The World Bank

Asia Sustainable and Alternative Energy Program

Vietnam

State and People, Central and Local, Working Together

The Rural Electrification Experience

March 2011

ASTAE

The World Bank

Asia Sustainable and
Alternative Energy Program

State and People, Central and Local, Working Together:

The Vietnam Rural Electrification Experience

Defne Gencer, Peter Meier, Richard Spencer, and Hung Tien Van

March 2011

ASTAE

State and People, Central and Local, Working Together: The Vietnam Rural Electrification Experience

1818 H Street NW
Washington DC 20433 USA
Telephone: (202) 473-1000

First printing: March 2011
Manufactured in the United States of America.

Photo credits: Hung Tien Van

Contents

Part C. Lessons Learned from Vietnam's Rural Electrification Experience

Boxes

Figures

Tables

The printed version of this report includes a DVD of the documentary film *The Last Mile: Bringing Electricity to the Countryside of Vietnam*, produced as part of the broader activity to record Vietnam's achievements in rural electrification. The documentary can also be viewed at **http://www.youtube.com/watch?v=pmrEY0jwoXM**.

Foreword

The 15 years that the Government of Vietnam and the World Bank have been working together on the electrification of Vietnam have witnessed remarkable changes. From the early days of our collaboration, when the power system had just been unified, through to today, when more than 95 percent of all households have access to electricity, there is a compelling story. It is not only a story of policies and institutions, or of financing and tariffs. It is also a story of Vietnam's growth as a nation and as a society built on the unifying force of electrification.

From the beginning, the people of Vietnam have made clear their message that getting electricity into their houses has been of the utmost importance to them. They wanted it because they saw its potential to improve their lives in so many ways: at work, at school, in the hospitals, and at home. And Vietnamese people are not shy in demanding what they want from the communes, districts, provinces, and central ministries—and in the national assembly, leaders have heard the message. Our initial steps may have been faltering, and it would be wrong to suggest that it has been a completely smooth ride. There is more to be done to connect the 5 million people who still don't have a regular supply of electricity, as well as to improve the supply to those who do have it. Even as I write, many continue to strive to go the last mile and complete our electrification mission.

I recommend this book to all those interested in bringing electricity to the people of the developing world and am happy to share Vietnam's experience with any and all who are interested. On behalf of the Government of Vietnam, I extend an invitation to all countries that want to learn more to come and see for themselves firsthand. We would be delighted to see you.

Hoang Trung Hai
Deputy Prime Minister

Preface

This book chronicles the development of Vietnam's rural electrification program. It tells the story of how the Vietnamese government conceived, developed, scaled up, and improved its program. It also discusses the role the government, the country's main utility, local authorities, local communities, and the country's international development partners played in the pursuit of the electrification agenda.

The book provides an overview of the strategies that fueled the impressive expansion of access to electricity in Vietnam, the development of the institutions that implemented the program, and the passage of policies and laws that made growth of such scale possible. It also discusses results from the ground, and particularly the impacts of electrification on people's lives. It concludes with an attempt to draw lessons from Vietnam's experience.

This activity is intended to benefit multiple audiences in different ways. The target audience includes policy makers and electrification practitioners from other countries facing a similar rural electrification challenge; World Bank task teams working on similar operations; and decision makers and practitioners in the energy sector in Vietnam.

These lessons drawn and subsequent recommendations are intended for policy makers in other developing countries facing the challenge of expanding access to electricity who may want to learn from Vietnam's experience. Takeaway messages from the World Bank's project experience in supporting the rural energy sector may be of interest to World Bank staff developing similar projects in other countries. Finally, this book may be useful for decision makers and energy sector practitioners in Vietnam, through documenting the context of the overall electrification effort in Vietnam, providing an overview of issues, and discussing possible approaches for addressing remaining challenges.

This book draws on investigations and analyses undertaken as part of two separate activities:

- The first was an effort, funded by the Bank Budget and the Asia Sustainable and Alternative Energy Program (ASTAE), to document the history of Vietnam's rural electrification program. This activity was undertaken by World Bank staff with input from international consultants.
- The second was an exercise funded by ASTAE, the Energy Sector Management Assistance Program (ESMAP), New Zealand Aid, and the Swedish International Development Cooperation Agency (SIDA), and managed by Bank staff. This activity set out to examine the impacts of rural electrification on households in Vietnam, based on results from a series of three longitudinal surveys undertaken in 2002, 2005, and 2008, as well as subsequent analysis carried out by the Vietnam Institute of Sociology and international consultants. This book summarizes a selection of findings of the multiyear survey that were deemed relevant for its own purposes. A more detailed and comprehensive publication presenting the findings and analysis resulting from that exercise is also under preparation, and will be published separately.

The book comprises three main parts:

- **Part A,** made up of eight sections, provides an overview of Vietnam's rural electrification experience, which can be divided into six distinct periods. These sections are organized as follows:
  - Section A1 provides the general background on the impressive achievements in the rural electrification effort in Vietnam, and provides a brief introduction to the government's efforts, which are supported by the government's international partners in the later years.
  - Section A2 discusses the period covering the postwar years from 1976 to 1985, when the primary focus was recovering from the devastation of the war.
  - Section A3 introduces the government's efforts for scaling up rural electrification from 1986 to 1993.

- Section A4 covers the period from 1994 to 1997, when electrification accelerated significantly. This period also marks the beginning of the World Bank's involvement in Vietnam and the start of the preparation of the early projects in the energy sector.
- Section A5 covers the period from 1998 to 2004, when institutional change and regulation of the sector was initiated, in step with other reforms in the power sector. This period was also host to the implementation of the government's and the World Bank's Rural Energy Project (REP) and the beginning of the preparation of the Second Rural Energy Project (RE2).
- Section A6 discusses the continued progress between 2005 and 2008, including a focus on quality and ensuring efficiency in the sector and investments in network rehabilitation. This period also covers the implementation of the RE2.
- Section A7 discusses 2009 onwards, along with the challenges associated with going the "last mile" in Vietnam's electrification program.
- Section A8 discusses the tasks and challenges facing Vietnam's rural electrification program as it goes forward.

- **Part B** summarizes a select set of findings from the multiyear survey and discusses the impact of rural electrification on Vietnamese households.

- **Part C** draws lessons from the experience of rural electrification in Vietnam, based on the information presented in parts A and B. It discusses the lessons learned from the perspectives of the government and the World Bank.

Acknowledgments

The primary authors of this book are Defne Gencer, Peter Meier, Richard Spencer, and Hung Tien Van. It also draws on material prepared by consultants Anil Malhotra and Douglas Barnes, and a panel survey carried out by the Vietnam Institute of Sociology.

The book benefited from feedback provided by the Vietnam energy team, particularly Anh Nguyet Pham, Beatriz Arizu, and Ky Hong Tran. The authors are especially thankful to reviewers Susan Bogach, Luiz Maurer, and Dana Rysankova. The authors would like to recognize editor Rebecca Kary, graphic designer Laura Johnson, and consultant Laurent Durix for their contributions to the production of this publication.

The authors would like to acknowledge the leadership of Hoang Trung Hai, Deputy Prime Minister.

The authors are also thankful to Jennifer Sara, Vijay Jagannathan, Junhui Wu, and Hoonae Kim of the World Bank for their encouragement in pursuing this topic.

The team working on the broader effort to document Vietnam's achievements with respect to rural electrification would like to recognize all those who contributed to this activity and the production of the accompanying documentary film, "The Last Mile." They include Do Huu Hao, Vice Minister of Ministry of Industry and Trade; Le Tuan Phong, Deputy Director, Energy Department of Ministry of Industry and Trade; Do Van Chien, Vice Chair, People's Committee of Tuyen Quang; Nguyen Minh Hieu, Vice Rector, Electricity University; Nguyen Manh Hung, Deputy General Director, EVN; Trinh Ngoc Khanh, Director of Rural Electrification and Business Department, EVN; Nguyen Thanh Duy, Director of Power Company No. 2; Nguyen Phuc Vinh, Director of Power Company No. 1; Nguyen Van Nhiem, Director, Power Service, Soc Trang; Trinh Cong Huy, Worker, PC2; Nguyen Bach Hai, Power Service, Soi Tien; Tran Huy Quang, Farmer, Tuyen Quang; Lien Hanh, Sawmill Owner, Yen Lac; Tran Van Lam, Shrimp Farmer; Soc Trang; Nguyen Ngoc Cam, Teacher, Soc Trang; and Duong Ngoc Kim, CEO of FIMEX Shrimp Processing Factory, Soc Trang.

The team is greatly appreciative of ASTAE, ESMAP, the Government of the Netherlands, New Zealand Aid, and SIDA for providing the resources to make this activity and its results possible.

Unless otherwise credited, photos were contributed by Hung Tien Van.

Acronyms and Abbreviations

ASTAE	Asia Sustainable and Alternative Energy Program
CEG	Commune electricity group
CFL	Compact fluorescent lamp
DEG	District electricity group
DoIT	Department of Industry and Trade
DPO	Development Policy Operation
ERR	Economic rate of return
ESMAP	Energy Sector Management Assistance Program
EVN	Vietnam Electricity
FRR	Financial rate of return
GDP	Gross domestic product
GOV	Government of Vietnam
GSO	Government Statistics Office
GWh	Gigawatt-hour
HH	Household
IBT	Incremental block tariff
IoS	Institute of Sociology
KfW	Kreditanstalt für Wiederaufbau
kLmh	Kilolumen-hour
kV	Kilovolt
kWh	Kilowatt-hour
LDU	Local distribution utility
LV	Low-voltage
MPI	Ministry of Planning and Investment
MTR	Mid-Term Review
MV	Medium-voltage
MW	Megawatt
NGO	Nongovernmental organization
NPT	National Power Transmission Company
OPEC	Organization of Petroleum Exporting Countries
PC	"Power Company" before February 2010 and "Power Corporation" thereafter
PPC	Provincial People's Committee
RARE	Remote Area Rural Electrification
RE2	Second Rural Energy Project
REP	Rural Energy Project
SIDA	Swedish International Development Cooperation Agency
TWh	Terawatt-hour
US¢	U.S. cents
Vhour	Viewing hours
VAT	Value added tax
VHLSS	Vietnam Household Living Standards Survey
VND	Vietnamese dong

Exchange Rates

Effective dates	US$1 equivalent Vietnamese dong
December 31, 1986	80
December 31, 1988	2,800
December 31, 1994	11,003
December 31, 1998	13,892
December 31, 2005	15,893
December 31, 2009	18,474
December 31, 2010	19,498

Executive Summary

The rural electrification effort in Vietnam has been one of remarkable achievements, with the share of households with electricity access growing from 2.5 percent in 1975, to 96 percent by 2009. Through a remarkable and unparalleled effort, the country succeeded in providing access to more than 80 million people over 33 years; the number of people with access to electricity grew from 1.2 million in 1976 to about 82 million in 2009.

The efforts of Vietnamese authorities addressed a wide array of challenges along the way and successfully balanced the sometimes-competing interests of local, provincial, and central governments. Government programs, combined with support from the government's development partners in the later years, created an institutional structure for rural electricity supply, which bodes well for long-term sustainable development.

Vietnam's rural electrification program and its priorities have evolved over time. The issues encountered during the course of the rural electrification effort were constantly changing, and the challenges that had to be tackled were daunting. The country did not have one unified master plan at the outset. It started one way, and has continually evolved in the way it tackled the challenges, which themselves were changing. The challenge of the early stages—providing simple connections—evolved into one of securing quantity and quality of supply, while meeting ever-burgeoning urban and rural energy demand.

The History of Rural Electrification in Vietnam

A brief summary of the various phases of Vietnam's rural electrification experience is provided below.

During the postwar **recovery period** (1976–85), when the household electrification rate grew from 2.5 percent to 9.3 percent, 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 service to rural households was secondary to electricity supply for productive uses, especially irrigation of agricultural areas.

The **preparation period** (1986–93) saw the implementation of the *Doi Moi* reforms, which had a significant impact on all aspects of the Vietnamese economy. During this period, the household electrification rate grew from 10 percent to 14 percent. Although there wasn't a large jump in the proportion of households electrified per se during this period, the policy decisions made and steps taken subsequently had major repercussions on rural electrification. Highlights included the increase in rural incomes as a result of *Doi Moi*, the development of several large power plants across the country, the building up of medium-voltage (MV) networks, and the start of the construction of the 500 kV transmission line running the length of the country, which would also serve as a unifying force. The foundations laid by these important developments would enable significant progress in rural electrification in the subsequent periods.

The **taking off period** (1994–97) witnessed remarkable growth in electrification, with the share of households with access to electricity increasing from 14 percent to 61 percent. A notable feature of the progress during this period was the strong demand-driven, bottom-up process that characterized rural electrification. By all accounts, people really wanted to gain access to electricity and they were prepared to pay for it. The local and central government authorities responded to the strong societal demand for electricity. Indeed, by the mid-1990s, electricity access rates had become one of the key indicators in the yearly socioeconomic development assessment of every commune, district, and province. Meeting the increase in demand for electricity access had become possible with the completion and coming into operation of the last unit of the Hoa Binh Hydropower station, as well as other relatively large power plants, and the 500 kV transmission line, making additional energy available throughout the whole country. Other important developments during this period included the establishment of Electricity of Vietnam (EVN)[1] in 1995 and the setting of clear nationwide electrification targets by the government in 1996. During this period, the government and the World Bank began preparing their first energy sector project together.

1. When it was established in 1995, EVN's proper name was Electricity of Vietnam. Its name was changed to Vietnam Electricity in 2004, when it was converted into a holding company, referred to as "corporation," in the Vietnamese context.

After a time of rapid growth in electrification, the most accessible sources of financing had been depleted, and issues with the management and operation of rural electricity networks had begun to emerge. There were inadequacies in two important areas: institutional arrangements and technical specifications for rural networks. The roles of EVN and its Power Companies (PCs) with regard to distribution were limited to bringing electricity to commune centers, and there was no national policy on how to connect households beyond that point, or what institutional arrangements should be followed. Consequently, a wide variety of operational and management arrangements for delivering electricity emerged. The flexibility provided by the availability of multiple methods for financing and building LV networks contributed to the rapid pace with which these networks were built in such a short time. On the other hand, the variety of entities that were allowed to build the LV networks also meant that there was divergence in their institutional capabilities, and in the manner in which the LV networks were managed, operated, and maintained. The low efficiency with which some of those networks were run, combined with the lack of financial controls on the operation of the system, in turn had an effect on how much consumers ended up paying for electricity. There were no minimum technical requirements for LV networks, which meant that those built around this time were built according to divergent technical specifications. This, in turn, was to lead to issues that had to be tackled in the subsequent periods.

During the next period, there was a **move toward better regulation** (1998–2004). Although the growth in electricity access rates—from 61 percent of households to 87 percent over the course of seven years—was slower than during the previous period, this period was host to a series of fundamental changes in the sector, which would pave the way for sustained success in the coming years. A significant feature of this period is more pronounced government involvement in determining the course of rural electrification, through defining strategies for the planning, implementation, and management of rural electrification; setting the legal framework in the sector; and engaging with its international partners for the implementation of its strategic priorities. In addition to important actions, such as the prime minister's Decision 22 and government Decree 45, which set out institutional and financial arrangements for the electricity system, this period also witnessed the passing of the country's first electricity law and issuing of a policy paper on rural electrification. Another critical government initiative at the time was the setting of a ceiling tariff for rural customers as a step toward establishing financial controls over the rural electricity supply business. The government and the World Bank's Rural Energy Project (REP), which was financed by a US$150 million IDA credit, was approved during this period. As part of the preparatory work for this project, technical specifications for rural electricity systems in Vietnam were developed, and these standards were formally adopted in the later years.

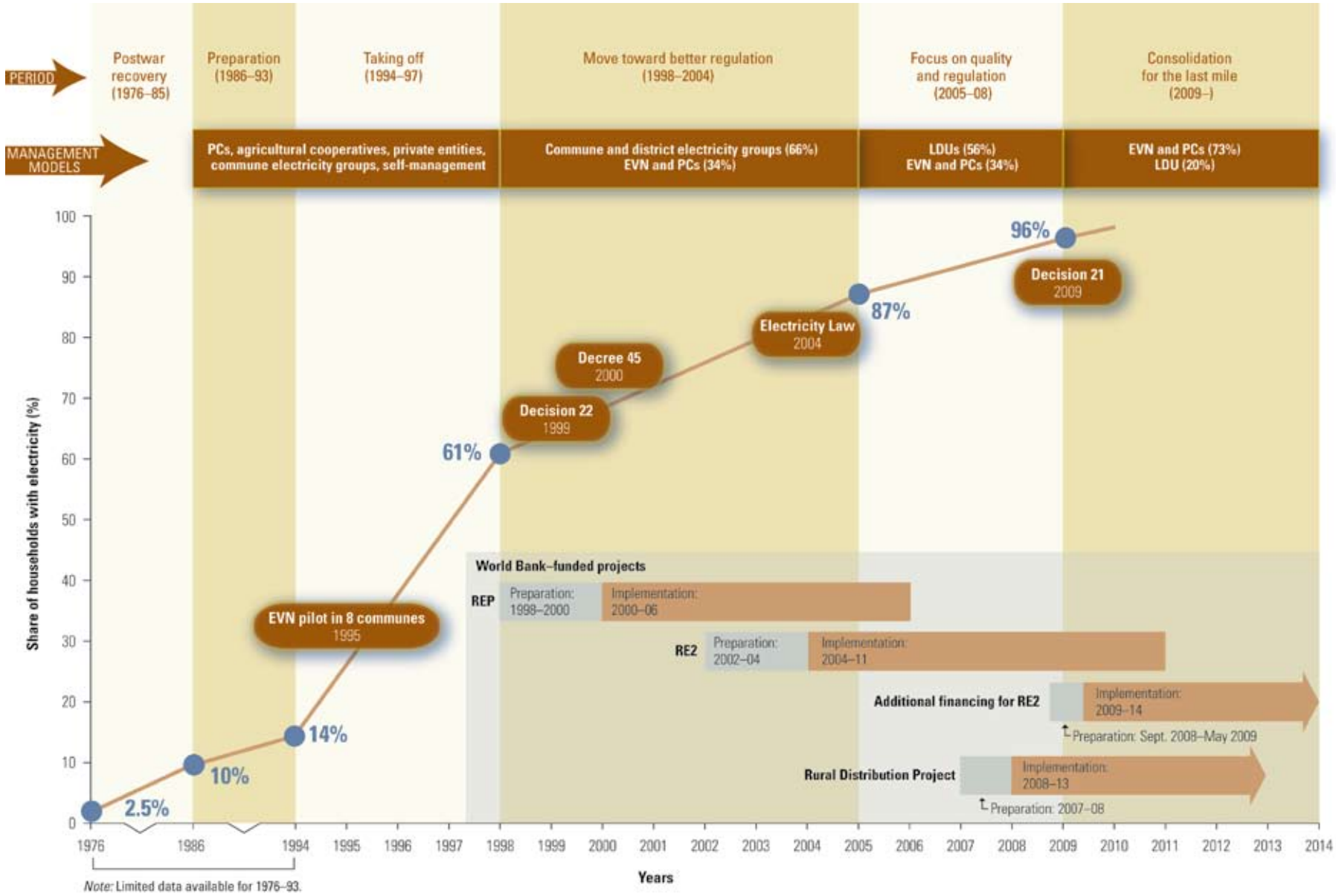
There was a significant shift in the institutional arrangements and sources of financing for rural electrification. EVN began a pilot program for operating LV systems, and started acquiring MV systems that had been financed by other entities. Under the service agent model, created under REP, local community members maintained LV systems on behalf of the PCs, carried out simple repairs, and handled collections. This helped ensure accountability within local communities, minimize nonpayment, reduce system losses, and significantly lower the costs of system operation and management for the PCs.

Meanwhile, the quality and reliability of electricity supply was emerging as an important issue. Between 2005 and 2008, the government chose to **focus on quality and regulation**, in addition to continued expansion of electricity access. This period could be characterized by the enforcement of regulations, a shift in focus from network extension to rehabilitation, and direct government support for extending electricity access, particularly to minorities and those in remote areas. The government's focus was not only on increasing electrification rates, but also on ensuring efficiency and addressing institutional shortcomings in the sector.

These concerns, in turn, would be the focus of the RE2 developed as part of the government–World Bank cooperation on rural energy. As a result of the government's actions and support from donors, there was a major overhaul of the ad hoc management and operational arrangements for rural networks through the creation of legally recognized local distribution utilities (LDUs). By the end of the period, 5,600 LDUs had emerged. While most of them had limited financial resources, these LDUs were facing pressure to continue investing, and over time, it was becoming evident that many of the newly formed LDUs were simply "too small to succeed" and could not be financially viable in the coming years. Policy makers began to recognize that consolidation of the operation of LV networks had to take place.

The period from 2009 onwards can be characterized as one of **consolidation for the last mile**, signifying the focus on ensuring sustainability of the rural electricity supply business, while pushing for greater accountability, working to determine the most appropriate strategies for extending access to those without electricity, and ensuring the affordability of electricity for the poor.

HISTORY OF RURAL ELECTRIFICATION IN VIETNAM Timeline with main government actions and evolution of household electrification.



An important milestone of this period was the prime minister's Decision 21, issued in February 2009, stipulating a unified national tariff for all residential consumers, alongside an incremental block tariff (IBT) arrangement, with a new lifeline block. The decision also allowed the takeover of financially weak LDUs by the PCs, now renamed power corporations. In fact, a significant consolidation of the rural electricity distribution and retail business took place, with smaller and financially weak LDUs being absorbed by the larger PCs. The Vietnam Distribution Code was approved in 2010. It outlined the rights and obligations of PCs and their customers, including provisions concerning quality of service obligations and consumer protection.

