1 | 3.28 |
| **Total:** | **170** | **652.87** |

**Task Team Members**

| Names | Title | Unit | Responsibility/ Specialty |
|---|---|---|---|
| **Lending** | | | |
| Darayes Mehta | Principal Power Engineer | EASEG | TTL |
| Rebecca Sekse | Financial Analyst | EASEG | |
| Enrique Crousillat | Senior Energy Economist | EASEG | |
| Jack Fritz | Environmental Specialist | EASES | |
| Maninder Gill | Resettlement Specialist | EASES | |
| Clifford Garstang | Counsel | LEGEA | |
| Ranjit Lamech | Restructuring Specialist | IENPD | |
| Carolyn Tager | DSM Specialist | ASTAE | |
| Jas Singh | DSM Specialist | ASTAE | |
| Anil Malhotra | Regional Energy Advisor | EACVF | |
| Hung Tien Van | Operations Officer | EACVF | |
| Theresa Gamulo | Task Assistant | EASEG | |
| **Supervision/ICR** | | | |
| Anil Malhotra | Regional Energy Advisor | EASEG | Team Leader (to end 2002) |
| Hung Tien Van | Senior Operations Officer | EASEG | Team Leader (to end 2004) |
| Richard Spencer | Senior Energy Specialist | EASEG/EASVS | Team Leader (to closing) |
| Rebecca Sekse | Financial Analyst | EASEG | |
| Ranjit Lamech | Restructuring Specialist | IENPD | |
| Carolyn Tager | DSM Specialist | ASTAE | |
| Jas Singh | DSM Specialist | ASTAE | |
| Kurt Schenk | Senior Power Engineer | EASEG | |
| Hong Vu | Resettlement Specialist | EACVF | |

| Names | Title | Unit | Responsibility/ Specialty |
|---|---|---|---|
| Mariko Ogawa | Financial Analyst | EASEG | |
| Quang Ngoc Bui | Operations Officer | EASVS | |
| Hung Viet Le | Financial Management Specialist | EAPCO | |
| Lien Thi Bich Nguyen | Program Assistant | EACVF | |
| Anh Nguyet Pham | Senior Operations Officer | EASVS | |
| Cung Van Pham | Financial Management Specialist | EAPCO | |
| Phuong Thi Thanh Tran | Senior Environmental Specialist | EASVS | |
| Kien Trung Tran | Senior Procurement Specialist | EAPCO | |
| Ky Hong Tran | Energy Specialist | EASVS | |
| Teresita G. Velilla | Program Assistant | EASTE | |
| Grayson Heffner | Energy Efficiency Specialist | Cons. | |
| Dilip Lamaye | Energy Efficiency Specialist | Cons. | |

**Rural Energy Project (P056452)**

**Key Project Data (amounts in US$ million)**

| | Appraisal estimate | Actual or current estimate | Actual as % of appraisal estimate |
|---|---|---|---|
| Total project costs | 201.6 | 203.2 | 101 |
| Loan amount (IDA) | 150.1 | 139.0 | 93 |
| Grant (PHRD) | - | - | - |
| Cofinancing | - | - | - |
| Cancellation | - | - | - |

**Cumulative Estimated and Actual Disbursements**

| | FY00 | FY01 | FY02 | FY03 | FY04 | FY05 | FY06 | FY07 | FY08 | FY09 |
|---|---|---|---|---|---|---|---|---|---|---|
| Appraisal estimate (US$M) | 2.2 | 43.6 | 112.7 | 138.9 | 150.1 | 150.1 | 150.1 | 150.1 | 150.1 | 150.1 |
| Actual (US$M) | 0 | 1.4 | 28.8 | 67.4 | 103.3 | 116.7 | 123.3 | 138.9 | 139.0 | 139.0 |
| Actual as % of appraisal | 0 | 3 | 26 | 49 | 69 | 78 | 82 | 93 | 93 | 93 |

Date of last disbursement: 06/28/2007

**Project Dates**

| | Original | Actual |
|---|---|---|
| Appraisal | 01/06/2000 | 01/06/2000 |
| Board approval | 05/30/2000 | 05/30/2000 |
| Effectiveness | 11/29/2000 | 11/29/2000 |
| Closing date | 06/30/2004 | 12/31/2006 |