As of 2010, it was estimated that 99 percent of the communes and 96 percent of the households in Vietnam were connected to the grid. Going forward, the tasks lying ahead include the rehabilitation of the electricity networks in about 3,000 communes, determining the most suitable way of achieving the target of electrifying all the country's households, ensuring sustainability of the operation of rural electricity networks, and continuing to make sure that electricity is affordable to the poor.

The Way Forward

Going forward, a number of tasks need to be fulfilled as part of Vietnam's rural electrification program.

1. Continued investment in existing distribution networks.
In the years ahead, a significant amount will need to be invested in the rehabilitation of existing LV systems to reduce losses and the upgrading of the MV networks to allow them to meet growing demand.

- Investment in the rehabilitation of existing LV systems. Many of the small LV systems developed in rural communes in the 1990s still remain relatively weak. These systems need to be rehabilitated in order to reduce losses, and to increase the quality and quantity of power supply. This would mean that a significant amount of resources and effort will need to be dedicated to the rehabilitation of LV networks in about 3,000 communes. Based on preliminary estimates by EVN, bringing existing LV systems up to current Vietnamese standards may cost somewhere between US$2 billion and US$3 billion.
- Investment in upgrading MV networks. The growth in LV systems and increased demand in rural areas will also imply a greater need for the improvement of the MV distribution network over the medium term. Reliability of supply is of concern in some rural areas, since existing systems are becoming unable to meet existing and projected load requirements. In some instances, the MV systems have become a bottleneck in the power flow from the transmission system to the LV systems in the communes.

2. Ensuring sustainability of the operation of rural electricity networks.
Decision 21, issued in February 2009, made it possible for PCs to take over the management and assets of any LDU that is financially weak. The challenge going forward will be to ensure that the transfer of the responsibility for managing and operating existing LV systems from financially weak LDUs is paced according to the absorption capacity of the PCs. To ensure this, it may be necessary to find the most effective ways of building institutional capacity in PCs, in order to equip them to manage and operate rural electricity networks in an efficient and sustainable manner.

3. Expanding access to those still without it.
About 1 million households, mainly in mountainous areas and on islands, are still without access to electricity. The objective of expanding electricity access to unserved rural and mountainous areas of the country was included in the National Energy Development Strategy issued in December 2007. This strategy envisages that all rural households will have access to electricity by 2020. The challenge will be identifying the most appropriate way of electrifying the remaining households, most of which are in poor, mountainous, or remote areas, and have low consumption levels.

4. Continuing to make sure electricity is affordable to the poor.
As the country expands access to a greater number of people, chances are that there will also be a greater number of poor people connected to the system. The prime minister's Decision 21, issued in February 2009, established a clear framework for providing for the poor. The decision stipulates an IBT with a lifeline block with a lower electricity price paid for the first 50 kWh of consumption. Also as part of the decision, the PCs were allowed to recover operating costs through the tariffs charged to all consumers in their territory, in effect, cross-subsidizing low-consuming households by other consumers. If, in the future, policy makers, for any reason, wish to make subsidies more transparent, they will need to make a determination as to how this can be achieved through a new mechanism.

There are hard choices that need to be made with respect to Vietnam's rural electrification program going forward. The country's policy makers have to determine how to allocate the scarce resources among their various priorities. They have to determine how to allocate resources among investments in rehabilitating LV systems, upgrading MV networks, and expanding electricity access to those remaining without it, while also setting aside resources to continue to provide for the poor and build institutional capacity for sustainable management and operation of the rural networks. It is clear that improving the existing distribution systems would bring benefits to a larger number of people. On the other hand, completing the last mile of the access agenda and connecting the unserved populations are an important priority for the government. The question is how this can be done in a sustainable manner, and where the resources will come from.

Impacts of Rural Electrification in Vietnam

Under the World Bank's REP, a monitoring and evaluation plan was set up in order to quantify the social and economic impacts of rural electrification, and to assess the welfare effects of rural electrification under the project. With funding support from SIDA and New Zealand Aid, the Institute of Sociology of the Vietnamese Academy of Social Sciences was commissioned to conduct a longitudinal survey of the beneficiaries of the project, covering rural households with varying social and economic conditions. As part of the longitudinal survey, a panel of households was surveyed three times over a six-year period—the first in 2002, the second in 2005, and the third in 2008. A representative sample of 30 households was drawn from each of 42 communes in 7 provinces.[2]

The survey and the associated analysis showed that there were multiple benefits for rural households accruing from REP and the broader rural electrification effort in Vietnam. The findings of the survey are largely consistent with results from studies by other researchers and international development agencies.

Other survey findings that merit attention and may inform future policy are summarized below.

- The survey showed that most of the appliance uptake occurred in the first few years of electrification, with consistent growth in consumption for the first few years (as the most desired appliances were acquired), but stabilized after five to six years. Meanwhile, in the survey findings, appliance ownership did not appear to be as strongly correlated to income as some might have expected. Appliance ownership increased across the board over the course of the survey years. The survey showed distinct patterns of appliance ownership correlated to years of electrification. It was observed that the longer a household was electrified, the more likely it was to have a color television, a rice cooker, and a fan.
- The survey showed that, over the years, not only did the rate of electrified households increase, but also the amount of electricity used by electrified households—and remarkably so. As households purchased larger appliances over time—starting with lighting and continuing on to radios, televisions, refrigerators, and electric fans—electricity consumption increased in all households. The survey found that even though household electricity consumption grew for all expenditure quintiles, there was significant variation in electricity consumption across expenditure quintiles.
- The survey showed a reliance on incandescent lighting among the poorest. Incandescent bulbs have a lower initial cost, but normally have a higher lifetime cost than compact fluorescent lamps (CFLs).
- As part of an exercise to estimate the economic benefits of electrification, demand curves for lighting and television usage were derived. This analysis showed that there was rather high willingness to pay for lighting, and up to quite high levels of light consumption.
- In a self-assessment of the impact of electricity, rural households that gained reliable electric service for the first time reported higher levels of well-being. The respondents felt that electricity had brought great benefit to their lives. Over a wide range of indicators, they indicated that their lives had improved since electrified—more time for reading, entertainment, for television, and in higher expectations about educational outcomes for children, particularly for higher education.
- Even though the survey did not present strong evidence that would establish causality between electricity and education of adults and children, the survey does indicate a correlation between electrification and the ability of people to take best advantage of the education they have received. The survey

2. Ha Giang (Northeast), Lai Chau and Hoa Binh (Northwest), Quang Binh (North Central Coast), Quang Nam (South Central Coast), Dac Lac (Central Highlands), and Soc Trang (Mekong River Delta). In 2004, Lai Chau was split into two provinces: Lai Chau and Dien Bien.

shows a strong impact of electrification on the relationship between income and years of schooling, and it shows that this change occurs within a few years of electrification. Indeed, the survey shows little difference between households electrified for more than 10 years, and households electrified for between 5 and 10 years. Moreover, according to commune-level results, there are statistically significant differences between electrified and unelectrified households in terms of people's ability to make the best use of the education they have received, even when the impact of other infrastructure is controlled for.

- Similarly, although the causality in the relationship between rural electrification and income was difficult to establish in the context of this survey, it is widely accepted that rural electrification can impact rural incomes through a variety of farm and nonfarm channels. Over the course of the survey, expenditure shares on food dropped sharply, while shares on education and other discretionary items increased: this again follows the general international experience on the consequences of improvement in economic well-being. There were also remarkable changes in income composition.
- From survey results, it is difficult to be definitive about the direct poverty reduction impacts of electrification, but there appears to be some evidence.

The results of the survey confirm some of the main assumptions made at the time of the REP design, namely, that the welfare benefits of rural electrification significantly exceed the costs of extending the grid in most remote rural areas; that once the grid had been extended to remote communes, the connection rates would grow rapidly over the early years; and that average electricity consumption would increase over time.

The findings of the survey may also provide useful inputs to a wide range of important decisions, from the preparation of electricity consumption forecasts to determining whether there is a need to provide subsidy for connection to the poorest as part of a wider poverty reduction program. For instance, with the remaining unelectrified households having significantly higher poverty rates than the electrified households, targeted assistance can be directed at these households to ensure that appliances and light bulbs of appropriate design are provided (that is, fluorescent rather than incandescent bulbs), and that the costs of connection are reimbursed. Stimulating productive use in rural areas remains a problem: the survey notes the constraints in replacing diesel-powered equipment with electric motors, most notably the high first cost involved in replacing equipment. It is well understood by diesel users that electric equipment is much cheaper to run than diesel engines, which suggests that it may be worthwhile for rural electrification projects to provide assistance for equipment replacement. However, such schemes are likely to function only if power quality can be assured.

Lessons from Vietnam's Rural Electrification Experience

Needless to say, some portions of the Vietnamese experience with rural electrification are specific to the social, political, and cultural context of the country, and hence, some parts of Vietnam's experience may not be easy to replicate elsewhere. An example is the unique opportunity presented by the focus on unification of the country after the war, which in turn contributed to the broad support for the 500 kV line to connect the northern and southern parts of the country. Another is the abundance of generation resources that became available in the early 1990s, which, combined with the completion of the 500 kV line, made it possible to respond to the society's strong demand for electricity.

Certain features of Vietnam's experience, especially the ways in which the government managed to tackle the challenges that emerged, can provide useful lessons for other countries. The lessons learned are organized in two parts, one from the perspective of the government, which can inform strategies of other developing countries in their efforts to expand access to electricity, and the other from the World Bank experience, which can be of relevance during the development of projects in the future.

Vietnam's success in rural electrification can be explained by a range of factors, including the following:

- Unwavering government commitment that is responsive to strong demand from society.
- Long-term vision, gradual approach, prioritization, and flexibility.
- Sharing of costs by all stakeholders and mobilization of various resources.
- Clear allocation of responsibilities among all levels of government, sector participants, and consumers.
- EVN's emergence as a strong champion for rural electrification after 1999.
- Making technical choices suitable for sector status and priorities.
- Ensuring the economic and financial viability of rural electricity supply while establishing and maintaining financial controls.

Important lessons learned from Vietnam's experience are summarized below. Further detail is available in part C.

Lesson 1: Vietnam's success can be credited to the unwavering national commitment to rural electrification. A significant feature of Vietnam's experience has been the bottom-up manner in which the drive for rural electrification materialized. There was very strong demand for electricity across Vietnam, but strong demand is not unique to this country, and one can easily argue that strong demand for electricity is present almost everywhere in the world. What was distinctive about the Vietnamese experience was how this strong demand translated into action and, eventually, results. The local and central governments listened to the people and were responsive to their strong desire for electricity access. Local and central government authorities made rural electrification a priority and mobilized their resources to make it possible. Local authorities' responsiveness to the strong societal demand, and their choice to accord adequate priority to this issue, and the culmination of this into a national agenda item were critical factors for success. There was persistent dedication and collaboration between central government policy makers and provincial, district, and commune level authorities, as well as EVN and local communities. Once rural electrification targets were set, and pledges to support rural electrification were made, policy makers stood by them and never backtracked from what was originally promised.

Lesson 2: The key to Vietnam's success has been flexibility, adaptability, and willingness to correct mistakes, but above all to continue to move forward. The rural electrification effort involved an evolving strategy that was anchored by very clear objectives, implemented gradually, and fine-tuned over time to reflect changing priorities. The government maintained a strategic vision for achieving its electrification targets, and the core tenet of this vision was achieving it through the extension of the national grid. Different approaches were adopted for different periods, each with their own challenges. All of this was done without losing sight of the overarching goal that electrification is about national solidarity and is a high-level political goal.

Lesson 3: Transformation in the rural sector needs to be seen in a long-term context. A long-term vision, combining steps to be taken gradually, based on a realistic assessment of what can be achieved within one's means, has been a critical factor of success. The communication with stakeholders concerning the assessment of what can be achieved in light of resources available can help maintain costs at reasonable levels, manage expectations, and keep political pressure up to expand to unsuitable areas at a minimum.

Lesson 4: The presence of cost sharing among different parties has been an important contributor to the success of Vietnam's rural electrification program. In addition to making financing and building of rural systems easier, cost sharing helped create a sense of ownership by the parties involved. The provision of financial support by provincial, commune, and district authorities, as well as by the prime minister's office, was a critical element of success in ensuring the rapid increase in access to electricity in rural areas.

Lesson 5: A well-formulated and properly communicated program with achievable goals and investments from multiple sources has proved to be very effective. The issuance of policy documents outlining the principles underlying this program was useful in formalizing the government's commitment and sending a clear message to all stakeholders that government resources would be available to backstop local resources.

Lesson 6: An important factor in Vietnam's success was that the responsibilities were shared among various stakeholders. This collaboration-based approach can be credited with making it possible to move forward with the rural electrification effort on all fronts, and possibly much faster than what could have been achieved had the effort relied on the resources and capabilities of one central entity. That the government offered a lot of flexibility in terms of constructing, managing, and operating local electricity networks in the early years made a critical impact on the expansion of access to electricity.

Lesson 7: The policy and regulatory measures introduced by the government, equipping EVN with the mandate and resources it needed to perform its leadership role in a commercially sustainable way, were critical components of Vietnam's success in rural electrification. EVN's emergence as a strong champion for rural electrification in the late 1990s was an important factor for ensuring the technical quality of the rural energy networks and sustainability of rural electricity supply going forward. In the case of expansion of access through large-scale grid extensions, a precondition of sustainability is to secure interest, commitment, and dedication from the country's main utility(ies). This can be achieved by making it possible for the utility to participate in rural electrification on terms that enable it to meet its commercial objectives. The utility should be equipped with a clear mandate and provided with the resources it needs to perform its leadership role in electrifying rural areas through grid extension.

Lesson 8: In Vietnam, the MV-LV split, and the presence of multiple actors in the mid-1990s proved very effective in facilitating the rapid expansion of access, but the absence of uniform technical standards at that time also led to issues that had to be addressed in the future. Unified national technical standards were introduced in the late 1990s, when electricity access rates had exceeded 60 percent, and they made a significant impact on improving the quality of the power supply, which reduced technical losses, tariffs, and costs.

As electricity access levels change, so do sector priorities. Early on in a rural electrification effort, when access rates are low, the priority is to deliver simple connections to as many people as possible. With higher electrification rates, focus can shift to ensuring quality of supply. There are trade-offs and long-term consequences associated with various combinations of options for allocating responsibilities and technical requirements for building rural networks. What matters is the selection of combinations that are appropriate and feasible, in light of the current circumstances, sector priorities, and capacity of the sector participants. Technical standards are essential for ensuring quality of supply and long-term sustainability of a system. If there are multiple entities that can build and operate rural electricity networks, policymakers will need to be aware of the trade-offs involved and, based on the electrification status and sector priorities, determine the most appropriate time and manner to introduce uniform standards for rural networks.

Lesson 9: As Vietnam's experience demonstrates, ensuring the sustainability of the rural electricity supply business is critical. The culture of payment is likely to make a significant difference in ensuring the success of rural electrification. Although the very culture of payment or specific institutional models applied in Vietnam may not be directly replicable in other countries, the principles of cost sharing, local involvement in management and operation of rural electricity networks, and particularly bill collection, can be easily adopted by other countries.

Lesson 10: While allowing reasonable returns to investors on the one hand, attention should be paid to making new connections and use of electricity as affordable as possible on the other. When grid extension covers customers who cannot afford to pay for the full cost of connections, there should be mechanisms to compensate the investors.

Lesson 11: Results and information from the implementation of rural electrification efforts, as well as monitoring and evaluation in general, will be useful inputs into future policy actions. These results, through validating (or negating) initial assumptions and giving an indication of emerging implementation issues, can help ensure that the policies and decisions reflect and address realities on the ground.

Lessons from World Bank Experience in Supporting Rural Electrification in Vietnam

With the lifting of the trade embargo in 1994, the World Bank began providing support to the government's various economic development programs. The World Bank's involvement in the power sector began in 1995, with the preparation of the **Power Sector Rehabilitation and Expansion Project**, followed by the **Power Development Project** in 1996. When the preparation of the Power Development Project began in 1996, 50 percent of Vietnam's households had already gained access to electricity.

The fundamental principle underlying the Government of Vietnam and World Bank's partnership on rural electrification was the provision of support to the achievement of the government's objectives as part of a programmatic approach. At the outset of cooperation in the rural energy sector, four major projects were planned to assist the implementation of Vietnam's rural electrification program. During the design of the cooperation in the rural energy sector, the government, EVN, and IDA worked together in formulating projects for the realization of the government's priorities and identifying solutions to problems. The cooperation began with addressing the most urgent issues at the time, and carefully preparing for the subsequent and more difficult interventions. A brief summary of these projects and their primary areas of focus is provided below.

- In the case of the **Rural Energy Project**, approved in May 2000 and involving a US$150 million IDA credit, the focus, consistent with government preferences, was entirely on rapid expansion of access to rural areas without electricity, and specifically on increasing the number of basic connections. It was decided that the issues of rehabilitation of distribution networks, quality of service, and institutional aspects would be taken up in later operations.
- Indeed, with the **Second Rural Energy Project**, approved in November 2004 and providing a US$220 million IDA credit, the focus shifted to the

rehabilitation of existing LV systems, while also addressing further expansion of access, especially in communes that were already connected, and development of institutions to ensure service delivery at the retail level.

- In 2008, the **Rural Distribution Project** was initiated, with US$150 million in IDA financing. This five-year project was designed to improve the reliability and quality of the MV networks bringing electricity to local distributors and build the capacity of regional PCs to act as independent participants in the power sector.
- In May 2009, the provision of another US$200 million in the form of **Additional Financing for the Second Rural Energy Project** was approved by the World Bank's Board of Executive Directors. This additional financing was intended for addressing a shortfall of financing resulting from increased costs associated with original project activities, scaling up project coverage, and rehabilitating LV and MV networks in a greater number of communes.

Some lessons from the World Bank project experience in Vietnam are presented below.

Lesson 12: The World Bank project experience with rural electrification in Vietnam has shown that the establishment of a well-defined program, where fundamental principles, institutional arrangements, and the use of financing have been agreed on in advance, helps ensure efficiency and effectiveness during implementation. The programmatic approach that was adopted enabled the delivery of new projects in a relatively short period.

Lesson 13: There should be a clear, yet flexible, roadmap for achieving the government's objectives and for showing how World Bank support should support them. This roadmap should be the basis for designing specific interventions. Instead of designing a large project to address the whole set of issues in the rural energy sector, the approach involving the phasing of individual projects and designing each project to address the most critical issue of the time, and then addressing remaining issues in later projects, has proved effective. Policy dialogue and investment operations are best run on separate but parallel tracks, with each informing the other—hence the importance of flexibility in the roadmap.

Lesson 14: During project preparation:

- It is important to keep in mind that a single project can't solve all the issues in the sector, and it should be seen for what it is—ideally, a step in a longer-term program.
- Extensive time and resources should be set aside to work out important aspects of project design, and for consultations.
- Engaging all stakeholders and ensuring their buy-in early in the process is essential for the long-term success of rural electrification.
- It is essential to mobilize local experience and knowledge as much as international experience.

Lesson 15: A key factor in the success in implementing World Bank projects focused on rural electrification projects has been flexibility. A certain degree of flexibility needs to be built into the project scope and implementation arrangements. As long as the changes are consistent with the objectives and principles agreed at the outset, the process for their review should be determined ahead, and should be kept as simple as possible. Project outcome indicators should reflect the assessment of what can be achieved.

Lesson 16: Another success factor for the implementation of World Bank projects has been the building of effective partnerships between EVN and local authorities, and communities, and specifically through the sharing of costs and responsibilities among stakeholders. Cost-sharing arrangements need to be carefully designed to ensure the ownership and dedication of the related parties, but not surpass their payment capacity. It is important to determine the most appropriate ways of combining different funding sources and allocating costs proportionally. By contrast, it is advisable to allocate responsibilities in a way that will not hamper the coordinated construction, management, and operation of the systems themselves.

Lesson 17: Participation of the local people needs to encompass all elements of the project—from design to operations. Ensuring local participation in all aspects of the project can help mobilize and maintain local support and commitment to rural electrification, while ensuring a rapid pace of electrification, creating employment, building local capacity, and thereby laying the foundation for the sustainable management and operation of the networks.

Lesson 18: As a general rule, project design and implementation arrangements should make it as easy as possible for project implementing entities, and should be mindful of the resources and capacity of the parties involved. The implementation of all project activities by

one entity, or by multiple entities with similar capabilities, working in a highly coordinated manner, can help make project implementation progress smoothly. In case of mismatches between capabilities of different implementing agencies, efforts should be made to address them through policy dialogue, technical assistance, and support during project preparation, to the extent possible, should time and resources permit. Where addressing the concern is not immediately possible because of the lack of resources, the presence of pressing needs for, and/or urgency of project activities, project implementation arrangements should be designed with a realistic view of what can be achieved in light of the institutional arrangements.

Part A

Vietnam's Rural Electrification Story

A1

Background

Vietnam has witnessed remarkable change over the last two decades. Rapid growth experienced at every level of society has been the result, in part, of the government's commitment to liberalizing markets and investing in social sectors and rural development. The building of roads and other rural infrastructure; access to clean water, good health care, and improved primary school services; and the extension of grid electrification have all worked together to improve the quality of life for millions of people in Vietnam's countryside. These complementary investments have proven synergistic. Roads have helped rural people gain access to markets, grid electricity has enhanced education and the potential for more productive use of time and labor, and improved water supplies have contributed to a healthier population. One piece of this development agenda—providing grid electricity to Vietnam's rural people—has been a spectacular success. One might even describe the program among the best in the world.

Providing electricity to nearly all of Vietnam's rural population was achieved in a relatively short period, thanks in large measure to the commitment of Vietnam's government and its partnership with the World Bank and other international donor agencies in the later years. The many difficulties included high costs, an institutional structure not yet oriented to rural electrification, lack of legal or regulatory framework or laws, and multiple provincial and local businesses already involved in electricity distribution, using a variety of technical standards.

Faced with this challenge, Vietnam succeeded in providing its rural people electricity quickly, with little dissent from all those with a vested interest in the status quo. How was this daunting task accomplished? What strategies did the government adopt to overcome the financial and legal constraints? What roles did the central, provincial, and local governments play in these programs?

Rapid Growth in Socioeconomic Development

Vietnam has seen major economic growth over the past three decades. It is a densely populated country that, in the last 30 years, has had to recover from the ravages of war, the loss of financial support from the old Soviet bloc, and the rigidities of a centrally planned economy. The seeds of this expansion were planted more than two decades ago, with the launching of the renovation process known as *Doi Moi* in 1986. Vietnam has since then witnessed a rapid transition to a globalized, market-based social economy. The goal has been to adopt market mechanisms while preserving social inclusion.

Since 1993, when the World Bank reengaged with Vietnam, gross domestic product (GDP) per capita has grown sixfold, and the poverty rate has been cut by three-quarters. Table 1 presents select key indicators. Living standards have risen fast, and the country is now moving into middle-income status.

Comprehensive policy reforms introduced over the past decade have succeeded in strengthening Vietnam's public financial management and encouraging the participation of private firms in most sectors. To level the playing field, common regulations for corporate governance have been implemented. In addition, an ambitious equitization[3] plan and restructuring effort have helped to trans-

3. Equitization is the process of creating a joint stock company and sale of shares to individuals and non–state-owned companies.

TABLE 1 SELECT MILLENNIUM DEVELOPMENT GOAL INDICATORS FOR VIETNAM

	1993	2009
GNI per capita (Atlas method, US$)	170	1,010
Poverty incidence rate (%)	58	14.5
Under-5 child mortality (per 1,000 live births)	53 (1990)	24
Maternal mortality rate (per 100,000 live births)	200 (1990)	56 (2008)
Net primary school enrollment rate (%)	77 (1990)	96

Sources: World Bank GDF&WDR Database, Millennium Development Goals Database.

form many state-owned enterprises into more efficient companies with better overall performance and financial status. To avoid a conflict of interest between management and regulation, ownership rights increasingly have been transferred out of ministries and provinces. Such reforms have been accompanied by Vietnam's accession to the World Trade Organization, whose benefits have included lower trade barriers and the opening of service sectors to competition.

The Power Sector as a Foundation for Economic Growth

The economic growth experienced during the past several years is an impressive accomplishment, and it has played an important role in poverty reduction. But the rapid economic growth is also at the root of many of the issues in Vietnam's energy sector: growing GDP feeds increasing demand, while meeting that demand enables GDP to continue to grow.

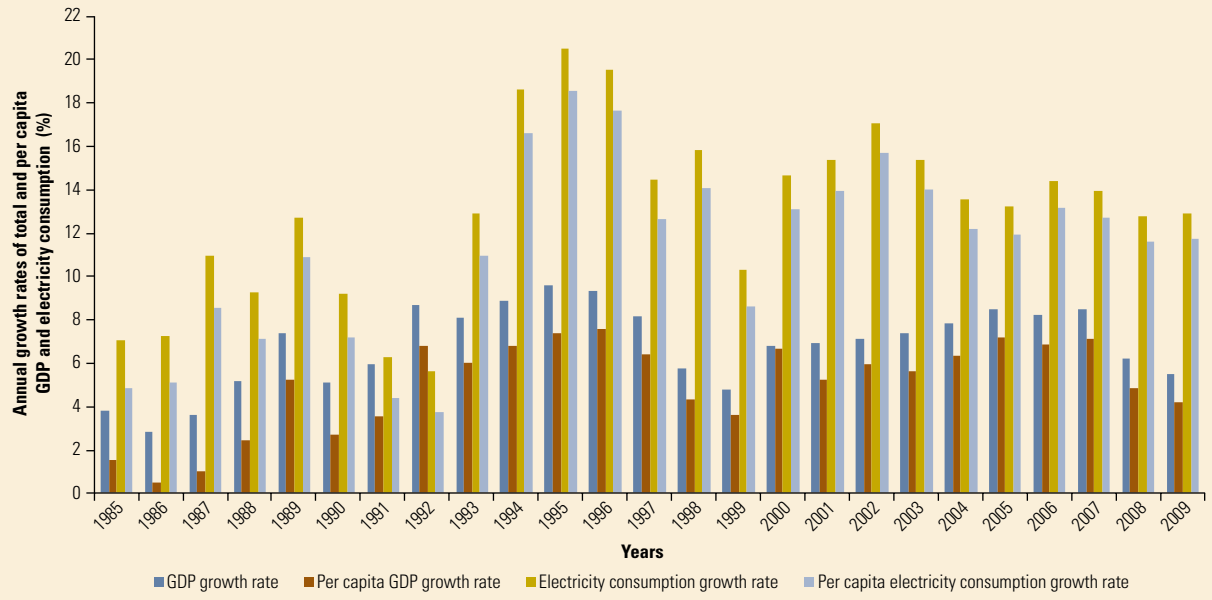
Since the early 1990s, electricity consumption has been growing at a rate almost double that of GDP growth. Figure 1 presents annual growth rates of total and per capita GDP and electricity consumption since 1985.

Figure 2 shows the evolution of electricity production and consumption in Vietnam during the past four decades.

As figure 3 shows, electricity consumption in Vietnam is growing from a very low base. In 1995, total power sales of 11.2 TWh amounted to only 156 kWh per person per year. Even after growth in electricity use to 74.9 TWh—about seven times the 1995 level—by 2009, total per capita electricity consumption amounted to only 865 kWh per year, compared with an average of 1,883 kWh[4]

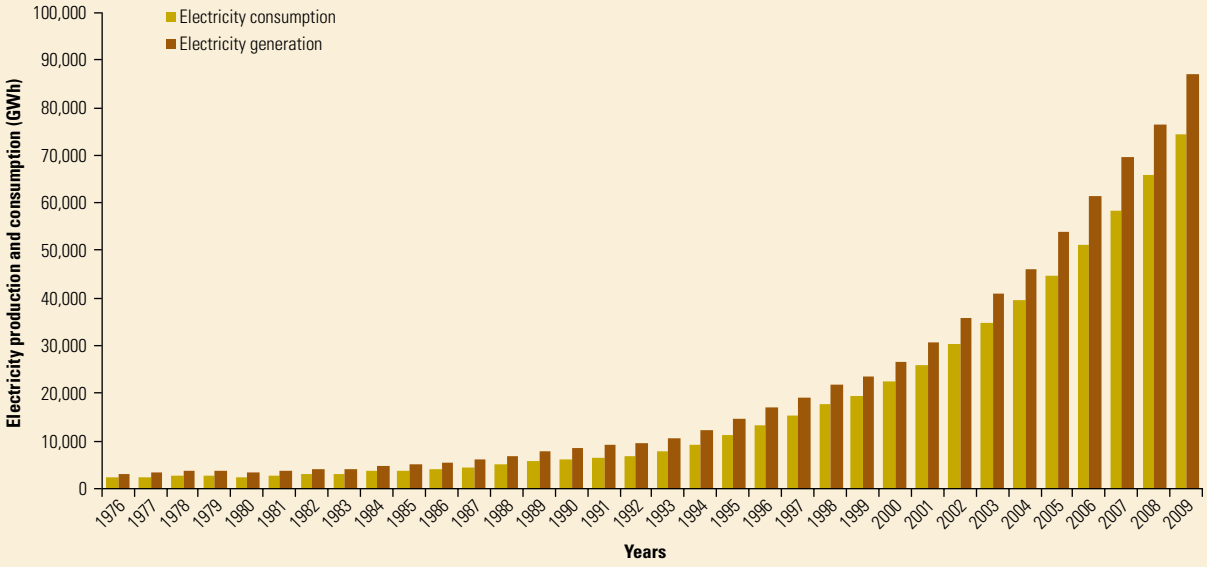
4. 2007 data.

FIGURE 1 GDP AND ELECTRICITY CONSUMPTION, 1985–2009



Source: World Bank staff based on EVN data and GDF and WDR databases.

FIGURE 2 ELECTRICITY PRODUCTION AND CONSUMPTION IN VIETNAM, 1971–2009



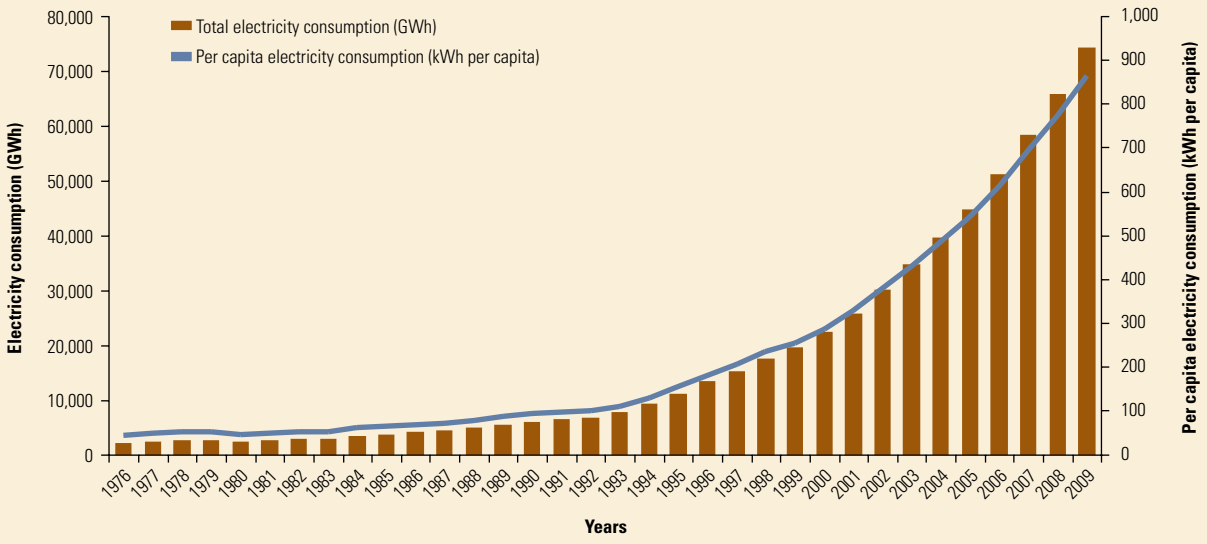
Source: World Bank staff based on EVN data.

per capita per year in East Asia and the Pacific and 1,606 kWh per capita per year in low- and middle-income countries worldwide.

As a result of the increase in the total urban population in Vietnam, and the success in rural electrification, the number of electricity consumers has increased dramatically—with 52 million people beginning to receive electricity for the first time between 1993 and 2008.

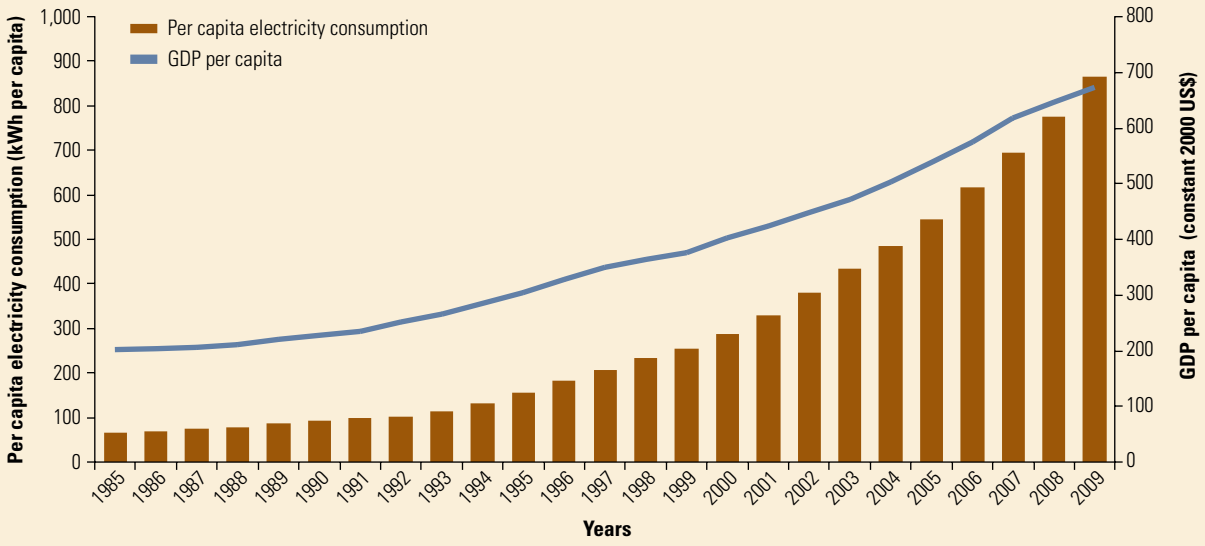
As disposable incomes have grown from very low levels in the mid-1990s, there has been strong growth in energy use, particularly because of increased household appliance ownership. Figure 4 illustrates the evolution of

FIGURE 3 PER CAPITA AND TOTAL ELECTRICITY CONSUMPTION, 1976–2009



Source: World Bank staff based on EVN data.

FIGURE 4 PER CAPITA ELECTRICITY CONSUMPTION AND PER CAPITA GDP, 1985–2009



GDP per capita income in constant US$2,000 and per capita electricity consumption.

The current monthly average per capita electricity consumption of about 25 kWh among residential users in rural areas is still relatively low. Per capita electricity consumption, both among urban and rural consumers, is certain to increase, as electricity use grows from nascent levels in rural areas, and as heavy appliance use, especially of air conditioners, begins to take hold among middle-income groups.

Current Ownership Structure in the Power Sector

The main electricity provider is EVN, which owns about two-thirds of all generation capacity in Vietnam. Through its subsidiary National Power Transmission Company (NPT) and Power Corporations,[5] EVN owns and operates the transmission and MV distribution systems, the LV distribution to the main urban areas, and LV distribution in some rural areas. Distribution in the rural areas is managed by a mix of different entities, including PCs and local distribution utilities (LDUs), which are province-, district-, and commune-owned cooperatives or companies supplying electricity at LV to consumers. Electricity supply in rural areas is currently undergoing change to make the system more commercially viable and financially sustainable.

A large share of electric power generation is supplied by EVN. However, in the past decade, the government has increasingly encouraged power generation by investors other than EVN. In 2002, non-EVN-owned capacity totaled some 620 MW, accounting for just 7 percent of installed capacity connected to the system. In 2008, non-EVN capacity amounted to just over 5,000 MW, taking grid connected non-EVN-owned capacity to 32 percent of the national total.

Rural Electrification: A Success Story

Rural electrification has been a critical component of the government's program to eliminate poverty, redress imbalances in development, and improve overall welfare levels by providing reliable lighting sources, better living conditions, health care, and other services to the rural world. Dramatic increases in rural electricity access rates

5. Until 2010, the designation "PC" stood for the three main Power Companies, which were subsidiaries owned by EVN. The major ones were PC1 in the north, PC2 in the south, and PC3 in the center. After February 2010, the Power Companies were transformed into Power Corporations. PC1 made up the majority of the Northern Power Corporation, PC2 the majority of the Southern Power Corporation, and PC3 the bulk of the Central Power Corporation. Therefore, the term PC refers to Power Company before February 2010 and Power Corporation thereafter.

TABLE 2 COMMUNE AND HOUSEHOLD ELECTRIFICATION RATES, 1996–2009 (percent)

	1996	1998	2000	2002	2004	2006	2007	2008	2009
Communes	62.2	75.1	82.0	89.8	94.3	97.4	97.89	97.89	97.89
Households	50.7	62.5	73.0	81.0	87.4	92.3	93.66	93.66	96.3

Source: EVN data and Bank staff estimates.

and steady reductions in transmission and distribution losses of EVN and its PCs have been particularly notable achievements.

In 1996, just over half the country's households had been electrified, and about 30 million people still had no access to electricity, as presented in table 2. Today, the household electricity access rate is more than 96 percent, and network coverage is 98 percent at the district level, a remarkable achievement.

Consumption in rural areas is still rather low, with annual household electricity consumption in the 500–700 kWh range and total rural consumption less than 15–20 percent of the country's electricity consumption.

The dynamics of GDP growth and rural electrification are complex, involving many underlying forces. Among these forces are the significant investments Vietnam has made in other rural infrastructure. Rural electrification, roads, education, and other programs have together contributed to higher incomes, more business opportunities, and greater educational attainment. Higher incomes, in turn, have made electricity and appliances more affordable, making it easier for the country to invest further in rural electrification. This cycle of sustainability is sometimes called the "virtuous circle of development." Rural electrification itself has a significant independent and complementary effect on income and educational opportunities, contributing further to the virtuous circle of development. Rural electrification is now also seen as a source of national solidarity.

International Development Partners

Over the years, the focus of donor engagement, in continued alignment with the government's priorities, shifted from connecting as many households as possible to ensuring good quality and reliable supply of electricity. This change in focus meant that investments are now increasingly directed toward rehabilitation and network reinforcement.

The World Bank has been a strong partner for Vietnam in rural electrification. Since 1996, the World Bank supported the Government of Vietnam through a long-term, results-oriented program comprising consecutive rural electrification projects.

Rural electrification in Vietnam has received support from bilateral donors and other international agencies. In 2004, the Agence Française de Développement provided €19 million to EVN for rural electrification efforts in southern parts of Vietnam. The Asian Development Bank decided in 2009 to provide Vietnam with a loan of US$151 million to help the country improve electricity services through increased renewable energy in poor, remote communities with ethnic minorities. Also in 2009, Kreditanstalt für Wiederaufbau (KfW) of Germany provided €120 million for the rehabilitation of rural networks. The Government of Japan has been supporting rural electrification at the provincial level, while the Organization of Petroleum Exporting Countries (OPEC) provided US$10 million to Quang Nam Province for rural electrification.

In parallel with the investment activities, technical assistance has supported two areas: institutional and organizational development in the Ministry of Industry and Trade, EVN, its PCs and LDUs; and evaluation of the impacts of rural electrification. In the latter work, the World Bank has partnered with other bilateral donors, notably the governments of Sweden and New Zealand. The central plank of this work has been to conduct three panel surveys—in 2002, 2005, and 2008—to analyze the impacts of electrification over the longer term. Some findings of this survey are discussed in part B.

Recovery

Between 1976 and 1985
Electrification rate grows from 2.5% to 9.3%

During this period, the Vietnamese economy was in the process of recovering from the impacts of the war, and GDP per capita was less than US$200. The power system was rather underdeveloped. Power supply was only available for cities and large industries, and was provided by isolated systems. Average power consumption per capita was about 45 kWh in 1976 and increased to about 65 kWh in 1985, as presented in table 3.

Rural electrification centered on vital rice cultivation areas, which required electric water pumping for irrigation and drainage, particularly in the northern parts of the country. The installation of irrigation pumps began during this period, and went on to replace manual or animal-driven methods over the years that followed.

Extension of electricity service to rural households was secondary to "productive uses." Most electricity lines intended for irrigation pumps in rice fields bypassed communities. Residential use of electricity in rural areas, where it existed, was a by-product of power supply for irrigation. Electricity was also available to towns close to the main line of the national grid, and those near mini- and micro-hydropower plants in mountainous areas. Figure 5 shows a typical substation constructed in the 1970s and 1980s for irrigation of rice fields.

Based on the estimates by regional electricity supply companies, the share of households with access to electricity grew from about 2.5 percent in 1975 to 9.3 percent.

Example of a substation supplying power to pumping stations

Source: World Bank staff photo.

TABLE 3 PER CAPITA AND AGGREGATE ELECTRICITY CONSUMPTION IN VIETNAM, 1976–85

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Per capita electricity consumption (kWh)	45	50	53	52	47	51	53	54	62	65
Aggregate electricity consumption (GWh)	2,306	2,709	2,808	2,808	2,930	3,016	3,222	3,260	3,866	4,141

Source: EVN data and World Bank GDF & WDI Central Database, 2010.

A3

Preparation

Between 1986 and 1993
Electrification rate grows from 10% to 14%

Critical Government Actions

A major turning point came with the *Doi Moi* or Renovation Policy, introduced in 1986, which had a significant impact on all aspects of the Vietnamese economy (see summary in box 1).

The overall economic improvement brought about by *Doi Moi* and subsequent actions by the government also had a significant impact on rural electrification, through increasing rural incomes, improving the affordability of electricity service extension, and making credit available so that households could borrow to pay for their share of new electricity connections. Agricultural sector reform under *Doi Moi*, coupled with policies supporting trade, led to a boom in farm exports and a dramatic reduction in rural poverty. As of 1998, two years after the introduction of the *Doi Moi* policies, Vietnam had moved from being a rice importer to a rice exporter.

Another important policy was introduced in 1990, when the government exempted farmers from agricultural taxes. Many agriculture cooperatives in turn decided to use their savings resulting from this tax exemption for the construction of rural electricity networks.

Availability of Energy Sources and the Development of the Transmission and Distribution System

During this period, several large power plants were beginning operation. These include the 400 MW Tri An Hydropower Plant in the south and Hoa Binh Hydropower Plant in the north, the largest power plant with 1,920 MW installed capacity, and the last unit of Pha Lai Thermal Power Plant in the north, bringing the plant's total installed capacity to 440 MW.

The additional generation capacity becoming available meant that the additional energy could be distributed to the rural areas locally. Moreover, as the electricity supply capacity in the north began to gradually exceed the demand there, the government began to consider options for using this additional supply.

The government considered two options: (1) selling the excess power to China or (2) building a 500 kV line to transport the energy from the north to central and southern parts of Vietnam. With a total length of 1,487 km, and requiring the crossing of rather difficult terrain, the 500 kV line posed many challenges. After evaluating the project from political, technical, and energy security perspectives, the government decided to proceed with the construction of this line in 1992. As discussed in section A4, the completion of this 500 kV line would, in turn, have a significant role in facilitating rural electrification.

BOX 1 VIETNAM'S *DOI MOI* PROGRAM

The *Doi Moi*, a program of economic renovation, was launched by the Government of Vietnam in 1986. The reform program involved a set of measures to gradually move from central planning to market mechanisms and an opening up of the economy to trade and foreign investment.