**Staff Time and Cost**

| Stage of Project Cycle | Staff Time and Cost (Bank Budget Only) | |
|---|---|---|
| | No. of staff weeks | US$ '000s (including travel and consultant costs) |
| Lending | | |
| FY98 | | 17.6 |
| FY99 | | 184.7 |
| FY00 | 71 | 204.5 |
| FY01 | | 0.4 |
| FY02 | | 0.0 |
| FY03 | | 0.0 |
| FY04 | | 0.0 |
| FY05 | | 0.0 |
| FY06 | | 0.0 |
| FY07 | | 0.0 |
| **Total:** | **71** | **407.3** |

| | | |
|---|---|---|
| **Supervision/ICR** | | |
| FY98 | | 0.0 |
| FY99 | | 0.0 |
| FY00 | 7 | 7.1 |
| FY01 | 61 | 173.5 |
| FY02 | 28 | 75.8 |
| FY03 | 30 | 67.1 |
| FY04 | 23 | 41.6 |
| FY05 | 20 | 47.9 |
| FY06 | 25 | 65.8 |
| FY07 | 27 | 50.9 |
| **Total:** | **221** | **529.8** |

**Task Team Members**

| Names | Title | Unit | Responsibility/ Specialty |
|---|---|---|---|
| **Lending** | | | |
| Anil Malhotra | Task Team Leader | EASTE | |
| Rebecca Sekse | Financial Analyst | EASTE | |
| Enrique Crousillat | Senior Energy Economist | EASTE | |
| Ranjit Lamech | Restructuring Specialist | EASTE | |
| Anil Cabraal | Renewable Energy Specialist | EASTE | |
| Kurt Schenk | Principal Power Engineer | EASTE | |
| Hung Tien Van | Operations Officer | EACVF | |
| Thang Chien Nguyen | Procurement Officer | EACVF | |
| Clifford Garstang | Senior Counsel | LEGEA | |
| Pham Nguyet Anh | Energy specialist | EACVF | |
| Thuy Anh Nguyen | Team Assistant | EACVF | |
| Douglas French Barnes | Peer Reviewer | ETWES | |
| Lanfranco Blanchetti-Revelli | Social/Resettlement Specialist | Cons. | |
| Jack Fritz | Environmental Specialist | Cons. | |
| Arun Sanghvi | Peer Reviewer | Cons. | |
| **Supervision/ICR** | | | |
| Hung Tien Van | Task Team Leader | EACVF | |
| Kurt Schenk | Procurement Consultant | EACVF | |
| Anil Malhotra | Consultant | EACVF | |
| Rebecca Sekse | Financial Analyst | EASTE | |
| Kien Trung Tran | Procurement Officer | EACVF | |
| Quang Ngoc Bui | Operations Officer | EASSO | |
| Richard Jeremy Spencer | Senior Energy Specialist | EASTE | |
| Robert P. Taylor | Lead Energy Specialist | EASTE | |
| Phuong Thi Thanh Tran | Environmental Specialist | EACVF | |
| Lien Thi Bich Nguyen | Program Assistant | EACVF | |
| Beatriz Arizu de Jablonski | Senior Energy Specialist | EASTE | |
| Perter Meier | Consultant | | |

| | | | |
|---|---|---|---|
| Teri Velilla | Program Assistant | EASTE | |
| Ky Hong Tran | Energy Specialist | EACVF | |

**System Efficiency Improvement, Equitization and Renewables Project (P066396; P073778 [Additional Financing])**

**Key Project Data (amounts in US$ million)**

| | Appraisal estimate | Actual or current estimate | Actual as % of appraisal estimate |
|---|---|---|---|
| Total project costs | 347.9 | 419.5 | 120 |
| Loan amount (IDA) | 225.1 | 292.8 | 130 |
| Grant (GEF) | 4.5 | 4.1 | 91 |
| Cofinancing | - | - | - |
| Cancellation | - | - | - |

**Cumulative Estimated and Actual Disbursements (P066396)**

| | FY02 | FY03 | FY04 | FY05 | FY06 | FY07 | FY08 | FY09 | FY10 | FY11 | FY12 | FY13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appraisal estimate (US$M) | 0 | 11.3 | 90.0 | 193.5 | 213.8 | 225.0 | 225.0 | 225.0 | 225.0 | 225.0 | 225.0 | 225.0 |
| Actual (US$M) | 0 | 4.1 | 33.5 | 46.2 | 69.3 | 83.1 | 157.0 | 217.4 | 240.7 | 268.6 | 274.1 | 292.8 |
| Actual as % of appraisal | 0 | 36 | 37 | 24 | 32 | 37 | 70 | 97 | 107 | 119 | 122 | 130 |
| Date of last disbursement: 02/26/2013 | | | | | | | | | | | | |

**Cumulative Estimated and Actual Disbursements (P073778, Additional Financing)**

| | FY02 | FY03 | FY04 | FY05 | FY06 | FY07 | FY08 | FY09 | FY10 | FY11 | FY12 | FY13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Appraisal estimate (US$M) | 0 | 0 | 2.0 | 4.0 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Actual (US$M) | 0 | 0.3 | 0.3 | 0.4 | 0.7 | 1.0 | 1.6 | 2.5 | 2.8 | 4.1 | 4.1 | 4.1 |
| Actual as % of appraisal | 0 | - | 15 | 9 | 16 | 22 | 36 | 55 | 62 | 91 | 91 | 91 |
| Date of last disbursement: 04/19/2011 | | | | | | | | | | | | |

**Project Dates (P073778)**

| | Original | Actual |
|---|---|---|
| Appraisal | 01/18/2002 | 01/18/2002 |
| Board approval | 06/25/2002 | 06/25/2002 |
| Effectiveness | 02/19/2003 | 02/19/2003 |
| Closing date | 12/31/2007 | 12/31/2010 |

**Staff Time and Cost**

| Stage of Project Cycle | Staff Time and Cost (Bank Budget Only) | |
|---|---|---|
| | No. of staff weeks | US$ '000s (including travel and consultant costs) |
| **Lending** | | |
| FY00 | 13.99 | 29.31 |
| FY01 | 58.25 | 148.81 |
| FY02 | 106.34 | 228.38 |
| FY03 | 0.00 | 0.00 |
| **Total:** | **178.58** | **406.50** |
| **Supervision/ICR** | | |
| FY00 | 0.45 | 0.52 |
| FY02 | 0.00 | 0.04 |
| FY03 | 26.15 | 98.23 |
| FY04 | 22.34 | 56.32 |
| FY05 | 25.99 | 50.85 |
| FY06 | 36.00 | 69.40 |
| FY07 | 21.36 | 71.14 |
| FY08 | 32.00 | 62.07 |
| FY09 | 29.03 | 85.37 |
| FY10 | 17.06 | 68.50 |
| FY11 | 17.59 | 56.72 |
| FY12 | 23.84 | 74.23 |
| FY13 | 33.40 | 94.88 |
| **Total:** | **285.21** | **788.27** |

**Task Team Members**

| Names | Title | Unit |
|---|---|---|
| Anil Malhotra | Task Team Leader | EASTE |
| Rebecca Sekse | Senior Financial Analyst | EASTE |
| Kurt Schenk | Senior Power Engineer | EACVF |
| Ranjit Lamech | Senior Restructuring Specialist | EASTE |
| Susan Bogach | Senior Energy Economist | |
| Jon Exel | Renewable Energy Specialist | |
| Anil Cabraal | Senior Renewable Energy Specialist | EASTE |
| Jas Singh | Energy Efficiency Specialist | ASTAE |