Major reforms implemented in the early years of the *Doi Moi* program included the following:

- **Agricultural sector reform:** Agricultural collectives were dismantled and land was distributed among farming households; peasants were given land-use rights for 20 years; and these land use rights could be renewed, in addition to the option of being sold or mortgaged.
- **Price reform:** Controlled prices for most goods and services were abolished.
- **Macroeconomic reform:** Production and consumption subsidies were eliminated from the budget. Interest rates on loans to state firms were raised above the level of inflation. The use of credit for financing the budget was gradually brought to an end.
- **Increased integration with the international economy:** The opening of Vietnam's economy to international markets was initiated with the unification of the country's multiple exchange rates, the devaluation of the dong, which was followed by gradual structural reforms in foreign trade and investment.
- **Financial sector reform:** Economic stabilization was achieved through reducing the fiscal deficit and growth of credit to manageable levels.
- **State enterprise reform:** The budget constraint for the state-owned sector was hardened. Fiscal subsidies were reduced and then eliminated. Loans for state enterprises were controlled more carefully and priced appropriately. These measures eventually led to a major restructuring of the sector.

The reforms enacted in the years following the initiation of the *Doi Moi* program led to rapid growth and poverty reduction. Between 1992 and 1998, agricultural GDP grew by 4.5 percent, industrial GDP by 13.0 percent, and GDP in the services sector by 8.3 percent.

Sources: World Bank, Vietnam Development Report 2000, and IDA, "IDA at Work," February 2007.

Moreover, with the rehabilitation of Da Nhim, and the construction of Tri An and Hoa Binh hydropower plants, transmission system expansion at 220 kV and 110 kV levels accelerated from 1988. In a comparatively short period, all three regions of the country experienced considerable growth. In the north, the areas of the Red River Delta, north central, and northwest particularly benefited. In the south, more than 250 km of 220 kV and 850 km of 110 kV lines were built, while 1,650 MVA of transformer capacity were added, linking Ca Mau at the very southern tip of the country to the grid, in addition to improving service in the Mekong Delta region. In the central part of the country, the coastal areas between Vinh in Nghe An Province in the north and Cam Ranh in Khan Hoah Province in the south were interconnected.

Progress in Rural Electrification

From the mid-1980s onwards, network extensions were intensified with the construction of 35 kV distribution lines in the northern mountainous areas. The proportion of poor households with access to electricity grew to 13.9 percent in 1990 and around 49 percent in 1993. Although these official figures indicate that considerable progress was made in rural electrification during those years, the electrification effort had involved connecting households in areas already covered by the MV network rather than extension of service to unelectrified areas.

The general improvement in the living standards of rural populations, along with the increased availability of

power, particularly in the north, combined with the need to increase rice production for exports, which in turn fueled power demand for irrigation, led to the rapid development of MV systems of 6/10/22 kV during this period.

In 1988, the total length of MV lines was 17,137 km, and the total capacity of MV substations was 3,264 MVA. By the end of 1994, the total length of MV lines increased to about 33,822 km, and total capacity of MV substations reached 3,680 MVA. The MV system in the central and the southern parts of the country developed even more rapidly during this period.

The main sources of funding for the MV system during this period were (a) the power sector; (b) the agriculture sector for irrigation purposes; and (c) the agricultural cooperatives, with assistance from local authorities in communes, districts, and provinces. Development of the 110 kV system played an important role in enabling further progress in rural electrification, since the 110 kV system served as the feeders for the MV system.

Through the course of this period, residential electricity use continued to be a by-product of the development of MV systems for irrigation and industrial purposes.

The development of the transmission and distribution systems during this period created a favorable environment for the development of the rural electrification for use by rural households in the next period.

The Role of the Power Companies

Having recognized developments in rural electrification, regional PCs established rural departments of their own, in order to coordinate the rural electrification process. During this period, PCs participated in rural electrification through the following:

- Development of the transmission system at 500/220/110/35 kV levels and portions of the distribution system in rural areas at 6/10/22 kV levels for irrigation purposes.
- Assisting cooperatives or other customers with the construction of MV systems in the rural areas.

In 1993, the PCs were not directly involved in the supply of power to residential consumers in rural areas.

A4

Taking Off

Between 1994 and 1997
Electrification rate grows from 14% to 61%

The period from 1994 to 1997 could be characterized by (a) a boom in household electricity access rates; (b) a demand driven, bottom-up process; (c) a lack of required institutional arrangements; and (d) the absence of technical specifications for rural networks.

This period encompasses the fastest growth of rural electrification in Vietnam. However, the rapid development during this period took place without the necessary preparatory work in terms of institutional arrangements and technical requirements. The inadequacy of institutional and technical arrangements, in turn, led to many consequences that have subsequently had to be tackled.

Strong Demand for Rural Electrification

There was extremely strong demand for access to electricity during this period. Electricity was the focus of day-to-day conversation among regular citizens. Some examples are presented in box 2. In addition, rural electrification was discussed in every National Assembly session. The electricity access rate became one of the key indicators in the yearly socioeconomic development assessment of every commune, district, and province.

Development of the Power System

In 1994, the last unit of the 1,920 MW Hoa Binh hydropower station and of the 150 MW Thac Mo hydropower station, both in the north, began operation, making available additional energy that could be supplied to rural areas.

The 500 kV line was completed and began operation in 1994. Stretching across the whole country, from north to south, the line had a significant impact from several perspectives:

- It linked all the isolated systems into one, and thereby made the power system significantly more reliable.
- It enabled the transportation of power from the north to central and southern areas during the early period.
- It created the necessary conditions for the rapid expansion of rural electrification efforts, particularly for the south and central areas, in the following years.

The numerous substations that were part of the 500 kV line also facilitated the connection of new villages to the system, and thereby further increased electrification levels. The rapid development of the transmission and distribution systems during the previous period (1986–93) also contributed to the creation of the conditions necessary for the development of the LV system.

Institutional and Technical Aspects of Rural Electrification

From an institutional perspective, until 1995, the Ministry of Energy was responsible for the administration of the power sector, while planning and development of national electricity programs were under the auspices of the Institute of Energy. The three regional PCs—PC1 in

BOX 2 EXAMPLES OF STRONG DEMAND AND WILLINGNESS TO PAY FOR ELECTRICITY ACROSS VIETNAM

There was extremely strong demand for access to electricity during this period.

- It had become customary for people to talk about electricity everywhere. Some people had even replaced a normal greeting by the question "does your commune have electricity" or "is your house connected?"
- When the construction works of a rural electricity network was set to begin in a commune, the groundbreaking ceremony would be accompanied by days of celebrations all across the commune.

In addition to strong demand, people showed a high willingness to pay for access to electricity.

- According government statistics, the average monthly per capita income in rural areas was only VND 187, 900, or about US$17, in 1996. Accordingly, the average income of a five-member household in rural areas was about VND 1 million, or about US$85 per month, in 1996.
- By contrast, households' contribution to the development of the MV and LV electricity networks during this period ranged between VND 1 and 2 million.
- This meant that the share of new connection costs paid by households was equivalent to at least a full month's income, if not two times that.
- In addition to the contribution toward the cost of new connections, the customers would also pay for the meter and service drop from the LV line to their houses. This additional expense usually amounted to another VND 1 million.
- Regardless of the cost of connections, many households were eager to pay their share. For example, in an interview conducted during the preparation of the REP, when the head of a poor household was asked how he would finance his share of the connection cost, he answered that it would be "simple," and that they would sell their piglets or chickens.

Source: Government statistics; World Bank staff interviews.

the north, PC2 in the south, and PC3 in the central region of the country—were responsible for generation, transmission, and distribution. Each had electricity offices at their respective provincial and district levels. At the local level, communes managed their electricity supply using a wide variety of ad hoc distribution systems and technical standards.

In 1995, the government initiated a major restructuring of the power sector with the establishment of EVN, comprising a general corporation and five PCs in charge of the electricity distribution business. A rural electrification department was set up under EVN, and rural electrification departments of PCs were strengthened.

It is important to point out the linkage between the technical and institutional aspects of rural electrification during this period. The creation of the 500 kV line from the north to the south of the country forced the technical unification of the system, since each of the previously independent power networks now had to be synchronized to one another. This required a certain level of system management countrywide (dispatch and reserve management; fault clearing, correction, and other day-to-day operations; investment planning; and management over the longer term). This was particularly important, given that the north and south had radically different systems based on different standards. In other words, the creation of EVN as a single entity was a direct consequence of system integration.

Immediately after its establishment, EVN started the electrification of eight communes in different provinces in Vietnam as a pilot. The purpose of this pilot electrification effort was to determine whether EVN could or should proceed with rural electrification and, if so, how it should be done.

As table 4 shows, the results of the pilot from three "typical" communes, considered representative of northern, central, and southern parts of the country, the average cost per household in the southern areas turned out to

TABLE 4 RESULTS OF EVN'S RURAL ELECTRIFICATION PILOT FOR THREE REPRESENTATIVE COMMUNES (1995 exchange rate: US$1 = VND 11,100)

A: VND

Commune	Dong Thinh (North)	Gio Hai (Center)	Phuoc Thinh (South)
Province	Bac Thai	Quang Tri	Tay Ninh
Population	3,986	5,321	7,950
Number of households electrified	836	1046	1771
Total cost (billion VND)	6.18	6.23	6.57
Cost per household (million VND)	7.40	6.00	3.70
Electricity sold (kWh), June 1996	9,744	14,020	31,839
Household consumption (kWh/HH/month)	12	13.4	18
Losses (%)	10.20	8.40	12.70
Average tariff (VND/kWh)	452.7	461	491
Average yearly collections per household (VND)	75,408	102,480	105,984
Total yearly turnover (mil VND)	63	107.2	187.7
Payback period (if gross turnover is used)—years	98	58	35

B: US$

Commune	Dong Thinh (North)	Gio Hai (Center)	Phuoc Thinh (South)
Province	Bac Thai	Quang Tri	Tay Ninh
Population	3,986	5,321	7,950
Number of households electrified	836	1046	1771
Total cost (US$)	556,757	561,622	592,072
Cost per household (US$)	667	541	333
Electricity sold (kWh), June 1996	9,744	14,020	31,839
Household consumption (kWh/HH/month)	12	13.4	18
Losses (%)	10.20	8.40	12.70
Average tariff (US$/kWh)	0.041	0.042	0.044
Average yearly collections per household (US$)	6.794	9.232	9.548
Total yearly turnover (US$)	5,676	9,658	16,910
Payback period - years	98	58	35

Note: Exchange rate as of February 1, 2011: US$1 = VND 19,490.
Source: EVN.

be about 50 percent of that of the northern and central areas. This difference in costs could be explained by the divergence in technical standards used in the different areas. More specifically, the network in the south was built according to U.S. standards, which enabled the use of single-phase configuration for grid extensions, which is less costly. The system in the north of the country, by contrast, was built based on Russian standards, which prevented PC1 and PC3 from using the less costly single-phase configuration for grid extension for rural

electrification.[6] The relatively high cost per household electrified and low electricity consumption recorded translated into unsatisfactory financial results for EVN, which was now a commercial business entity. Therefore, in light of the results of the pilot effort, EVN decided to stop its rural electrification program.

Critical Government Actions

In 1996, the resolution of the Eighth Party Congress set a clear target for 100 percent of districts, 80 percent of communes, and 60 percent of rural households in Vietnam to be connected to the national power grids by the year 2000.

In 1997, the Ministry of Industry issued a "Power Sector Policy Statement." The policy statement elaborated the government's policy objectives for the power sector, outlined the reform strategy for meeting its objectives, and included a reform implementation plan.[7] The policy statement listed the government's power sector policy objectives as providing electricity access to the national economy and the entire population of Vietnam; increasing the operating and technical efficiency of the electricity sector to optimize the use of scarce investment resources; ensuring reliable electricity supply of good quality; resolving the mismatch between market-based production costs and state administered prices; clearly delineating and separating state management functions and business management functions; and enabling Vietnam to raise the necessary financing for power sector expansion.

Critical components of the strategy included the following:

- Structural reform and commercialization of sector enterprises.
- Setting up of a legal and regulatory framework for the power sector.
- Gradually moving toward cost reflectivity of electricity prices over time, through progressively raising average retail tariff and introducing a cost-based bulk transfer price for bulk power sales to the distribution companies.
- Enabling diversified participation and introduction of private sector participation in the sector.
- The development of a rural electrification master plan.
- Introduction of measures and systems for electricity demand-side management and load management in Vietnam.

Also in 1997, the National Assembly decided to put the PCs directly in charge of managing rural networks. That same year, the Ministry of Planning and Investment (MPI), in cooperation with EVN and other ministries, developed the "Proposal for Rural Electrification up to 2000." This proposal set the objectives of rural electrification, reviewed the rural electrification program, and estimated the financing requirements for meeting the target set by the Party Resolution, issued during the Eighth Party Congress. For the first time the rural electrification was proposed to be set as a **National Program**. The proposal presented two options for the rural electrification out to 2000:

- **Option 1** would involve the electrification of 3,424 commune centers and the rehabilitation of networks in 5,519 communes to achieve the target of connecting 100 percent of communes and 80 percent of households in the lowland areas, and 80 percent of communes with 60 percent of households in mountainous areas. The total investment required to meet the target was estimated about VND 37 trillion, equivalent to about US$3.3 billion at 1996 exchange rates.
- **Option 2** would involve the connection of 1,520 commune centers, to increase the commune-level access rate to about 80 percent, and supply power for about 652,000 households, and rehabilitation of networks in 2,269 communes to expand access to about 657,000 additional households; increasing household access to 60 percent, and improving quality. With this more realistic target, the total financing requirement was estimated to be about VND 8.47 trillion, equivalent to about US$760 million.

Cognizant of the strong demand for rural electrification and the government's desire to rapidly provide access to the rural areas, but deterred by concerns over the financial aspects of rural electrification and the limits on its own financial capacity, EVN developed a program

6. The North American system involves the use of a three-phase, four-wire configuration, with the fourth (neutral) return wire grounded at numerous points along the line. The configuration allows the use of a single phase and the common return wire for step-down to low voltage. By contrast, in the configuration that was used in the north, there was no common return, and therefore a single phase cannot be stepped down.

7. A copy of the policy statement is available in annex 12 of the Project Appraisal Document of the Transmission, Distribution and Disaster Reconstruction Project (Report 17016–VN).

BOX 3 METHODS USED FOR FINANCING THE RAPID GROWTH IN RURAL ELECTRIFICATION, 1993–97

Funds for rural electrification were mobilized from practically every possible source and in different ways:

- **Central government budget:** Since the central budget during this time was very scarce, the limited funds available were reserved for the connection of district centers, mountainous areas, and densely populated centers.
- **Provincial/district budget:** Most of the funds from these sources were for the MV system.
- **Commune/cooperative budget:** These funds were mainly for the development of LV systems in communes.
- **Electricity tariff surcharge:** Under this approach, each kWh consumed by urban customers would be subject to a surcharge to support the development of rural networks. Ho Chi Minh City, Hanoi City, and some provinces have applied this method to mobilize funds for their rural electrification efforts. For example, Ho Chi Minh City collected about VND 760 billion (about US$60 million) in 1998.
- **Customer contributions:** During this period, it was a must for customers to pay for a share of the cost of grid connection. The amount of the contribution varied across locations, depending on the availability of funds from other sources. In many cases, particularly at the beginning of this period, customers paid for 100 percent of the costs for the LV, and even part of the MV system. In almost all cases, the customer at the very least paid for the cost of the connection from LV lines to their house, meter, and of course in-house wiring.
- **Borrowing:** Many agriculture cooperatives and communes borrowed from commercial banks to finance the development of the LV system in their areas.
- **International donors:** From 1994 onwards, international donors and nongovernmental organizations (NGOs) started supporting rural electrification efforts. For example, from 1996 onwards, the Japanese government made funds available to some provinces, through MPI, and OPEC directly provided US$10 million assistance to Quang Nam Province. These sources become more and more in the next period.

In most cases, the network in a commune was built using a combination of funds from these sources.

One of the issues with the funding methods was that there were no guidelines on record-keeping on sources of funds and project expenditures. This situation led to many of the problems during next period, when new business models were adopted and some arrangements for managing LV networks required transfer of assets between owners.

continued

whereby the PCs would bring electricity to commune centers, leaving it to the local agencies to provide connections to households. Under this approach, the PCs would invest in the MV system up to the 35 or 22/0.4 kV transformers, thereby bringing electric service to communes. Beyond the MV transformers, responsibility for mobilizing funds, purchasing, and installing the LV grid and for its operation and management belonged to local authorities; to provincial, district, commune, and agriculture cooperatives; as well as to customers themselves. As part of this approach, about VND 760.7 billion was invested into the power sector for the 35 and 22 kV systems between 1993 and 1996.

This led to a wide variety of local organizational arrangements for delivering electricity. Moreover, in the absence of a clear national policy, there had been a growth of diverse management structures in the rural electricity distribution sector, and institutional responsibilities and authority varied across the country. The sources of financing and business models for rural electrification during this period are summarized in boxes 3 and 4.

Beginning of Government–World Bank Partnership in the Energy Sector

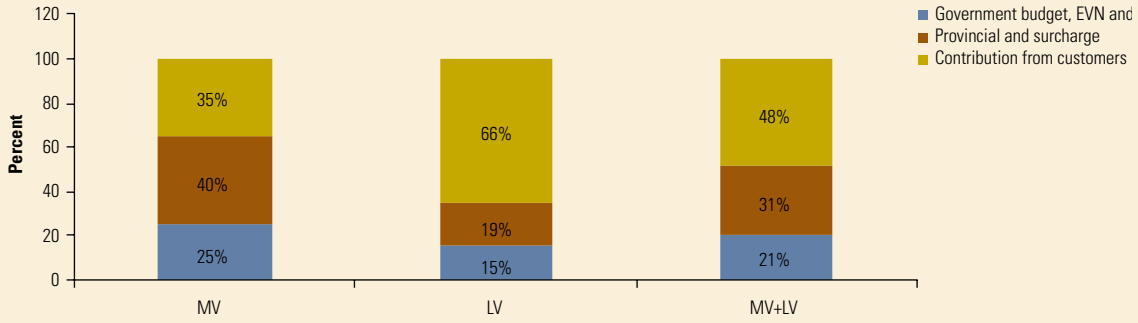
With the lifting of the trade embargo in 1994, the World Bank began providing support to the Government of Vietnam's various economic development programs. The World Bank's involvement in the power sector began in

BOX 3 CONTINUED

Moreover, because of the lack of a robust system for documentation, maintenance, and retention of records, reliable figures on total investment in rural electrification during this period are not available. Nonetheless, it is estimated that the total value of rural network assets in 1998 was more than VND 6,700 billion (about US$600 million), according to EVN data. Figure 5 shows the estimated breakdown of investment in MV and LV networks according to sources of funds.

For the MV system, the largest source of funding was the provincial budget (40 percent), followed by customer contributions (35 percent), while central government and EVN and the power companies provided about 25 percent. For the LV system, the largest share source of funding was customer contributions (66 percent), at almost double the combined contributions from provincial budget (19 percent), and the central government, EVN, and PCs (15 percent). Overall, the customers paid for about half the cost (48 percent) of distribution system investments during this period.

FIGURE 5 MV AND LV NETWORK INVESTMENTS, BY FUNDING SOURCE, 1993–98



Source: World Bank staff, based on EVN data.

1995, with the preparation of the **Power Sector Rehabilitation and Expansion Project**, followed by the **Power Development Project** in 1996. Through these two projects and a series of technical assistance activities, the World Bank was able to provide technical, institutional, and capacity building support to Vietnam's electricity sector. The dialogue that took place during these activities led to the development of a reform strategy, which was agreed upon with the government under the Power System Development Project. The Power Development Project is of particular relevance to rural electrification, as, in addition to financing new generation and transmission capacity, the project supported the provision technical assistance for the preparation of a Rural Electrification Master Plan. The technical assistance was aimed at providing assistance to the government in developing a national rural electrification strategy and implementation plan to extend electricity service. The technical assistance was completed in mid-1999, and its findings and recommendations were used in the preparation of the Rural Energy Project, which was approved in the year 2000.

In 1997, preparation for the **Transmission, Distribution and Disaster Reconstruction Project** began. The objective of this project was to strengthen the country's transmission and distribution system, and assist the government in its efforts to rehabilitate the power system, which had been damaged by the 1997 typhoon in southern Vietnam. The project, which became effective in 1999, assisted EVN with the improvement of a series of transmission lines and substations, which served as feeders for the rural distribution system.

BOX 4 BUSINESS MODELS FOR RURAL ELECTRIFICATION

The LV systems in the communes were managed and operated under one of four main groups of business models:

1. **Management of the LV system directly by administrative authorities.** There were variations of this model:

- **Commune electricity group (CEG):** Under this model, commune authorities assigned some of their own staff to operate and manage the LV system in the commune. Commune authorities either directly signed contracts with the PCs or authorized CEGs to do so. In terms of operations, CEGs either directly managed retail sales to each household or managed the bulk sales to a group of households, which in turn elected representatives among themselves to handle retail sales to individual households in the group.
- **District electricity group (DEG):** This model is similar to the CEG, but larger in scale, and at the district level. The DEG model was very popular during this period, and was applied in about 70–80 percent of the electrified communes. This model followed the Inter Ministerial Circular 18/TT-LB between the Ministry of Energy and State Pricing Board issued in 1992.

  This model had the following advantages:

  - During a period when rural electrification relied heavily on contributions from users, the direct involvement of local authorities facilitated the mobilization of the funds required for development.
  - CEGs and DEGs were able to work closely with Commune People's Committees, the lowest-level administrative body and, through them, communicate any issues to higher administrative levels or the PCs.
  - In many cases, commune administrative authorities were able to cooperate with the local PC branches for staff training.