| Names | Title | Unit |
|---|---|---|
| Jack Fritz | Environmental Specialist | Cons. |
| Mary Judd | Senior Anthropologist | |
| Behdad Nowroozi | Senior Financial Maanagement Specialist | EASTE |
| Mei Wang | Legal Counsel | LEGAM |
| Hung Tien Van | Senior Operations Officer | EASVS |
| Anh Nguyet Pham | Operations Officer | EASIS |
| Thang Chien Nguyen | Procurement Specialist | EACVF |
| Kien Trung Tran | Procurement Analyst | EASR2 |
| Hong Vu | Operations Officer (Resettlement) | EACVF |
| Phuong Thi Thanh Tran | Environmental Specialist | EACVF |
| Jitu Shah | Senior Environmental Specialist | ECSEN |
| Quyen Duong Do | Disbursement Analyst | |
| AnhThuy Nguyen | Program Assistant | EASHH |
| Hung Viet Le | Financial Management Officer | EAPCO |
| Arun Sanghvi | Peer Reviewer | Cons. |
| Douglas Barnes | Peer Reviewer | Cons. |
| H. Ezaki | Peer Reviewer (JBIC) | |
| Anh Nguyet Pham | Senior Energy Specialist | EASIS |
| Hung Tien Van | Senior Energy Specialist | EASVS |
| Franz Gerner | Lead Energy Specialist | EASVS |
| Beatriz Arizu de Jablonski | Senior Energy Specialist | EASWE |
| Cung Van Pham | Senior Financial Management Specialist | EASFM |
| Dilip R. Limaye | Consultant | ECSEG |
| Dung Kim Le | Team Assistant | EACVF |
| Hoi-Chan Nguyen | Consultant | OPCIL |
| Hung Tan Tran | Power Engineer | EASVS |
| Kien Trung Tran | Senior Procurement Specialist | EASR2 |
| Ky Hong Tran | Energy Specialist | EASVS |
| Lien Thi Bich Nguyen | Program Assistant | EACVF |
| Mai Thi Phuong Tran | Financial Management Specialist | EASFM |
| Quang Ngoc Bui | Operations Officer | EASVS |
| Ramesh Sivapathasundram | Lead Information Officer | TWICT |
| Richard Jeremy Spencer | Country Sector Coordinator | SASDE |
| Phuong Thi Thanh Tran | Senior Environmental Specialist | EASVS |
| Yen Thu Thi Cao | Consultant | EASVS |
| Natsuko Toba | Senior Economist | EASWE |
| Daisuke Miura | Energy Specialist | EASVS |
| Hanh Thi Huu Nguyen | Financial Management Specialist | EASFM |
| Nghi Quy Nguyen | Social Development Specialist | EASVS |
| Son Van Nguyen | Environmental Specialist | EASVS |
| Thi Ba Chu | ET Consultant | EASVS |
| Peter Meier | Economic Consultant | EASIS |

| Names | Title | Unit |
|---|---|---|
| Dung Manh Tran | Consultant | EASFM |
| Ly Thi Dieu Vu | Consultant | LCSEN |
| Joel Maweni | Operations Advisor | EASSD |
| Thuy Bich Nguyen | Program Assistant | SECPO |
| Hiep Quan Phan | Financial Officer | |
| Jennifer Thomson | Senior Financial Management Specialist | OPSOR |
| LanThi Thu Nguyen | Natural Resources Economist | EASVS |
| Van Nguyen Thanh | | |
| Hung Viet Le | Financial Management Specialist | EAPCO |
| Teri Vellila | Program Assistant | |
| Philip Gray | Senior Energy Economist | |
| Grayson Heffner | Consultant | |
| Hien Minh Vu | Program Assistant | EASWE |
| Teresita Ortega | Program Assistant | EASWE |