  However, the CEG and DEG models also had their drawbacks:

  - There was very limited technical and management capacity—for instance, by the end of 1997, only about 20 percent of CEG/DEG staff had gone through basic training.
  - No financial management and controls were implemented.
  - No technical standards were available or applied. Technical losses were in the 30–50 percent range.
  - Because of the absence of financial controls and the high losses, final users had to pay very high tariffs, and there appeared to be a large divergence among rates paid by individual users. The CEGs and DEGs enjoyed a bulk tariff of VND 360/kWh, or about US¢3. However, according to 1998 data, only about 47.5 percent of the customers paid tariffs less than VND 700/kWh, about US¢6, and others had to pay much higher rates—in some cases up to VND 1,500/kWh, or nearly US¢13. The difference between reported tariffs among different end users may be because many communes reported tariffs up to the group of customers, while individual end users may have had to pay much higher rates because of further losses incurred during distribution within a group.

2. Allocation of operating rights through bidding. This model was a form of leasing. The commune and customers collected the funds, built the system, and contracted out the operation of the system. An entrepreneur would bid for the right to use the wires to deliver electricity. The wires were leased to the entrepreneur in return for regular payments to the system owner, which in this case was the commune. The entrepreneur would pay for the electricity bought and recover his costs for the purchase of electricity and for the payments for leasing the wire from the customers. The problem with this arrangement was that the entrepreneur had little incentive to maintain the system and every incentive to maximize the tariff from consumers, since any revenues above the costs would be retained directly by the entrepreneur.

continued

BOX 4 CONTINUED

3. **Company/Enterprise:** There were two main variations of this model:

- **Provincial electricity and water company or board, under the People's Committee.** Some provinces, such as Baria Vung Tau, An Giang, Tra Vinh, Can Tho, and Vinh Long, set up a company or board under the People's Committee, to be in charge of the development and management of rural electrification and water supply in the province. This model can be seen as a variation of the model involving direct management by local administrative authorities.
- **This model had many more advantages than the CEG/DEG model.** Thanks to the economies of scale, the companies/board could mobilize and coordinate various sources of funds, including debt financing. Most entities of this kind were financially sustainable, and were later incorporated in compliance with company law.
- **Company established under the company law.** This model entails the development and management of rural electrification by a company incorporated in line with the requirements of the company law. During this period, there Hai Phong was the only province where this model was implemented.

4. **Power Companies:** By 1997, there were about 30 communes where the PCs directly managed the LV system and handled retail sales.

Dramatic Results

Thanks to strong nationwide demand for rural electrification and government commitment, coupled with the availability of energy from newly built power plants and the unification of the system with the completion of the 500 kV line, household electrification rates grew dramatically during this period. At the beginning of this period, about 1.7 million households, corresponding to 14 percent of the total, had access to electricity. By the end of 1997, the share of households with access to electricity increased to 61 percent of the total number of households. In other words, 6.2 million households were electrified during the course of the period, which meant that, on average, 1.6 million households gained access to electricity each year.

It is important to note that during this period, electricity consumption patterns were skewed toward urban dwellers, who represented about 20 percent of the population, accounting for more than 86 percent of the total consumption. Urban household electricity consumption was 6–10 times higher than rural households, which varied between 21 and 50 kWh per month.

Emerging Issues

Although this period was one of strong momentum and impressive results for rural electrification, it was also host to arrangements that were associated with issues that had to be tackled in the subsequent years. This combination of institutional, ownership, management, and technical arrangements is summarized below.

While many more communes gained access to electricity during this period, access to rural households remained relatively limited, because of the focus on electrification of commune centers. Because the majority of the connections were paid for by end users, rural electrification oftentimes excluded the poorest, who could not afford to pay the connection costs. In fact, in many communes, fewer than 50 percent of the households had access.

Progress of the government's rural electrification program was often hampered by poor institutional arrangements and lack of sufficient capital. Commune electricity groups (CEGs) and other organizational structures that had no legal status, minimal technical competence, and little financing, carried out almost 90 percent of rural electricity distribution, but had no means to raise further capital. Financing further expansion was a major hurdle for development.

There were concerns with the technical quality of some LV systems built during this period. A large number of the grids were poorly designed and constructed, leading to heavy technical losses varying from 20 to 50 percent in some cases. When these grids fell into disrepair, there were often no funds for rehabilitation, or in some cases, even for routine operations and management. Moreover, there were no national standards for the wires and equipment. In many communes, the

Examples of divergent technical quality of rural systems

Source: World Bank staff.

households were permitted to buy their own equipment; the wires and equipment were often of inconsistent, and of low quality.

During this period, no standards or specifications for the rural networks were available. Therefore, two approaches emerged while building the new MV and LV systems: (1) use specifications of networks in urban areas or (2) use whatever material was available. The first option was followed by richer communes and led to unnecessarily sophisticated technical specifications. Most of the communes, however, followed the second approach. The lack of proper design, appropriate specifications for equipments and materials, and technical standards in turn led to most of the systems developed in this period having high losses, providing unreliable electricity, resulting in safety issues, and in some cases, involving a high rate of accidents. The photos provide two examples of rural systems built with varying technical quality.

Prices paid for connections and energy use were high and variable. The entity managing the local grid purchased power at a fixed price. The cost of the high losses resulting from the poor technical quality and management methods ended up having to be recovered from the consumers. In some southern provinces, a system of intermediary agents had come up, where individuals bought power from the PCs and then sold it to the households at greatly enhanced prices to cover the cost of connections.

Prices paid for using electricity varied considerably across various communes, and overall, rural consumers paid much higher tariffs than their urban counterparts, with tariffs roughly two to three times the nationally prescribed residential tariffs. Since there was no regulation or financial control, in some areas, households on one side of the road paid much higher tariffs than households on the other side.

The divergent institutional arrangements and inadequate technical requirements that prevailed at such a period of rapid growth in rural electrification meant further amplification of the scale of the issues that would need to be tackled in later years.

A5

Moving to Better Regulation

Between 1998 and 2004
Electrification rate grows from 61% to 87%

This period could be characterized by (a) a slowing down of annual electrification rates, (b) change in investment sources, (c) stronger government role through setting up of the legal framework, and (d) active assistance from international donors.

By the end of 1997, 61 percent of the country's households had been electrified. However, about 30 million people still had no access to electricity. After booming during the previous period, when rural household electricity access increased by almost 12 percent points each year, Vietnam's rural electrification efforts entered a slower period between 1998 and 2004.

Two major reasons explain the slower pace of rural electrification:

- All sources of financing that were available had been exhausted, as any commune and any household that had the financial capacity had already been electrified. Almost all the local LV networks built to date had been financed by the local communities and were managed by CEGs or cooperatives.
- There were issues with the planning, implementation, and management of rural electrification, which had to be addressed before the program could move ahead.

Essential Government Decisions Setting the Course of Rural Electrification

This period was host to a series of important government interventions with regard to the country's rural electrification program. During this period, the Government of Vietnam passed several decrees and regulations that outlined the main principles for reform of the rural electricity distribution sector. These principles were consistent with those adopted in other parts of the sector: encouraging diversification of ownership and management, and increasing regulation.

In 1998, the government approved a national program for poverty reduction, known as the "135 Program," for the 1,870 most disadvantaged communes in remote, isolated, and mountainous areas. One of the objectives of this program was the development of infrastructure services, such as electricity, roads, schools, and clinics in those communes. Many communes chose to use funds from this program for developing LV systems in their communes.

A major action from the government was the setting of a ceiling price for rural household electricity use in 1998. This decision can be seen as the first attempt to establish financial controls over the rural electricity supply business. This decision allowed local distribution utilities (LDUs) to take advantage of the subsidized bulk tariff of VND 360/kWh and retain a margin for the operation of these systems, while also setting a ceiling price of VND 700/kWh and preventing them from going over that price.

Another important decision came in February 1999, with the issuance of **Decision 22**, announcing the approval of the "Proposal for Rural Electrification up to 2000," which had been prepared by the MPI.[8] Decision 22, formally entitled "Prime Minister's Decision on the Rural Electrification Proposal," had an important impact on Vietnam's rural electrification program. For the first time, the mechanism for allocation of responsibilities and financing of rural electrification had been formalized; and the rural electrification effort was branded as one of "State and people, central and local, working together." The main provisions of Decision 22 are summarized in box 5.

The government's determination to move forward with rural electrification culminated in the inclusion in the **Fifth Power Development Master Plan (2000–10)** of a target for achieving 90 percent rural household electrification by 2010. In the master plan's chapter dedicated to rural electrification, the principles for the evaluation, development, and implementation of rural electrification projects were outlined. According to the master plan:

- Rural electrification would be implemented gradually, in line with available financial resources.
- Priority would be given to electrification of areas that have the potential to enhance agricultural productivity, and industrial development, and to restructure the economies of the strategic zones. The allocation of responsibilities for investment, management, and operation of rural electricity networks should be based on maximizing the participation of local authorities, people, and investors.
- The cost of operation, maintenance, and depreciation of rural electricity infrastructure should be financed through the revenues from EVN, PCs, and the entities operating the rural networks. If such activities are deemed commercially unviable, the government shall provide subsidies.
- Supply of electricity to consumers in rural areas should be considered a commercial activity, except for areas where the government deems the provision of subsidy necessary. The entities supplying electricity to rural consumers should be provided with adequate financial incentives to remain in business and maintain an acceptable level of service.

In addition, the master plan reiterated the allocation of responsibilities established in Decision 22 and clearly stated that all rural electrification investments should meet national design standards for rural electricity networks, which would be set by the Ministry of Industry and overseen by EVN for compliance.

In 2001, the government issued Decree 45 on "Electricity Activity and Uses." Decree 45 had a chapter specifically dedicated to rural electrification, the main provisions of which are summarized in box 6.

8. The "Proposal for Rural Electrification up to 2000" was prepared by the MPI between 1996 and 1997, and the final report was issued in 1997. It was approved by the prime minister in February 1999.

BOX 5 KEY PROVISIONS OF PRIME MINISTER'S DECISION ON THE RURAL ELECTRIFICATION PROPOSAL

Decision 22—1999 outlined the allocation of responsibilities and costs of rural electrification. According to this decision, the costs of rural electrification would be allocated according to the following principles:

- All costs associated with the MV system would be borne by EVN and supported through a combination of central government budget, retained capital depreciation funds, soft loans from the government, and overseas development assistance.
- Costs associated with the main lines in communes would be covered out of local government budgets.
- Costs associated with MV branches and/or service drop to customers' houses would be borne by the customers.
- For remote or mountainous areas, or specific poor households, the government would share part of the costs for the LV lines and service drop.
- Rural electrification involving MV and LV lines in Hanoi, Hai Phong, Da Nang, and Ho Chi Minh City, as well as in Dong Nai, Khanh Hoa, and Baria-Vung Tau Provinces, would mainly be financed from local budgets.

As for the responsibility for the management and operation of these systems:

- EVN would be responsible for managing the MV system up to the 22/35 kV substation outlet.
- Local authorities, through LDUs, would be responsible for managing the LV systems.

BOX 6 GOVERNMENT DECREE ON ELECTRICITY ACTIVITY AND USES—KEY PROVISIONS CONCERNING RURAL ELECTRICITY

According to Clause 50, Chapter IV of Decree 45—2001, investment in and management of electricity networks in rural, mountainous, and island areas will be carried out based on the following principles:

- Investments in rural electricity networks would be made in accordance with the principle of "State and people, central and local, working together" following different investment and management models.
- Entities investing in rural networks in areas with difficult conditions could borrow from development investment funds at lower interest rates.
- The ceiling price for residential electricity use in rural areas would be set by the prime minister; while the chairmen of the People's Committees of Cities and Provinces would determine the individual prices for different locations.
- The distribution utilities purchasing electricity from the national grid for retail sale to rural households could be eligible for reduced taxes or tax exemption.

According to Clause 51, Chapter VII:

- EVN would invest in and operate MV distribution lines and substations, except in cases the prime minister agrees otherwise.
- LV main lines would be financed by funds mobilized locally.
- LV branches and service drop would be financed by end users.
- The Government of Vietnam would provide financial assistance for LV main lines in remote, mountainous areas, and service drop for poor households.
- For the areas inaccessible for the national grid, or where the connection is uneconomical, the development of an off-grid system with local energy sources, such as mini hydropower, solar power, diesel generators, or others will receive government financial assistance, and would be eligible for tax reductions or exemptions.

Moreover, according to Decree 45, all entities operating in the power sector were required to obtain licenses. This meant that entities operating under CEG, district electricity group (DEG), or other types of arrangements were required to obtain licenses and make any changes necessary to come in compliance with legal requirements.

In December 2004, Vietnam's first **Electricity Law** was passed by the National Assembly of Vietnam. The Electricity Law reaffirmed the government's determination to move forward with the rural electrification program, acknowledged the difficulties of implementing the program, and introduced measures to improve the electricity business in rural areas. The law included a chapter dedicated to "Electricity for Rural, Mountainous, and Island Areas." The law's provisions of relevant for rural electrification are summarized in box 7. The Electricity Law also established the Electricity Regulation Authority of Vietnam under the Ministry of Industry.

EVN's Role in the Rural Electrification Program

During this period, EVN went beyond the allocation of responsibilities under Decision 22 and introduced a pilot program for operation of LV systems. During the period from 1998 to 1999, EVN spent about VND 90 billion, or about US$6 million, to rehabilitate LV systems in 82 communes, and took over the operation and retail sales to end users. This would contribute to addressing concerns about the high cost and low quality of rural electricity supply.

Consistent with the allocation of responsibilities under Decision 22, from 1999 onwards, EVN started another program to acquire the MV systems that had been invested in and built by other entities, such as agricultural bodies, cooperatives, local authorities or private companies. EVN spent about VND 400 billion, or nearly US$27 million, to acquire those MV networks.

BOX 7 ELECTRICITY LAW PROVISIONS ON RURAL ELECTRIFICATION, 2004

With respect to rural electrification, the Electricity Law:

- required the mobilization of all potential sources of financing in order to speed up rural electrification.
- created a favorable environment for the provision of electricity to remote, isolated, disadvantaged areas, as well as to areas with ethnic minorities.
- made government financial assistance available to investors in the more challenging locations.
- encouraged the development of renewable energy.

The Electricity Law also specified a policy for support to investors and consumers in "disadvantaged areas:"

- The government would assist electric service providers operating in locations where the investments are not financially viable,
- The government would provide support to cover the cost of the service drop for the most disadvantaged and poorest households, which are certified by local authorities as such.
- The government assistance could be in the form of support with capital costs, interest rates, and taxes.

The law regulates the electricity tariffs in rural areas, and sets up the requirements for persons or entities operating in the electricity sector.

World Bank Support to Government Efforts for Rural Electrification

As discussed earlier in this section, by 1998, the pace of rural electrification had slowed down, since the most accessible sources of financing had been depleted and issues with the management and operation of rural electricity networks had emerged. At the same time, there was strong demand for increasing electricity access for remote and mountainous areas and ethnic minorities.

During this time, the World Bank, at the request of the government, began the preparation of a long-term program that focused on accelerating and improving access in rural areas in an economically viable and self-sustaining way.

The preparation of the first project took almost two years, in order to identify the most suitable way of addressing issues, such as the following:

- Whether focus should be on rehabilitation of the existing system to reduce losses or on expanding access to disadvantaged areas.
- Who would be in charge of implementing this effort.
- How implementation capacity could be secured for a large project covering scattered areas.
- What the appropriate business model would be to ensure the viability and sustainability of the program.

A series of studies and technical assistance activities were carried out during project preparation, including continuation of technical assistance for the preparation of the Rural Electrification Master Plan, which had started under the Power Development Project in 1996. The Master Plan was completed in June 1999, and its findings and recommendations were used as inputs to project design. Other significant outcomes from studies conducted during preparation were the establishment of technical specifications for rural networks, which would later become national standards, and completion of an analysis of various models for management and operation of rural networks, including cooperative, company, joint stock company, leasing, and service agent models.

In conjunction with the ongoing dialogue during the preparation of the project, the Government of Vietnam issued a policy paper on rural electrification, clarifying the roles of different parties and establishing the principles of rural electrification investments, which were also reflected in the design of the REP. A copy of this policy paper is available in the appendix.

The **Rural Energy Project**, financed by a US$150 million IDA credit, was approved by the World Bank's Executive Board of Directors in May 2000 and became effective the same year. The development objectives of the project were as follows:

- Expand rural access to electricity in 671 communes located in 32 provinces through grid extension, where economically justified, to improve welfare, enhance income-earning capacity, and help alleviate poverty.
- Define and establish institutional mechanisms and strategy for rural electrification in Vietnam that would facilitate
  - a sustained program of continued rural electrification with increased local operation and management, and conversion of CEGs to joint stock cooperatives or companies,
  - the long-term viability of the power sector through appropriate bulk supply tariffs and distribution margins, and
  - continued implementation of power sector reforms in accordance with the 1997 Policy Letter and Strategy.
- Promote the application of renewable energy sources in areas inaccessible to the national grid and supplement the grid power supply.

The project would be implemented by EVN through its PCs. EVN provided overall guidance to the project while the three PCs took over the detailed implementation of the project.

Rural electrification investments financed under the project had to meet certain basic principles. The project design principles required that investments

- involved local participation and cost sharing between consumers, local government, and the utility,
- were economically viable,
- comprised project components that were cost-effective and required no operating subsidies,
- were built according to technically sound specifications,
- were accompanied by consumer willingness to connect and pay, and
- involved local participation in operations and maintenance after construction.

The cost sharing would involve the PCs financing MV and LV systems, while provinces covered the cost of land acquisition and compensation, and customers paid for service drop to their households. Since the program involved the construction of the LV lines out to households at the connection level, and then turning them over to local companies, technical losses were expected to dramatically reduce to about 7–10 percent. Implementation of the project was completed in 2006; its results are discussed in section A6.

Having observed the success that was being achieved during the implementation of the REP, the World Bank and the Government of Vietnam decided to continue their cooperation, and initiated the preparation of RE2 in March 2003. The project preparation efforts also led to the initiation of dialogue and support for institutional change and regulation in step with other reforms in the power sector.

In addition to the World Bank, other international partners, such as Japanese and French governments and OPEC, were also actively assisting the government's rural electrification effort.

Results Achieved

By the end of 2004, all provinces, just over 94 percent of the communes, and more than 87 percent of the households in the country had access to electricity, as presented in table 5.

However, despite this expansion, electricity consumption in rural areas, including for residential use, irrigation

TABLE 5 ELECTRIFICATION RATES, 1998–2004 (percent)

	1998	1999	2000	2001	2002	2003	2004
Commune	15.1	77.8	82.0	84.9	89.0	92.7	94.3
Household	62.5	69.7	73.0	77.4	81.0	83.5	87.4

Source: World Bank staff, based on EVN data.

TABLE 6 ELECTRIFICATION COSTS: RESULTS FROM THE RURAL ENERGY PROJECT

	Communes electrified	Households connected	Total cost (millions of US$)	Cost per commune (thousands of US$)	Cost per HH	
					US$	% of estimated
PC1 area (north)	529	232,955	91.40	173	392	58
PC2 area (south)	187	184,472	54.72	293	297	106
PC3 area (center)	260	137,900	55.21	212	400	62
Total	976	555,327	201.33	206	363	72

Source: Implementation Completion and Results Report for the Rural Energy Project.

pumping, and other uses, accounted for about 19 percent of the total electricity consumption in the country.

Issues Remaining to Be Resolved

There was a need to secure financing to cover the cost of further expansion of electricity access. In the case of REP, the average connection cost for households electrified was US$363 per household. As shown in table 6, connection costs per household ranged from US$197 to US$400, depending on where households were located. These costs at project completion were nearly 30 percent less than the original estimate.

In addition to further expanding access, another issue that still had to be resolved was the diversity of management and operational models that prevailed in rural electricity supply during the period. Table 7 provides a breakdown of the models for management and operation of rural electricity networks at the time.

TABLE 7 MANAGEMENT STRUCTURE IN THE RURAL POWER DISTRIBUTION SECTOR, AS OF JANUARY 2004

Management Models	Number of communes	Share of total (%)
CEGs*	4,842	62.8
EVN PCs	1,466	19.0
Cooperatives	755	9.8
Companies owned by province or district	408	5.3
Unregistered agents*	233	3.0
Joint stock companies	5	0.05
Private companies	1	0.01
Total	7,710	100

*These arrangements have since been prohibited by the government.

During the course of this period, the CEG model continued to be the most common means of electricity supply in rural areas. In 2004, only 19 percent of the distribution networks in the rural communes were managed by the PCs, while the rest were under various local authorities. There were small distribution entities serving limited numbers of customers—on average 1,300 households each. As discussed earlier, this divergence led to significant variations in quality of rural networks, excessively high prices being charged for electricity supply to some users, and the inability of the poorest rural households to gain access to electricity. Moreover, the majority of CEGs had no legal status, and they were not subject to any financial accountability or controls. As a result, they had little ability to raise finances for rehabilitation or expansion.

Moreover, while there had been general improvement in access to electricity in recent years, the quality and reliability of electricity supply were an emerging issue. Investment climate surveys for Vietnam frequently cited power shortages and quality as an important issue, and rated poor power service as one of the top two infrastructure constraints and one of the top four of all constraints. A World Bank survey in 2006 found that 19 percent 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. A pilot survey in rural areas revealed similar results. All of these pointed to a need for a major and systematic effort for ensuring the quality and reliability of electricity supply.

The government recognized that in order to maintain the pace of rural electrification, the most urgent issues hampering development had to be resolved; namely, the need for viable models for management and operation of rural networks, and the need to secure financing for implementation of the rural electrification program. Addressing these concerns would be the focus of the government and its international development partners in the coming years.

A6

Focus on Quality and Regulation

Between 2005 and 2008
Electrification rate grows from 87% to 94%

This period could be characterized by the following: (a) enforcement of regulations, (b) a shift in focus from network extension to rehabilitation, and (c) direct government support for extending electricity access, particularly to minorities and those in remote areas.

At the beginning of this period, 87 percent of households in Vietnam had access to electricity. Through the government's rural electrification program, 90 percent of the country's households had been electrified by the end of 2005. By the end of the period, household electricity access rate had increased to nearly 94 percent.

The important issue of this period was the status of the networks built during the earlier periods. These networks had become obsolete, as they were unable to meet increasing demand, had rather high technical losses, and were in rather poor shape in terms of safety performance.

Critical Government Actions

In 2006, the Ministry of Industry issued its Decision 27 on licensing of entities operating in the electricity sector, and Decision 32 for licensing of persons operating in the electricity sector.

The Sixth Power Development Master Plan (2006–15) was approved in 2007. In that master plan, a target was set for 95 percent of households to be provided access to electricity by the end of 2010. This target was a reflection of the government's strong commitment to rural electrification. Also in 2007, the Ministry of Industry carried out a "Survey and Evaluation of the Management Models in Rural Areas." The objective of this exercise was to evaluate the effectiveness of existing models. As a result of this analysis, a set of recommendations was developed for the improvement of these models. Moreover, direct funding from the central government budget would be provided for remote areas and minority populations. For instance, 85 percent of the Central Highland Project was financed from central government budget and 15 percent from EVN funds.

While these policy actions were being pursued by the government, it was also active in implementing its program of electrification through a series of projects, with support from its international development partners. Prime among these was the REP, which is discussed in the next section.

Government Priorities Supported by the World Bank

By the beginning of this period, the Government of Vietnam and the World Bank's REP was nearing completion. The project was on track to having made a significant contribution to the achievement of the government's objectives for its rural electrification program, and exceeding the targets that had been set. By mid-2004, the project had helped connect more than 900 communes to the national grid, providing electricity to about 3 million people. The final results from the project are summarized in box 8.

BOX 8 RESULTS OF THE FIRST RURAL ENERGY PROJECT

As a result of the first REP, implemented between 2000 and 2006, 976 communes and about 550,000 households were connected, exceeding the original targets set at appraisal, as shown in table 8.

TABLE 8 COMMUNES ELECTRIFIED AND HOUSEHOLDS CONNECTED UNDER THE RURAL ENERGY PROJECT

	Number of communes connected		Number of households connected	
	Appraisal estimate	At completion	Appraisal estimate	At completion
PC1 area	347	529	147,150	232,955
PC2 area	120	187	166,667	184,472
PC3 area	204	260	81,184	137,900
Total	671	976	395,001	555,327

The project also contributed to capacity building for implementing agencies of EVN and PCs, during preparation and implementation stages.

Moreover, a key contribution of REI was the development of technical specifications and standardization of the design and 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 are too expensive for low-density areas. The standards were later adopted by the Ministry of Industry.

Early in the course of this period, it had become clear that further improvements were needed, not only in increased connections, but also for addressing the issue of losses and efficiency, as well as institutional shortcomings in the sector. Addressing these concerns was, in fact, the focus of the next project developed as part of the government–World Bank cooperation on rural energy.

The Second Rural Energy Project entailed a shift in emphasis from a complete focus on additional new connections to rehabilitation of existing systems, so that these systems were able to supply adequate electricity for the needs of consumers for both productive uses and in daily life.

The objective of the RE2, which became effective in 2005, was to improve access to good, affordable electricity services to rural communities in an efficient and sustainable manner. The development objective of the project, financed by a US$200 million IDA credit and US$5.25 million GEF grant, would be achieved through:

- A major upgrading and expansion of rural power networks in about 1,200 communes.
- Conversion of the existing ad hoc local electricity management systems to LDUs as legal entities recognized under Vietnamese law, to improve management of power distribution in rural areas, ensure financial sustainability, and enable future mobilization of private funds.
- Capacity building assistance for the LDUs, provincial authorities, participating regional PCs, and national authorities involved in the planning and regulation of rural electrification.

The project would dedicate significant attention to the repair and rehabilitation of existing systems for ensuring efficiency and to changing the institutional structures of the rural networks, in addition to expanding access.

All LDUs had to be established as legal entities, have technically sound investment and operational business plans, and have sufficient financial viability and sustainability. LDUs could be established in the form of (a) joint stock, joint venture, private, or public companies owned by local authorities; or (b) cooperatives, such as electricity, industrial, trading, or agricultural cooperatives.

Consolidation of the LDUs was a central area of focus of the RE2. One major requirement of the project was that the LDUs in all provinces had to be developed in such a way that they could be further aggregated into larger companies, if desirable in the future.

In 2008, the **Vietnam Rural Distribution Project** was initiated, with US$150 million in IDA financing. This five-

year project was designed to improve the reliability and quality of the MV networks bringing electricity to local distributors and build the capacity of regional PCs to act as independent participants in the power sector.

Results Achieved

By the end of 2005, as shown in table 9, 90 percent of the country's households had been electrified, which meant that the target set in the Fifth Power Master Plan for 2010 was met five years ahead of time. By 2008, 94 percent of the households had access to electricity.

In addition to the expansion of access, there was a major overhaul of the ad hoc management and operational arrangements for rural networks, as a result of the government's actions, and support from donors. Moreover, from an institutional perspective, all management and operation of rural electricity networks in 968 communes had been converted to legally recognized arrangements, such as a cooperative or a company, or had been transferred to the PCs in charge of those areas. All unregistered agents had been eliminated.

Focusing on quality

TABLE 9 ELECTRICITY ACCESS RATES, 2004–08 (percent)

	2004	2005	2006	2007	2008
Commune	94.3	95.9	97.4	97.89	97.89
Household	87.4	90.7	92.3	93.66	93.66

Source: World Bank staff, based on EVN data.

There were essentially three models for management and operation of rural electricity networks:

1. EVN, which provided electricity directly to the rural households through the PCS.
2. Rural cooperatives, which tended to cover only a single commune.
3. Joint stock companies, which provided power to one or more communes in the area.

By the end of this period, more than 5,600 LDUs were operating in rural communes.

Issues Remaining to Be Resolved

Going forward, concerns remaining to be addressed included the financial capacity of LDUs, and the emerging need for the consolidation of the industry. As noted earlier, more than 5,600 LDUs had emerged during the period. Some of the LDUs had low consumption of electricity and operated on a narrow profit margin. In some cases, with only 1,000 households as customers, the revenue stream was inadequate to cover the cost of operations and upgrading. Technical skills were lacking and the margins did not permit the hiring of adequately trained staff. There were customer complaints, as some of the LDUs sought to cover their expenses by raising retail tariffs with the approval of the provincial authorities. Studies also suggested that many of them struggled with issues of capacity, quality of supply, and safety: an estimated 200 electricity-related deaths were reported in one province last year. They had difficulty raising new capital for expansion especially at the commune level.

It was becoming evident that many of the newly formed LDUs were simply "too small to succeed." Policy makers had begun to see that consolidation of the LV networks had to take place, given the size and lack of financial viability of many LDUs. Addressing these concerns would be the focus of the government and its partners in the coming years. The RE2 would also play a significant part in the consolidation of the LDUs.

A7

Consolidation for the Last Mile

2009 onwards
Electrifying the last 4%

This period can be characterized by (a) efforts to identify the most appropriate strategy for extending access to the remaining 5 percent of households without electricity, (b) consolidation of the rural electricity distribution and retail business, and (c) tariff reforms.

As of 2009, 96 percent of the country's households, and 95 percent of the rural households, had gained access to electricity. There remained about 1 million households without access to electricity.

As standards of living improved, household consumption also increased, and potential for industrial growth in these areas also became evident. Rural areas therefore became more attractive for EVN and its PCs. By the beginning of this period, PCs were supplying electricity to all urban households, and a growing share of rural households, nearing almost 50 percent. The other half of rural consumers was served by LDUs.

Critical Government Actions

In an effort to regulate the rural electricity supply business, the government required LDUs to operate according to a new set of performance criteria going forward. The requirements included obtaining an electricity distribution and retail supply license, developing a reliable and transparent system of accounts, entering into a supply contract with each customer, issuing monthly bills and ensuring all customers had a certified power meter. These new regulations further challenged the smaller LDUs and eventually led to a process of further consolidation of the LDUs.

This period was also host to some important tariff reforms that affected the poor, put residential consumers on a more equal footing, and improved the targeting of subsidies. An important milestone of this period is **Decision 21** on electricity tariffs, issued in February 2009. The most significant feature of Decision 21 was that it stipulated a unified tariff for all consumers. Under this decision:

- The power tariff in rural areas would be the same as in the urban areas.
- The ceiling price of VND 700/kWh for rural areas was eliminated.
- The government allowed an increase in average power tariffs, as part of a move toward market mechanisms. In March 2009, tariffs would increase by 8.92 percent to VND 948.5/kWh. In March 2010, tariffs would increase by another 6.8 percent to VND 1,058/kWh.
- From January 1, 2010, the power tariff would be unbundled, with the generation portion based on

the market price and with regulated transmission and distribution elements.

- The increases allowed in tariffs would be accompanied by protection for poor consumers. IBTs were introduced, and a new set of "lifeline blocks" was introduced.

Further details on tariffs before and after Decision 21 are summarized in box 9. Decision 21 also made it possible for PCs to take over the management and assets of any LDU that was not financially viable. PCs were allowed to recover operating costs through the tariff charged to all consumers in the PCs' territory, in effect, cross-subsidizing the remote and poor consumers with other low-cost consumers. This was a critical factor in improving sustainability of electrification investment in the more remote and poor regions.

From 2010 onwards, further changes to the subsidy mechanism have been under discussion, including (a) limiting subsidies to only those customers consuming less than 50 kWh and (b) targeting subsidies to only rural customers.

The expected poverty and social impacts of changes to the IBT structure were analyzed as part of the Poverty and Social Impact Analysis that was undertaken as part of the preparation of the First Power Sector Reform Development Policy Operation. The changes analyzed included both the reduction in the coverage of the lifeline tariff and higher electricity prices. The analysis found that the poor in Vietnam would remain well protected despite the recent tariff adjustments and the narrowing of the lifeline band, and many rural consumers were in fact likely to benefit from the introduction of a unified system of

BOX 9 TARIFFS BEFORE AND AFTER DECISION 21

Prior to Decision 21:

- EVN's retail customers paid a lower rate than the LDUs were allowed to charge.
- The LDUs were subsidized through bulk power tariffs that apply to their wholesale purchase from EVN. The bulk electricity tariff paid by LDUs was around VND 390/kWh, or VND 429/kWh, including VAT (2.23 US cents and 2.45 US cents/kWh, respectively, based on February 2009 exchange rates).
- Retail tariffs were set by the LDUs, with provincial government oversight. These tariffs were formally capped at VND 700/kWh (4 US cents/kWh, in February 2009 exchange rates).
- The benefits of subsidized bulk power tariffs were supposed to be passed on to the end user, by virtue of the cap on the tariff. However, although retail tariffs were capped, anecdotal evidence suggested that many LDUs charged more than the VND 700/kWh ceiling, and that few, if any, applied a subsidy for low-income consumers.
- Only households receiving electricity directly from PCs received a lifeline tariff, which was for the first 100 kWh per month consumption block.
- The ceiling price for the first consumption block was set at VND 550/kWh (3.15 US cents/kWh, in February 2009 exchange rates).
- The second block comprising consumption of between 100 and 150 kWh was also slightly subsidized.
- The government did not provide any financing for subsidies; therefore, the system was entirely dependent on charges from other classes of consumers making up any shortfall from revenues from lifeline tariffs.

Decision 21 stipulated the following:

- The initial lifeline block would be subsidized and pegged at about 30–40 percent of costs.
- The amount of consumption subject to the lifeline tariff was reduced to the first 50 kWh of consumption, compared with 100 kWh previously.
- The tariff for the 51–100 kWh block was set at the breakeven cost, without profit.
- Higher blocks of consumption were set above average costs, to subsidize the lower consumption blocks.

continued

BOX 9 CONTINUED

- With the block tariff system, the margin left for an LDU varied depending on the volume of consumption.
- An analysis of margins allowed for LDUs in each consumption block is presented in table 10.
- Compared with the old fixed tariff, the margins for the first block will be reduced by VND 86/kWh with the 2009 tariff, and further reduced by VND 13/kWh with the 2010 tariff.
- The bulk electricity tariff for LDUs continued to be subsidized, but the rates went up in 2009.
- These changes would have a strong effect on small LDUs, especially those with less than 1,000 customers, each of whom consumed less than 60 kWh per month on average. Compared with the old fixed tariff, the margins for the first block will be reduced by VND 86/kWh with the 2009 tariff, and further reduced by VND 13/kWh with the 2010 tariff.
- The bulk electricity tariff for LDUs continued to be subsidized, but the rates went up in 2009.
- These changes would have a strong effect on small LDUs, especially those with less than 1,000 customers, each of whom consumed less than 60 kWh per month on average.

TABLE 10 TARIFFS EFFECTIVE AS OF MARCH 2010

A: VND/kwh

Block	New tariff with VAT	New bulk tariff for LDU (incl.VAT)	Margin left for LDU	Compared with old margin (VND 700/ kWh ceiling price)	Compared with margin of 2009
kWh	VND/kWh	VND/kWh	VND/kWh	VND	VND
0–50	660	475	185	–86	–13
51–100	1,104	828	276	5	–10
101–150	1,335	975	361	90	–13
151–200	1,753	1,350	404	133	–9
201–300	1,894	1,459	436	165	–10
301–400	2,028	1,562	466	195	–12
>400	2,079	1,601	479	208	–11

B: US¢/kWh

Block	New tariff with VAT	New bulk tariff for LDU (incl.VAT)	Margin left for LDU	Compared with old margin (VND 700/ kWh ceiling price)	Compared with margin of 2009
kWh	US¢/kWh	US¢/kWh	US¢/kWh	US¢	US¢
0–50	3.46	2.49	0.97	–0.45	–0.07
51–100	5.79	4.34	1.45	0.03	–0.05
101–150	7.00	5.11	1.89	0.47	–0.07
151–200	9.19	7.08	2.12	0.70	–0.05
201–300	9.93	7.65	2.29	0.87	–0.05
301–400	10.63	8.19	2.44	1.02	–0.06
>400	10.90	8.39	2.51	1.09	–0.06

residential tariffs and the expected integration of many LDUs into the PCs. For those continuing to receive power from the LDUs, expected benefits were identified, not only in terms of lower electricity prices, but also improvements in the quality and reliability of supply, and improved standards of safety.

Moreover, the Vietnam Distribution Code was approved in 2010, and it outlined the rights and obligations of PCs and their customers, including provisions about quality of service obligations and consumer protection.

The government continued to work with the World Bank and its other international development partners to achieve its objectives for rural electrification. In 2009, the Asian Development Bank approved a loan of US$151 million to help the country improve electricity services through increased renewable energy in poor and remote communities with ethnic minorities. Also in 2009, Germany's KfW provided €120 million for the rehabilitation of rural networks.

Scaled-up World Bank Support to Government Priorities

The RE2, which began to be implemented in 2005, continued to contribute to the meeting of the government's objectives in the sector. As of February 2009, when the project's Mid-Term Review (MTR) took place, the project had made good progress toward meeting the development objectives. As of the MTR, the project had supported the installation of 5,400 km of LV lines, 460 km of MV lines, 150 MVA of transformer capacity, and 310,000 household meters.

A significant amount of LV and MV assets had been created under the Second Rural Electrification Project. Box 10 provides an overview of the process for the transfer of assets created under the project.

The additional financing for the Second Rural Electrification Project, in the form of a US$200 million IDA credit, was approved in May 2009. The project development objectives remained the same, and this additional financing enabled project outcomes to be scaled up so that 1,500 communes, or about 1.5 million households, receive good, affordable electricity, compared with the original objective of 1,200 communes.

To support the government's continued efforts to move forward with its reform agenda, the **First Power Sector Reform Development Policy Operation (DPO)**, the first of a three-part government–World Bank program, was approved in March 2010. The series of operations under the DPO program are intended to support the introduction of the competitive generation market, which is the first stage of power market reform set out in the government's reform road map. Accordingly, the objective of the overall program is to support the implementation of a market for electricity generation, restructuring of the power sector, and tariff reform to facilitate effective competition, transparency, and predictability; encourage timely generation investment; improve system operational reserve; and provide incentives for efficient use of electricity.

BOX 10 TRANSFER OF NETWORK ASSETS CREATED UNDER RE2 PROJECT

In the project design, once the construction of the assets of the LV system is completed, it was expected that these assets would be transferred to LDUs.

According to the process put in place, provincial authorities would advise the LDU of the value of the assets created by the project, based on the best estimates available. The LDUs would be expected to prepare business plans based on the asset value, actual consumption, losses, and the tariff structures stipulated by Decision No. 21. The business plan would be submitted to the provincial Department of Industry and Trade (DoIT). The DoIT would review the business plan, and if the business plan were sound, would then propose to the PPC to transfer the asset to the LDU, with the agreement that the LDU pay the PPC for the asset value.

In case the business plan is (a) not satisfactory, and the financial viability of the LDU is not proven, or (b) the existing LDU does not want to continue to manage and operate the LV system, or (c) the LDU does not meet the other requirements set by the present regulation, the DoIT will propose to the PPC transfer of management of the commune's LV assets to the PPC, and the PPC will have the obligation to manage the LV network and pay back to the PPC the financing provided by the province for the project. As reported by the implementing agencies, about 100 communes have expressed willingness to transfer the LV asset.

Looking for a way for the last mile

The First Power Sector Reform DPO, comprising a US$200 million IBRD loan and US$112 million IDA credit, was designed to support the four policy areas on the government's program for reform, namely, development of the power market, power sector restructuring, electricity tariff reform, and improving demand-side energy efficiency. Specifically, the operation aims to put in place the important secondary legislation concerning the design of the competitive generation market, the main requirements for restructuring the power sector that are needed for the competitive generation market to work in a fair and transparent way, for the tariff mechanisms to set and update tariffs reflective of efficient costs, and for the establishment of the necessary preconditions for the government to take actions to improve energy efficiency. It will also enable a pilot of the final design of the competitive generation market to be run. It also supports substantive actions on tariffs, metering, and efficiency standards.

Results to Date

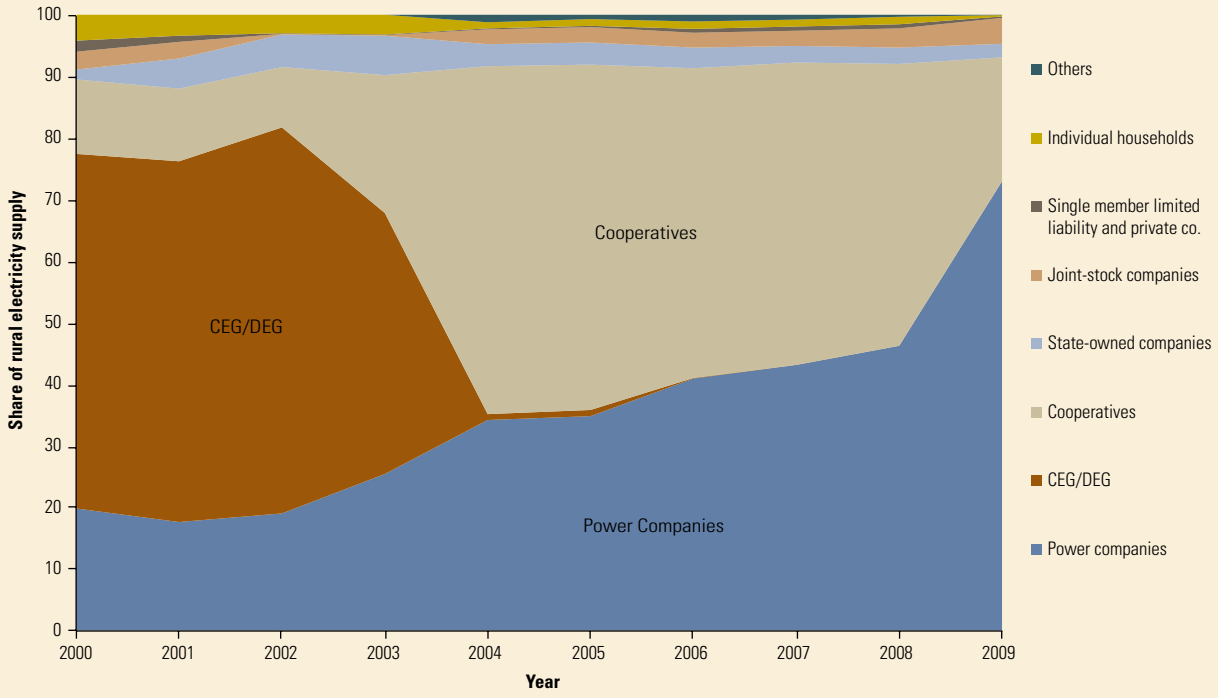
As of 2010, it is estimated that 99 percent of the communes and 96 percent of the households in Vietnam have been connected to the grid.

A significant change in the organization of rural electricity supply business is ongoing. As a result of government decisions, development in the energy sector, and the economy in general, over the course of the last decade, the organization of the rural electricity supply changed dramatically. The most dramatic turning points came with the phasing out of the CEG/DEG model in the aftermath of Decree 45 issued in 2001, and the introduction of the LDU model in 2005 followed by the consolidation over time of smaller LDUs—which were primarily cooperatives or joint stock companies—because of financial pressures and deliberate government actions to ensure financial viability of the sector.

A major impact of Decision 21 was to hasten the consolidation of management and operation of LV systems. The changes in tariffs had a strong effect on small and financially weak LDUs, and created strong incentives for consolidation. Consolidation had begun as early as 2005, when some smaller LDUs, generally cooperatives, sought to be taken over by EVN. During this period, the takeover of LDU assets by PCs intensified, and some LDUs with low financial capacity began to merge, consolidating a larger number of communes under a joint stock company structure at the district or provincial level.