## Annex B. World Bank Power Sector Projects in Vietnam: IDA and IBRD

| No. | Project ID | Project Name | Approval Date | Closing Date | Project Cost (US$ Million) | IDA/ IBRD (US$ Million) | Local/ Others (US$ Million) |
|---|---|---|---|---|---|---|---|
| 1 | P004836 | Power Sector Rehabilitation and Expansion | 5/16/1995 | 6/30/2000 | 186.7 | 137.96 | 48.74 |
| 2 | P042236 | Power Development | 2/20/1996 | 12/31/1999 | 216.19 | 179.61 | 36.58 |
| 3 | P045628 | Transmission, Distribution and Disaster | 1/20/1998 | 6/30/2007 | 248.46 | 149.57 | 98.89 |
| 4 | P056452 | Rural Energy | 5/30/2000 | 12/31/2006 | 203.47 | 150.92 | 52.55 |
| 5 | P066396 | System Efficiency Improvement, Equitization and Renewables | 6/25/2002 | 12/31/2012 | 419.50 | 299.70 | 119.80 |
| 6 | P074688 | Rural Energy 2 | 11/18/2004 | 6/30/2014 | 329.50 | 220.00 | 109.50 |
| 7 | P084871 | Transmission and Distribution 2 | 7/28/2005 | 6/30/2014 | 200.00 | 200.00 | |
| 8 | P099211 | Rural Distribution | 5/22/2008 | 6/30/2013 | 153.08 | 150.00 | |
| 9 | P103238 | Renewable Energy Development | 5/5/2009 | 6/30/2014 | 204.27 | 202.00 | |
| 10 | P113495 | Rural Energy 2, Additional Financing | 5/21/2009 | 6/30/2014 | 200.00 | 200.00 | |
| 11 | P115874 | Power Sector Reform DPO | 4/6/2010 | 8/31/2011 | 311.80 | 311.80 | |
| 12 | P120540 | System Efficiency Improvement, Equitization and Renewables, Additional Financing | 6/23/2010 | | 25.36 | 25.36 | |
| 13 | P114875 | Transmission and Distribution 2, Additional Financing | 3/29/2011 | | 180.00 | 180.00 | |
| 14 | P084773 | Trung Son Hydropower | 4/26/2011 | 12/31/2017 | 411.72 | 330.00 | 81.72 |
| 15 | P124174 | Power Sector Reform DPO2 | 3/22/2012 | 7/31/2013 | 200.00 | 200.00 | |
| 16 | P125996 | Distribution Efficiency | 9/11/2012 | 12/31/2018 | 448.90 | 448.90 | |
| 17 | P144675 | Power Sector Reform DPO3 | FY15 (under prep.) | | 200.00 | 200.00 | |
| 18 | P131558 | Transmission Efficiency | FY15 (under prep.) | | 700.00 | 500.00 | |

# Table 2. World Bank Power Sector Projects in Vietnam: Trust Fund Projects

| No. | Project ID | Project Name | Approval Date | Closing Date | Project Cost (US$ Million) | Trust Fund (US$ Million) |
|---|---|---|---|---|---|---|
| 1 | P071019 | GEF* Demand Side Management and Energy | 6/24/2003 | 6/30/2010 | 4.81 | 4.81 |
| 2 | P080074 | GEF Rural Energy 2 | 11/18/2004 | 6/30/2014 | 5.00 | 5.00 |
| 3 | P099211 | Rural Distribution Project (AusAID) | 5/22/2008 | 6/30/2013 | 3.08 | 3.08 |
| 4 | P103238 | Renewable Energy Development Project Donor: Swiss State Secretariat for Economic Affairs | 5/5/2009 | 6/30/2014 | 2.27 | 2.27 |
| 5 | P116846 | GEF Clean Production and Energy Efficiency | 7/5/2011 | 6/30/2016 | 2.00 | 2.00 |
| 6 | P125996 | Distribution Efficiency Project Donor: AusAID (US$6.89 m) and Multiple Donors (US$30.00 m) | 9/11/2012 | 12/31/2018 | 36.89 | 36.89 |

*Global Environment Facility

# Annex C. List of Persons Met

**Government of Vietnam**

Ministry of the Industry and Trade (MoIT), General Directorate of Energy
*Mr. Le Tuan Phong,* Deputy Director General
*Mr. Hoang Trong Hieu,* Deputy Director of Rural Electrification and Power Network Department
*Mr. Nguyen Ninh Hai,* Deputy Director of Renewable Energy Department

Electricity Regulatory Authority of Vietnam (ERAV), MoIT
*Mr. Nguyen Vu Quang,* Deputy Director General
*Mr. Nguyen The Huu,* Acting Director of of Power Market Development Research and Training Centre
*Ms. Dao Minh Hien*, Director of Planning, Supply-Demand Balance Department
*Mr. Tran Tue Quang*, Director of Tariff Department
*Mr. Pham Quang Huy*, Director of Power Market Department

Ministry of Finance
*Ms. Nguyen Lan Anh*, Deputy Manager of Multilateral Division
*Ms. Khuc Thu Phuong*, Expert of Multilateral Division

Dien Bien Provincial People's Committee
*Mr. Hoang Van Nhan,* Vice Chairman
*Mr. Vu Lenh Nghi,* Deputy Director of Provincial Department of Planning and Investment
*Mr. Nguyen Van Hoan,* Deputy Director of Provincial Department of Finance
*Mr. Nguyen Van Gioi,* Manager of Electricity Division of Provincial Department of Industry and Trade