Figure 6 illustrates the evolution of the rural electricity supply business between 2000 and 2009. While CEG/DEGs accounted for around 60 percent of rural electricity supply in the early part of the decade, the sector was more or less evenly split between cooperatives and PCs

FIGURE 6 MAIN ACTORS IN RURAL ELECTRICITY SUPPLY BETWEEN 2000 AND 2009



Source: World Bank staff, based on EVN data.

by the second half of the decade, and PCs eventually ended up supplying three quarters of rural households by the end of the decade.

Issues and Challenges

The recent trend of consolidation in the rural electricity supply business brought about a new set of operational issues. The Provincial People's Committees (PPCs) that took over the struggling rural LDUs are faced with the need to reorganize their distribution management system, and specifically, the handling of operational tasks, such as bill collection and safety inspections. As the LDUs that opt for being taken over by PCs are more likely to be the financially weakest and the most remote ones, the management of electricity supply in those areas is expected to be more challenging for the PCs.

Many of the PCs have already been experimenting successfully with the "service agent" model as one way of improving quality of service and safety, and reducing the cost of further expansion of their networks. The primary features of this model are explained in box 11.

BOX 11 SERVICE AGENTS

- Service agents are commune residents hired by PCs to handle collections and inspect the status of the infrastructure, such as meters and lines.
- They are used by the PCs in communes where the LV system is directly owned, managed, and operated by the PCs.
- One agent can be in charge of 300–1,000 customers and receive between US$30 and US$120 in fees per month.
- According to a recent estimate, the use of service agents reduces PCs' operating costs for meter recoding, bill collection, and safety inspection by 30–50 percent.

A8

The Road Ahead

Going forward, a number of tasks need to be fulfilled as part of Vietnam's rural electrification program:

- Continued investment in existing distribution networks;
- Ensuring sustainability of the operation of rural electricity networks;
- Extending access to those still without it; and
- Continuing to make sure electricity is affordable to the poor.

In addition to figuring out the most appropriate way to extend access to the remainder of the population living without electricity, the country has to continue making the required investments for rehabilitating and upgrading existing systems, ensuring the sustainability of the operation of those networks, and making sure that electricity is affordable for the poor. These tasks are examined in further detail below.

Continued Investment in Existing Distribution Networks

In the years ahead, a significant amount of investment will be needed to rehabilitate existing LV systems to reduce losses and upgrade the MV networks to allow the growing demand to be met:

- **Investment in rehabilitation of existing LV systems.** Many of the small LV systems developed in rural communes during the 1990s still remain relatively weak. These systems need to be rehabilitated in order to reduce losses and improve the reliability and quality of power supply. This means that a significant amount of resources and effort will need to be dedicated to the rehabilitation of LV networks in about 3,000 communes. Based on preliminary estimates by EVN, bringing existing LV systems up to current Vietnamese standards may cost somewhere between US$2 billion and US$3 billion.
- **Investment in upgrading MV networks.** The growth in LV systems and increased demand in rural areas will also imply greater need for the improvement of the MV distribution network over the medium term. Reliability of service is of concern in some rural areas, as existing systems are becoming unable to meet existing and projected load requirements. In some instances, the MV systems became a bottleneck in the power flow from the transmission system to the LV systems in the communes.

Ensuring Sustainability of the Operation of Rural Electricity Networks

Decision 21 of February 2009 made it possible for PCs to take over the management and assets of any LDUs that is financially weak. The challenge going forward will be to ensure that the transfer of the responsibility for managing and operating existing LV systems from financially weak LDUs is paced according to the absorption capacity of the PCs. To ensure this, it may be necessary to find the most effective ways of building institutional capacity in PCs, in order to equip them with the ability to manage and operate rural electricity networks in an efficient and sustainable manner.

Extending Access to Those Still without It

About 1 million households, mainly in mountainous areas and on islands, are still without access to electricity. The objective of expanding electricity access to unserved rural and mountainous areas of the country was included in the National Energy Development Strategy, which was issued in December 2007. This strategy envisages that all rural households will have access to electricity by 2020. The challenge will be identifying the most appropriate way of electrifying these remaining households, most of which are in poor, remote, or mountainous areas.

Continuing to Make Sure Electricity Is Affordable to the Poor

As the country expands access to a greater number of people, chances are that there will also be a greater number of poor people connected to the system. This means that large numbers of the poor people connected to the system have the potential to be affected by changes in tariffs and service levels. The Prime Minister's Decision 21, issued in 2009, established a clear framework for providing for the poor, and stipulated an IBT with a lifeline block for the first 50 kWh of consumption. The PCs were allowed to recover operating costs through the tariffs charged to all consumers in their territory, in effect, cross-subsidizing low-consuming households by others. In 2010, further changes to the subsidy mechanism have come under discussion, including limiting subsidies to only those customers consuming less than 50 kWh and targeting subsidies to rural customers only. In the future, if policy makers for some reason wish to make subsidies more transparent, they will need to make a determination as to how this can be achieved and what kind of arrangements should be put in place.

Hard choices need to be made with respect to Vietnam's rural electrification program going forward. The country's policy makers must determine how to allocate the scarce resources between its various priorities. They have to determine how to allocate resources among investments in rehabilitating LV systems, upgrading MV networks, and expanding electricity access to those remaining without it, while also setting aside resources to continue to provide for the poor and build institutional capacity for sustainable management and operation of rural networks. It is clear that improving the existing distribution systems would bring benefits to a larger number of people. On the other hand, completing the last mile of the access agenda and connecting the unserved populations is a top priority for the government. The question is how this can be done in a sustainable manner, and where the resources will come from.

Going the last mile

Part B

Measuring the Impact of Rural Electrification in Vietnam

B1

Background and Methodology

Introduction

Part B discusses the benefits and impact of electrification on rural households in Vietnam, and primarily relies on the findings of a longitudinal survey of beneficiaries of the World Bank's Rural Energy Project. That exercise was funded by ASTAE, ESMAP, New Zealand Aid, and SIDA, and was managed by World Bank staff. This section presents a summary of a select set of findings from that study. A more detailed and comprehensive publication presenting the findings and analysis resulting from that exercise is under preparation, and will be published separately.

Background

Recognizing the significant contribution of electricity to rural people's lives and livelihoods, the Government of Vietnam made monitoring and evaluation of its rural energy projects a priority. Monitoring and evaluation would enable policy makers and international development agencies to understand better the nature and extent of household welfare benefits attributable to rural electrification.

To this end, in 2001, an activity to examine the impacts of rural electrification on households was set up under the World Bank's REP, with support from ASTAE, ESMAP, New Zealand Aid, and SIDA. The objective of the activity was to quantify the social and economic impacts of rural electrification and to assess welfare impacts of rural electrification. This assessment would be done not only for the effects of REP itself, but by including control groups comprising already electrified areas, as well as unelectrified areas, it would be able to draw more general conclusions about the longer-term impacts of electrification on poverty alleviation and rural development.

The Institute of Sociology (IoS) of the Vietnamese Academy of Social Sciences was commissioned to conduct a longitudinal survey of the beneficiaries of REP, covering rural households with varying social and economic conditions.

Methodology

As part of the longitudinal survey, a panel of households was surveyed three times over a six-year period: the first in 2002, the second in 2005, and the third in 2008. A representative sample of 30 households was drawn from each of 42 communes in 7 provinces.[9]

The study was framed as a formal quasi-experiment with treatment and control groups. Of the six communes in each province:

- One commune had grid electricity since 2002 and had expected to continue to use it **[control group—electrified]**.

9. Ha Giang (Northeast), Lai Chau and Hoa Binh (Northwest), Quang Binh (North Central Coast), Quang Nam (South Central Coast), Dac Lac (Central Highlands), and Soc Trang (Mekong River Delta). In 2004, Lai Chau was split into two provinces: Lai Chau and Dien Bien.

- Two communes were outside the REP area, and were expected to remain without grid electricity throughout **[control group—not to be electrified]**.
- Three communes were without grid electricity in 2002 and were to receive electricity by 2005 under REP **[treatment group—to be electrified]**.

It was envisaged that such a formal "with and without," "before and after" research design would permit the identification of the independent effects of electrification on daily life and welfare in the sampled communes. Patterns of electricity use were examined for each group in all survey years. For the group that gained access to electricity between the survey years, it was possible to measure benefits precisely, because identical households were compared before and after they gained access.

This unique feature contrasts with most past studies, which estimated benefits by comparing households with and without electricity for a single period. Although longitudinal surveys have been conducted in other sectors, this was the first time that a longitudinal quasi-experimental survey design had examined the impacts of rural electrification—most recent World Bank–supported rural energy surveys (Peru, Philippines, Sri Lanka, and Yemen) have been more limited cross-sectional surveys.

The household surveys were complemented by surveys of important informants, including Women's Union representatives, teachers, health workers, and community leaders. The composite database is a unique resource on the impact of rural electrification that will be of great interest to the broader research community—in other countries as well as Vietnam.

These surveys showed that there were multiple benefits from the REP and the broader rural electrification effort for rural households in Vietnam. Access to electricity created conditions for economic development, particularly in the south, job opportunities for local people, and increased household income. Access also helped improve social and cultural life, reduced the burden of household chores for women and children, improved public primary health care, and improved children's education. Noteworthy findings of the surveys are summarized below. The findings of these surveys were consistent with results from studies by other researchers and international development agencies.

B2

Findings of the Survey

Increased Household Electrification and Changes in Energy Use Patterns

At the beginning of the study, the breakdown of the 1,262 households surveyed in 2002 according to electrification status, was as follows:

- 699 unelectrified households (55 percent);
- 322 connected to the national grid (26 percent);
- 163 with picohydropower systems generating electricity for individual households using a small turbine and generator placed in a nearby stream or river (13 percent).

The rest relied on minigrids or diesel generators.

The electrification patterns showed considerable variation across the seven surveyed provinces, as shown in figure 7.

In 2002, only 26 percent of the households in the study sample had grid electricity. By 2005, the share of study sample households with grid electricity had climbed to 87 percent, and by 2008, it had reached 95 percent. Figure 8 shows the changes in the energy sources used by households surveyed.

The rapid switch to grid electricity affected the actual composition of the households surveyed in terms of energy use. Of the 14 communes that at the time of survey design—around 2001 and 2002—were expected to be unelectrified by 2005, all but two *were* in fact electrified by 2005, and by 2008 only one commune remained unelectrified.[10] By 2005, 78 percent of households surveyed had access to the national grid, 9 percent had access to a minigrid, and the use of picohydropower and diesel generators had all but disappeared, as shown in figure 9.[11]

Although the originally envisaged control group (of unelectrified communes and households) had already become invalid at the time of the second survey, the data nevertheless allows a wide range of important conclusions about the benefits of rural electrification, and the contribution of rural electrification to poverty alleviation, which are discussed below.[12]

10. In 2005, only Ea Kiet in Dak Lak and Phuoc Nang in Quang Nam remained unelectrified; and in 2008, only Ea Kiet remained unelectrifed. Many of the communes that were unexpectedly electrified were in fact electrified by the REP. The explanation for this is that construction costs for REP were overestimated at the time of appraisal in 2000–01 (in part because of the unexpected very low inflation in the early 2000s), and therefore the unused funds were reprogrammed to electrify additional communes. Thus, REP electrified 976 rather than 671 communes, and 550,000 households rather than the 395,000 expected at appraisal.
11. Although IoS researchers observed a number of solar PV panels in Soc Trang Province, none of the surveyed households reported a PV system, even in 2008.
12. The attrition rates are relatively low: Of the 1,262 households in the original 2002 survey, 140 were lost in 2005 (11 percent), and a further 41 (3 percent) by 2008; and of the 137 households added as replacements in 2005, 12 were lost (9 percent). The literature suggests this is a low attrition rate for panel data spanning six years. A detailed assessment showed that attrition bias was not an issue (for details, see Khandker and others (2009).

FIGURE 7 ELECTRIFICATION STATUS IN SURVEYED PROVINCES, 2002

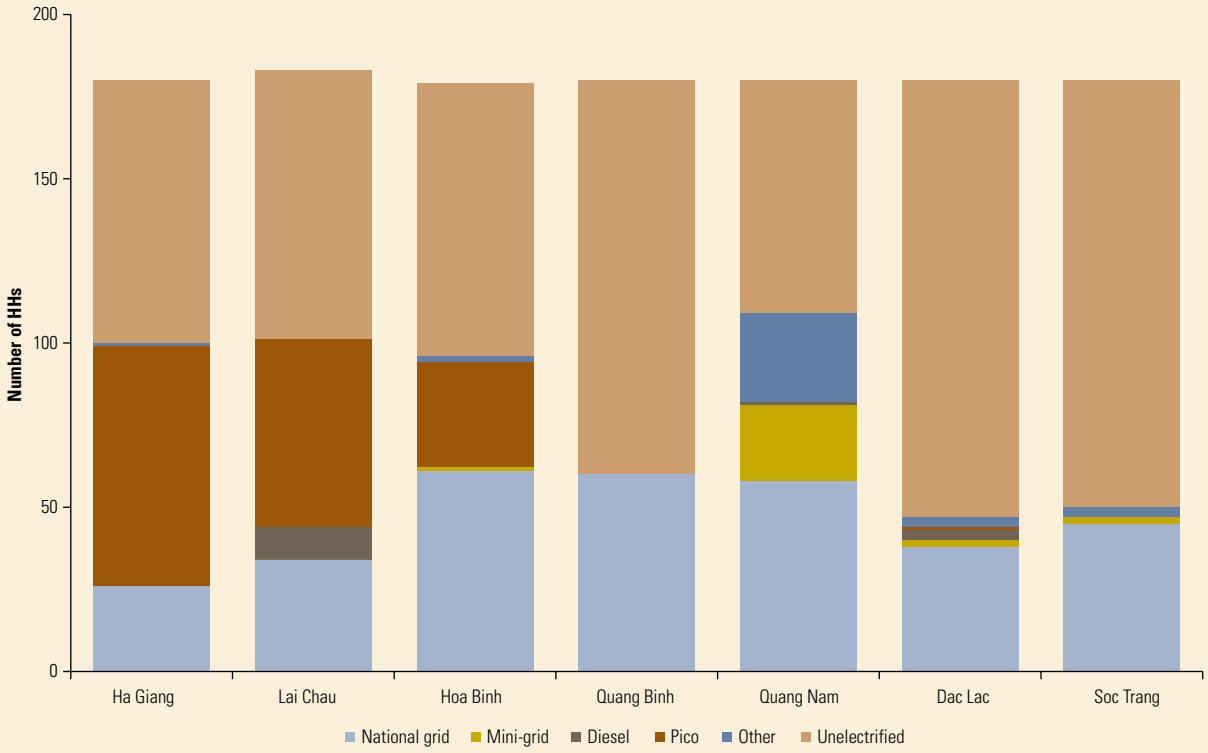


FIGURE 8 CHANGES IN HOUSEHOLD ENERGY USE OVER THE YEARS

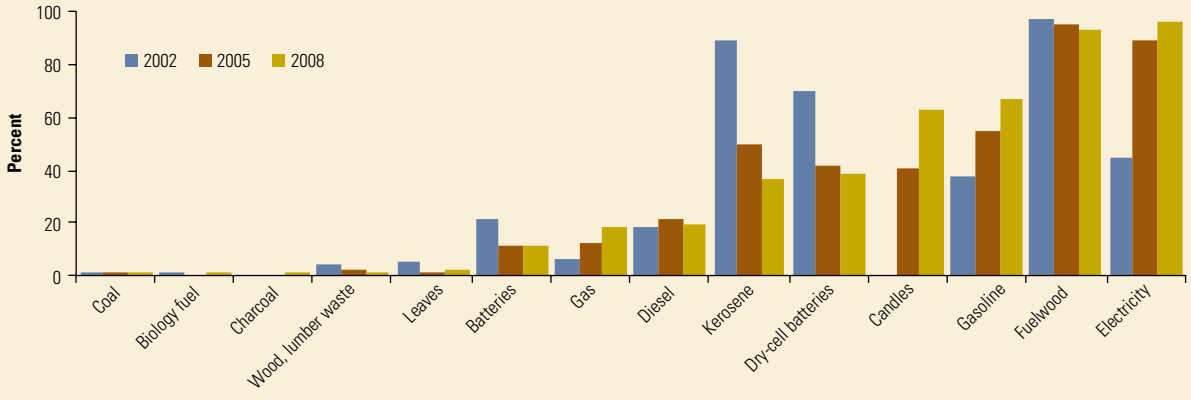
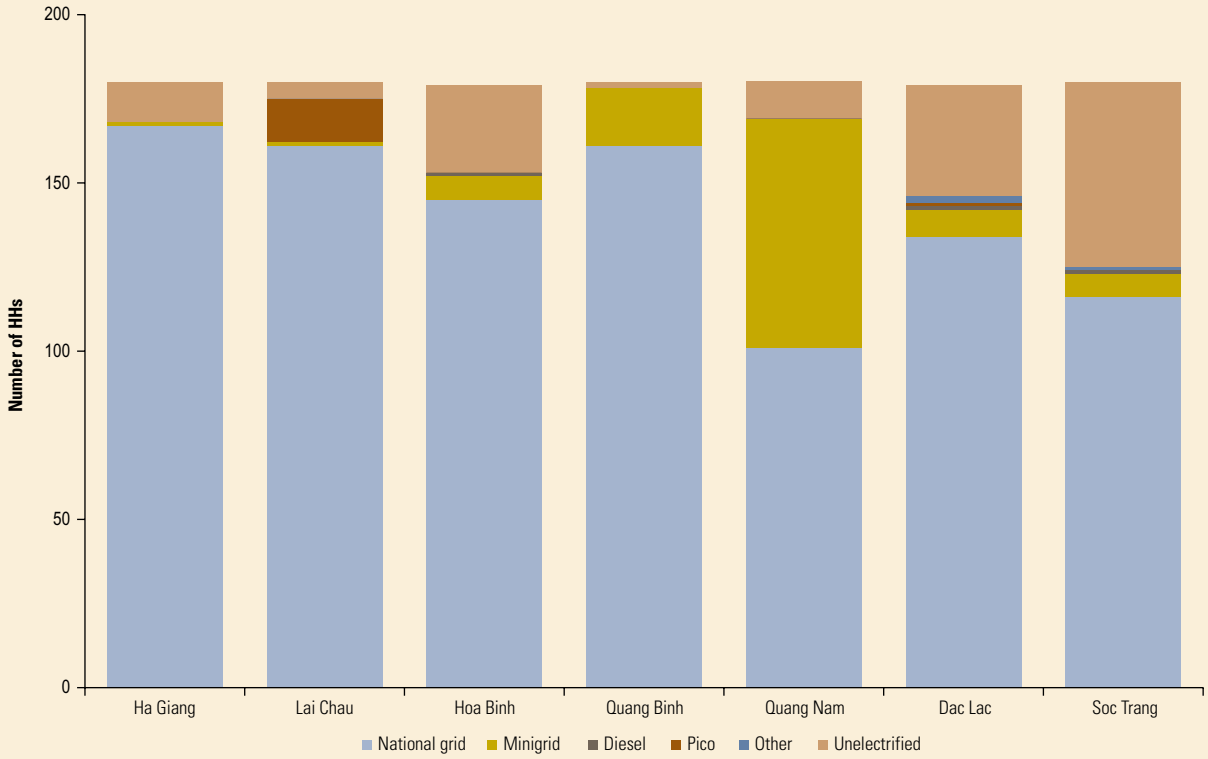


FIGURE 9 ELECTRIFICATION, BY PROVINCE, 2005



Increased Appliance Ownership

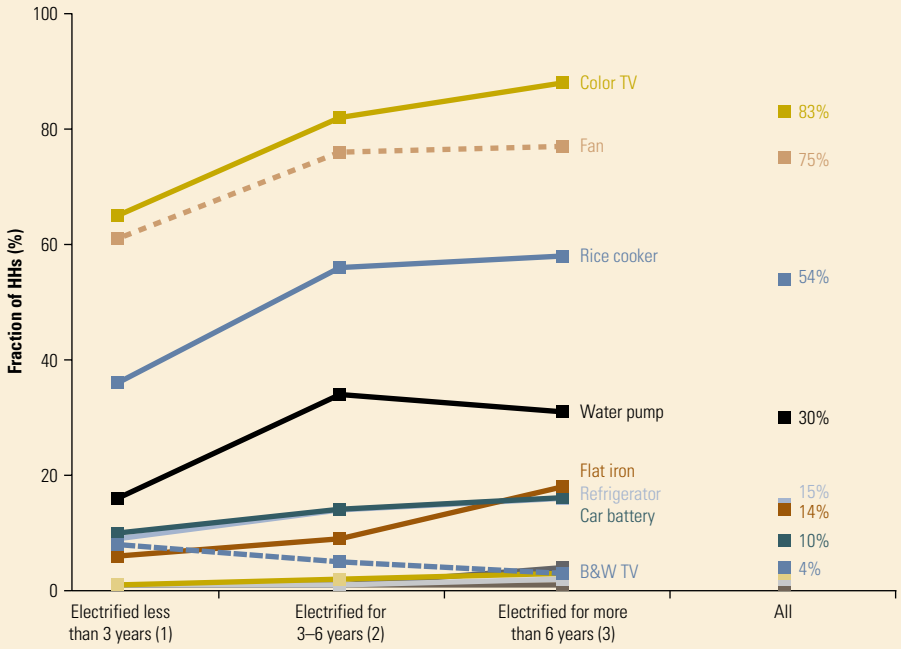
There are few surprises in the survey results for appliance ownership, which increased across the board over the course of the survey years. Starting with lighting, households purchased appliances such as radios, televisions, refrigerators, and electric fans, thereby increasing consumption of electricity. Ownership of durable appliances has increased dramatically over time in Vietnam, not only among better-off and urban households, but also among poor households.