Muong Te District, Lai Chau Province
*Mr. Nguyen Xuan Truong*, Vice Chairman of Muong Te District People's Committee
*Mr. Ly Ha Ca*, Vice Manager of District Department of Industry and Trade
*Mr. Le Thanh Tam,* Vice Director of Project Management Unit

Electricity of Vietnam (EVN)
*Ms. Luong Thi An,* Deputy Director of International Cooperation Department
*Ms. Nguyen Thi Lam Giang*, Expert of International Cooperation Department
*Mr. Ta Tuan Anh,* Expert of Technical Department
*Mr. Phan Sy Binh Minh*, Expert of Business Department
*Ms. Nguyen Hoang Dieu Huong,* Expert of Finance

National Load Dispatch Centre
*Mr. Quach Tien Dzung,* Deputy Manager of Dispatching Department
*Mr. Nguyen Thanh Long*, Deputy Manager of Planning & Material Department

National Power Transmission Corporation (NPT)
*Mr. Vu Tran Nguyen,* Vice President
*Ms.Luong Lan Dzung,* Director of International Relations Department
*Ms. Nguyen Hoai Anh,* Deputy Director of Accounting Department
*Mr. Luu Van Hung,* Expert of International Relations Department
*Mr. Cao Duc Dzung,* Expert of Technical Department

Northern Power Corporation (NPC)
*Ms. Ha Thi Minh Hue,* Director of International Economic Relations Department
*Ms. Tong Bao Ngoc,* Expert of Accounting Department
*Ms. Truong Thuy Lieu,* Expert of Business Department
*Mr. Pham Ky Nam,* Expert of Power Network Projects Management Unit
*Mr. Nguyen Huu Hau,* Expert of Planning Department
*Mr. Doan Van Sam,* Expert
*Mr. Vo Trong Hung,* Expert

Central Power Corporation (CPC)
*Mr. Nguyen Thanh,* Deputy Director General
*Ms. Phan Thi Dieu Lien,* Director of International Cooperation Department
*Mr. Nguyen Anh Tuan,* Manager of International Cooperation Department
*Mr. Nguyen Van Duc,* Director of Technical Department
*Mr. Nguyen Thanh Dat,* Deputy Director of Rural Electrification Projects Management Unit
*Mr. Tran Quan,* Deputy Director of Power Network Projects Management Unit
*Mr. Nguyen Quang Hung,* Deputy Director of Business Department

Southern Power Corporation (SPC)
*Mr. Hoang Huu Thoi,* Vice Director of International Cooperation Department
*Mr. Duong Huu Tuong,* Vice Director of Human Resource Development Department
*Mr. Nguyen Khoa Dinh Quy,* Expert of Technical Department
*Mr. Tran Huu Vinh,* Expert of Business Department
*Ms. Cong Thi Thuy Van,* Expert of Finance

Dien Bien Provincial Power Company
*Mr. Pham Van Lanh,* Deputy Director

Muong Te Hydropower Company, Lai Chau Province
*Mr. Mai Van Manh,* Director

**Non-governmental Institutions**

Thu Duc Steel Joint Stock Company
*Mr. Hoang Ngoc Oanh,* Director General
*Mr. Hoang Cong Thanh,* Manager of Technical Department
*Mr. Nguyen Tien Thinh,* Deputy Manager of Technical Department

Vietnam Energy Association
*Mr. Tran Viet Ngai,* Chairman
*Mr. Pham Quang Luc,* Vice Chairman
*Mr. To Quoc Tru,* Energy Specialist

Institute of Energy
*Mr. Nguyen Anh Tuan,* Manager of International Cooperation Department

**PROJECT SITE VISITS**

National Load Dispatch Centre, Hanoi
*Mr. Nguyen Thai Minh,* Operation Engineer of Power Market

Load Dispatch Central of Central Region, Da Nang
*Mr. Truong Van Thien,* Operation Engineer

**Substations**

110 kV Dai Loc, Quang Nam Province
*Mr. Vo Khac Hoang,* Manager of Technical Department of Central Grid Company
*Mr. Nguyen Trung Hieu,* Operator
*Mr. Ngo Xuan Trung,* Operator

110 kV/220 kV Tao Dan, Ho Chi Minh City
*Mr. Bui Van Hoang,* Vice Director of Eastern 2 Power Transmission Branch
*Mr. Truong Vu Thanh,* Deputy Manager of Technical Department of PTC 4
*Mr. Nguyen Thien Tam,* Deputy Manager of Technical Division of Eastern 2 Power Transmission Branch
*Mr. Nguyen Van Tam,* Manager

500 kV Phu Lam, Ho Chi Minh City
*Mr. Vo The Chau,* Manager

Local Distribution Utility, Cao Minh Commune, Xuan Hoa Township, Vinh Phuc Province
*Mr. Nguyen Hoai Nam,* Vice Director of Project Management Unit of Vinh Phuc Province
*Mr. Nguyen Van Quyen,* Vice Manager of Electricity Division of Provincial Department of Industry and Trade
*Mr. Duong Duc Bo,* Director
*Mr. Tran Van Luong,* Chief Accountant

**Hyropower Plants**

Nam Si Luong, Pa U and Ban Giang Hydropower Plants, Muong Te District, Lai Chau Province
*Mr. Nguyen Dang Luong,* Director of District Operation and Management Enterprise
*Mr. Tran Ngoc Tu,* Expert of Project Management Unit
*Mr. Tong Van Hieu,* Operator

**Off-grid Commune**
Pa U Commune, Muong Te District, Lai Chau Province
*Mr. Lo Van Hieng,* Commanding Officer of Pa U Military Station
*Mr. Le Cong Thanh,* Political Instructor of Pa U Military Station
*Ms. Nguyen Thi Kim Hai,* Headmaster of Pa U Kindergarten and Primary School

**Grid-connected Commune**
Nam Khao Commune, Muong Te District, Lai Chau Province
*Mr. Lo Van Hung,* Secretary of the Commune Communist Party Committee

**World Bank Group**

Washington, DC:
*Mr. Pedro Antmann,* Lead Energy Specialist, AFTG1, Co-TTL of DPO3
*Mr. Alain Barbu,* Consultant, former Operations and Portfolio Manager for Vietnam
*Ms. Beatriz Arizu de Jablonski,* Consultant
*Mr. Charles Feinstein,* Sector Manager, Water and Energy, Sustainable Development Department, EASWE
*Mr. Ajay Chhibber*, former Country Director for Vietnam
*Mr. Peter Johansen,* Senior Energy Specialist, EASWE, TTL of Proposed Vietnam Transmission Efficiency Project
*Mr. Ranjit Lamech*, Energy Sector Manager, ECSEG
*Mr. Dejan Ostojic*, Sector Leader, EASWE
*Mr. Jas Singh,* Senior Energy Specialist, ECSEG
*Mr. Richard Jeremy Spencer,* Lead Energy Specialist, SASDE, former Country Sector Coordinator for Vietnam
*Ms. Natsuko Toba*, Senior Economist, EASWE, ICR Team Leader for SEIER Project

Vietnam Country Office, Hanoi:
*Ms. Nguyen Cam,* Consultant
*Ms. Victoria Kwakwa*, Country Director for Vietnam, EACVF
*Ms. Keiko Sato*, Porfolio and Operations Manager, EACVF
*Ms. Jennifer J. Sara*, Sector Manager, HANWB
*Mr. Franz Gerner*, Lead Energy Specialist, HANWB, Energy Sector Coordinator for Vietnam, Co-TTL of DPO3
*Mr. Van Tien Hung,* Senior Energy Specialist, HANWB, TTL for REP (supervision/ICR)
*Mr. Tran Hong Ky,* Energy Specialist, HANWB, TTL for SEIER (supervision/ICR)
*Mr. Chu Ba Thi*, HANWB, Energy Specialist

IFC, Regional Office, Hanoi:
*Mr. Simon Andrews,* Regional Manager
*Ms. Vu Tuong Anh, Technical* Specialist, Energy Efficiency and Cleaner Production
*Ms. Tran Thu Hang,* Investment Officer, Infrastructure
*Ms. Cung Mai Loan,* Associate Investment Officer

**Asian Development Bank**
*Mr. Au Minh Tuan,* Senior Project Officer, Energy, Vietnam Resident Mission, Hanoi