Indeed, the survey showed that a significant number of rural households that connected to the grid between 2002 and 2005 decided to use electricity in a variety of ways beyond lighting. There was a dramatic increase in the ownership of color televisions. By 2008, black and white televisions and radios had almost disappeared: even in the poorest quintile, 56 percent had color televisions (as against 83 percent overall and 95 percent in the best-off quintile).[13] The increase in use of color televisions can be attributed to the sharp drop in prices. These can now be bought for less than US$50 (nearly VND 1 million), and are evidently affordable to even poorer families. Fans are the second most common appliance (75 percent), followed by rice cookers (55 percent). Once again, even in the poorest electrified homes, 56 percent of households had fans in 2008.

For most appliances, it is observed that the longer a household is electrified, the more likely it is to have a

13. The appliance ownership rates reported in the survey may be compared to those reported in the VHLSS for national averages in rural areas: in all electrical appliance categories (television, computer, and refrigerator), the national averages for ownership rates are higher than in our survey—the gap has narrowed considerably between 2002 and 2008. For example, in 2002, color television ownership in the survey area was only 17 percent, as opposed to the national average of 44 percent, but by 2008, color television ownership in the survey areas (79 percent) was much closer to the national (rural) average of 84 percent.

FIGURE 10 APPLIANCE OWNERSHIP, BY YEARS OF ELECTRIFICATION



color television, a rice cooker, and a fan.[14] Figure 10 illustrates appliance use in 2008 by the date of electrification: the categories are defined according to whether households electrified in 2008 had already been electrified in 2002 and 2005. Figure 10 shows that most of the appliance uptake occurs in the first few years of electrification. For example, in the case of rice cookers, whether a household has been electrified for between three and six years (56 percent), or for more than six years (58 percent), makes little difference.

A finding of some concern is that a significant fraction of the poorest electrified homes are still reliant exclusively on incandescent lighting: in 2002, 41 percent of electrified homes in the poorest quintile relied exclusively on incandescent bulbs for lighting, which reduced to 19 percent by 2008. However, in the best-off quintile, only 12 percent relied exclusively on incandescent bulbs in 2002, decreasing to just 4 percent in 2008.

Figure 11 shows the fraction of lumens provided by incandescent lighting by expenditure quintile: In 2002, 53.1 percent of the lumens in the poorest households depended on incandescent bulbs, but only 28.1 percent of lumens in the best-off group. By 2005, this fraction declined across all groups, but was still above 30 percent in the poorest group. As a result, the cost of lighting per lumen-hour in the poorest households is 50 percent higher than in the best-off quintile.[15]

Increased Household Electricity Consumption

The survey showed that, over the years, the rate of electrified households not only increased, but also the amount of electricity used by electrified households increased remarkably. Household electricity consumption increases as households acquire a larger number of electric appliances over time. According to survey results,

14. In all southeast Asian countries where rice is the staple diet, recent years have seen a high growth in the use of rice cookers—to which Vietnam is no exception. Rice cookers are relatively cheap appliances, and clearly offer great convenience benefits. Already in 2002, 24 percent of our electrified surveyed households had rice cookers, increasing to 55 percent by 2008. However, the reported reduction in daily cooking times is modest (no more than 20 minutes per day). Some informants also noted that rice cookers save food because rice does not stick or burn.

15. In 2008, the poor paid VND 27/kLmh, as opposed to VND 19/kLmh paid by the best-off.

FIGURE 11 FRACTION OF LUMENS PROVIDED BY INCANDESCENT LIGHTING, BY EXPENDITURE QUINTILE

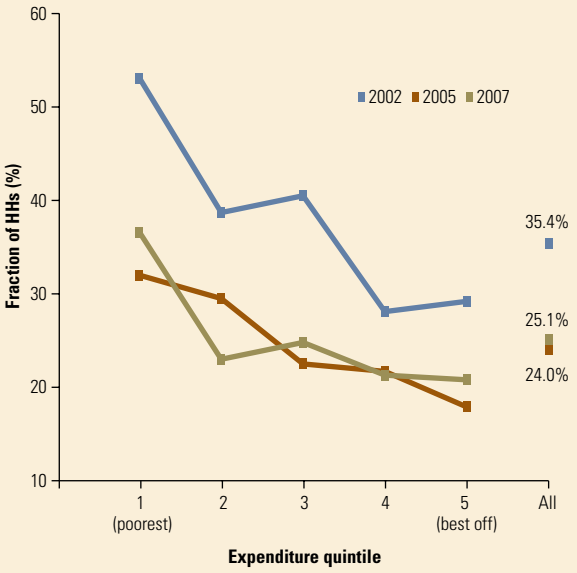
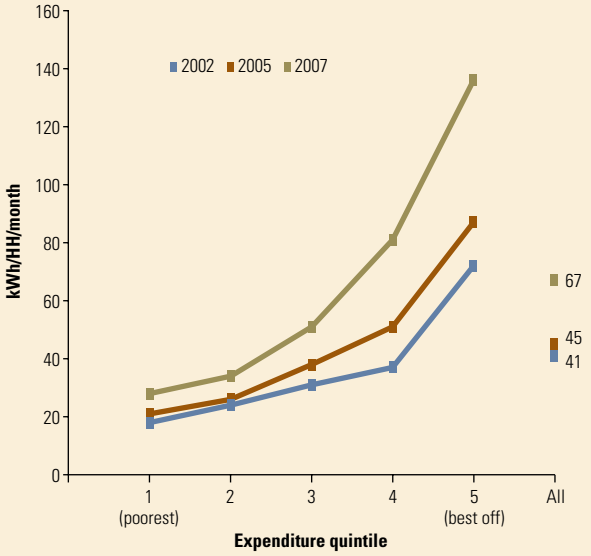


FIGURE 12 MONTHLY ELECTRICITY CONSUMPTION, BY EXPENDITURE QUINTILE



average electricity consumption grew from 41 kWh/HH/month in 2002 to 67 kWh/HH/month in 2008, as shown in figure 12.

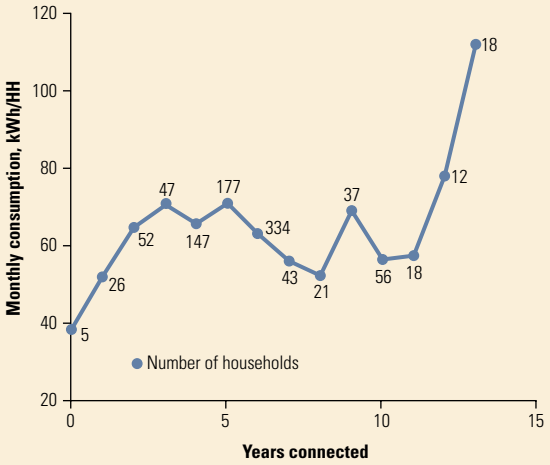
The survey showed that household electricity consumption grew for all expenditure quintiles, and that there was significant variation in electricity consumption across expenditure quintiles. In 2008, household electricity consumption in the poorest quintile was only 28 kWh/HH/month (up from 18 kWh/HH/month in 2002), while it was 136 kWh/HH/month in the best-off quintile (up from 72 kWh/HH/month in 2002). The high consumption figures in the best-off quintiles reflect significant business use, particularly for irrigation pumping.

An analysis of electricity consumption rates by year of connection shows consistent growth for the first few years (as the most desired appliances are acquired), but stabilizes after 5–6 years (figure 13). The very high consumption rates for a group of households (mainly in the south) electrified in the mid-1990s are a result of irrigation pumping use.[16]

16. A detailed statistical analysis at the provincial level shows that income is the dominant determinant of consumption level. In a multivariate analysis, in the presence of the income (or expenditure) variables, duration of connection is significant in only one province.

According to the survey, expenditure on electricity represents a relatively small proportion of total energy outlays in electrified households, accounting for just 12 percent of total energy expenditure in 2002, 13 percent in 2005, and falling to 10 percent in 2008. Part of the explanation is the reluctance (and high cost) of changing diesel pump sets to electric motors for irrigation pumping. However, the composition of expenditure in electrified households has stayed remarkably constant over time—fuelwood

FIGURE 13 AVERAGE CONSUMPTION, BY DURATION OF CONNECTION

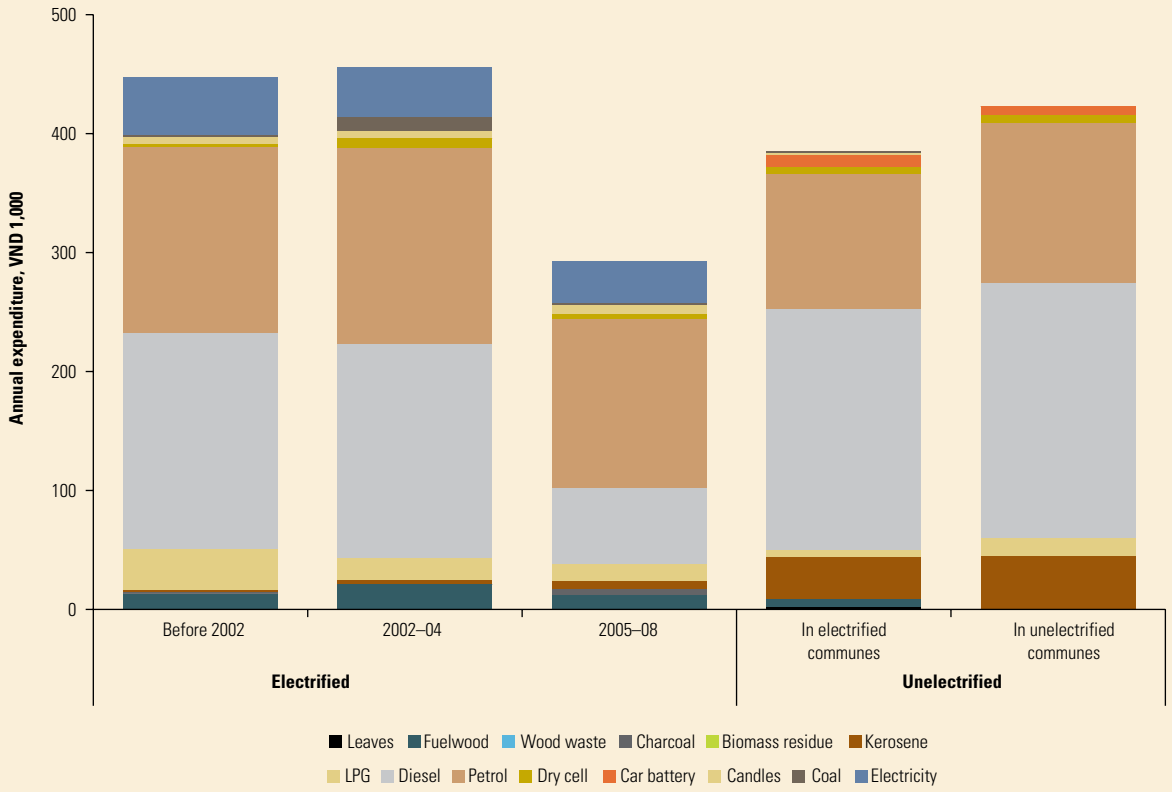


and kerosene expenditures have declined slightly,[17] and LPG increased slightly, but diesel and gasoline expenditure shares have changed little over time.

Indeed, as shown in figure 14, gasoline and diesel dominate household energy expenses (a pattern already observed in 2002). However, the differences between electrified and unelectrified households are much greater than the changes over time in electrified households. Diesel consumption is certainly consistently higher in unelectrified households and gasoline consumption lower—the latter largely an income effect, as electrified households have higher income, which allows greater discretionary spending on personal transportation. However, what is also clear from this comparison is that remote rural households are much more likely to be sensitive to gasoline and diesel price increases than to electricity tariff increases.

17. The continued use of kerosene for lighting after rural electrification in poor areas is not unique to our survey, and has been reported in a number of other countries. In Vietnam, the explanation is that kerosene and candles are used primarily for emergency lighting during brownouts and power failures.

FIGURE 14 ANNUAL ENERGY EXPENDITURE, VND 1,000, BY LENGTH OF ELECTRIFICATION, 2008



B3

Impacts of Rural Electrification on Households

The rapid shift to grid electrification for the households surveyed in rural Vietnam has resulted in a better quality of life for many rural families. Electrification relieved the financial burden on rural households by reducing their reliance on kerosene for lighting and batteries for operating larger communication devices. The increased ownership of time-saving home appliances, in turn, meant less time dedicated to household chores and more spare time for reading, socializing, and leisure, as well as productive activities. Moreover, the availability of electricity contributed to greater school enrollment for rural youth, increased farm productivity, and higher household incomes.

Households' Self-Assessment of the Impact of Various Uses of Electricity

Over the entire span of years covered by the surveys, unelectrified households expressed an overwhelming desire for access to the national grid. In 2008, 100 percent of the households in the one remaining unelectrified commune expressed a desire to be electrified; however, of unelectrified households in electrified communes, the proportion who desired electrification was somewhat lower at 76 percent.

Rural households that gained reliable electric service for the first time reported higher levels of well-being. There is little question that the respondents thought that electricity had brought great benefit to their lives, and over a wide range of indicators they indicated that their lives had improved since electrification—more time for reading, entertainment, and television, and in higher expectations about educational outcomes for children (particularly for higher education).

Electric lighting was the first priority of rural households covered by survey, out of all uses. Not so long ago, remote villages in Vietnam shut down at sunset. Adults returned home before dark and children went to bed not much later. The alternative to electric lighting was the use of kerosene lamps and candles, which were inadequate for reading, cooking, and other household activities. Once residents connected to the electricity grid, an immediate benefit was higher levels of household lighting at lower cost than kerosene.

For households that adopted grid electricity, the switch from kerosene lamps to electric lighting was life-changing. Electric lighting was less polluting and safer to use. It provided significantly higher quantities of reading and space light, the outcomes of which can eventually translate into higher household income. Having more light available meant that rural families used more hours of light each day. As household productivity grew, people purchased more electric lamps and used them longer. See the example in box 12.

Although the self-assessment of health status requires caution, in all three survey years, the proportion of who described themselves as having better health was higher in electrified households than in unelectrified households: and the proportion of described themselves as having worse health was lower in electrified households. For example, in 2005, 43 percent of households in electrified homes described themselves as in better health (as opposed to 35 percent in unelectrified households).

BOX 12 ILLUSTRATION OF THE WELFARE BENEFITS OF APPLIANCE OWNERSHIP—THE CASE OF THE ELECTRIC RICE COOKER

Rice is the main staple in the diet of every Vietnamese. Most rural families eat rice once or twice a day. But without grid electricity, rice preparation is a time-consuming process since most rural households still rely on traditional biomass stoves to cook their daily meals. The panel study found that rice cooker ownership surged over the course of the survey period in all households that gained access to grid electricity.

Rural households, and particularly women, who are often in charge of household cooking, benefit from electric rice cookers in several ways. Using biomass stoves to cook rice takes longer and has to be supervised by a household member to prevent the dish from burning. This means that women have less time to engage in more productive activities, such as reading or running a home-based business. Moreover, members of the household have to spend more time walking in order to collect biomass fuels from already depleted woodlands, and inhale more smoke emitted from inefficient stoves.

Because it allows a household chore to be completed in a shorter time, which in turn frees up time for productive or leisure activities, and requires much less effort and supervision and eliminates indoor air pollution related to the use of biomass stoves for rice cooking, an electric rice cooker is a very useful appliance for rural households. Since it also helps mitigate indoor air pollution and associated health impacts, it can also arguably improve the productivity of the household members when they go to work in the "productive sector." The cooker, however, is often classified as a consumer good and, thus, "not productive."

Quantification of Benefits

As part of the analysis of survey findings, demand curves for lighting and television usage were derived in order to estimate the economic benefits of electrification.

The economic benefits of electrification can be estimated by the examination of the demand curves for services provided by electricity—such as lumens of lighting or hours of television viewing. The economic benefits of a given level of consumption are given by the area under the demand curve (willingness to pay). For example, in the case of lighting, before electrification, consumers paid about VND 6,100/kLmh for kerosene, but only VND 17–55/kLmh provided by electricity (depending the mix of incandescent and fluorescent bulbs used). The economic benefits of electrification are then derived from the change in consumer surplus. Although these calculations depend on some further assumptions about the shape of the demand curves between these points, the methodology is generally recognized as providing a reasonable estimate of the economic benefits involved.[18]

Figure 15 shows the estimated demand curves for lighting and television viewing based on the survey data: the resulting estimate of the willingness to pay for lighting is around 70 US¢/kWh. This is consistent with similar valuations estimated in other countries.

This level of economic benefit permits not just a reassessment of the economic returns of the REP,[19] but more importantly, can serve as a useful input into the process of determining how best to meet the government's electrification targets and provide cost-effective electrification to the remaining unelectrified households.

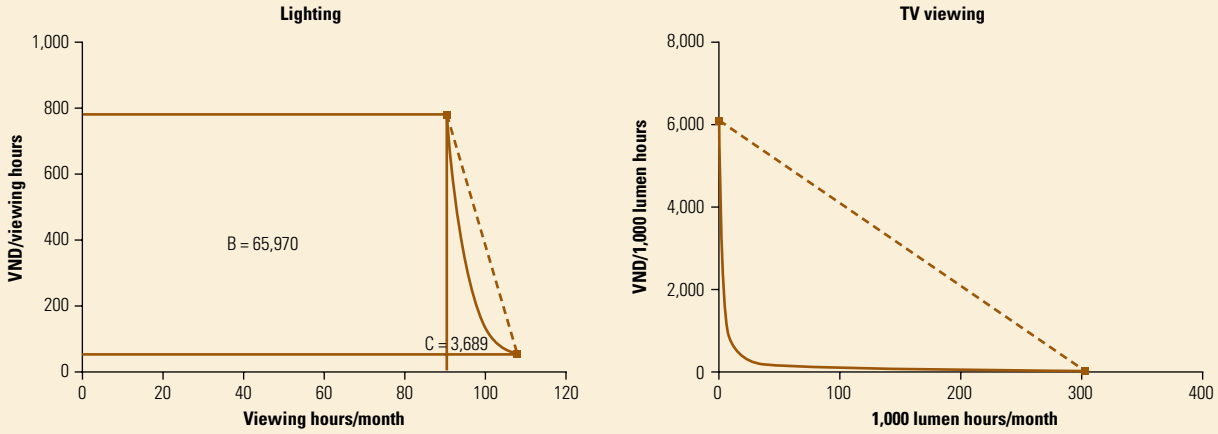
Recent programs to promote off-grid electrification in remote areas—such as the World Bank–supported Remote Area Rural Electrification (RARE) program—have encountered significant cost increases. For example, the district of Muong Te, which is one of the most remote areas in Vietnam, located in Lai Chau province, was one of the areas selected for off-grid electrification, because of the prohibitive costs of grid electrification of the remote communes in the district. Three new off-grid schemes, based on hydropower and the rehabilitation of four existing schemes, are currently underway under RARE. The cost estimates for off-grid electrification in Muong Te doubled between 2006 and 2008.

Figure 16 shows the maximum cost per household connection to still attain a 10 percent economic rate of return

18. This methodology and its application to World Bank rural electrification projects has been reviewed (and approved) by the Bank's Independent Evaluation Group (IEG 2008b).

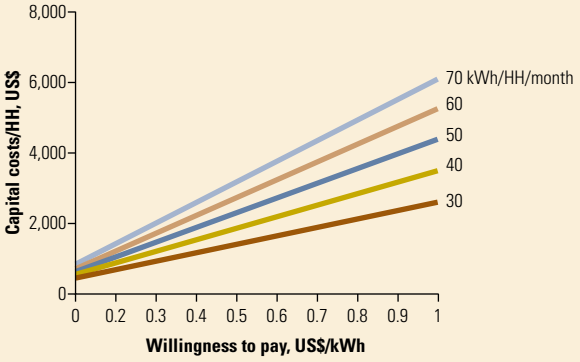
19. The REP Implementation Completion Report, prepared in 2007, reported an ERR of 27.6 percent, based on earlier estimates of WTP of around 30 US¢/kWh.

FIGURE 15 DEMAND CURVES FOR LIGHTING AND TELEVISION VIEWING



(ERR)—that is, a function of the level of consumption and the economic benefit per kilowatt-hour consumed. For the poorest and most remote areas, monthly consumption is estimated to be about 30 kWh/HH, for which the maximum capital costs are calculated at around US$1,800 per connection. In some of the most remote areas, connections to the grid could cost as much as 10 times this amount. For example, connecting the most remote households in Muong Te has been estimated to cost more than US$10,000 per household. For these areas, minigrid or off-grid solutions appear more attractive, since they are likely to exceed the 10 percent hurdle rate. In Muong Te, RARE program connection costs are in the range of US$700–1,000/HH.

FIGURE 16 MAXIMUM CAPITAL COST PER CONNECTION TO ATTAIN MINIMUM 10% ERR



Rural Electrification Impact on Education

Impact on adult education. The returns to education are well established in the development economics literature: the more years of schooling, the higher the income as an adult. The question for the evaluation of REP was the extent to which this relationship is affected by electrification.

Indeed, the survey shows a strong impact of electrification on the relationship between income and years of schooling, most unmistakably in the case of five or more years of schooling (and in the northern provinces across all levels of schooling).[20] Moreover, this differential occurs within a few years of electrification—there is little difference between households electrified for more than 10 years, and households electrified for between 5 and 10 years. The benefit of being in an electrified household is clear (figure 17).

This differential is true for minority ethnic groups (accounting for 77 percent of households), as well as for the second income earner in a household, and is not limited to the (mainly male) heads of household (see figure 18).[21]

The hypothesis that the better-educated reach their full potential when they get electricity may appear compelling, but correlation does not imply causation. Better

20. The distribution of years of schooling shows a median of 7 years (average of 8.4 years); the mode (accounting for 25 percent of heads of households) is 9 years.
21. Heads of household are predominantly male (79 percent). The second earner is predominantly female (81 percent).

roads, better access to mobile phones, or even health clinics—which have often arrived at about the same time as the grid—may have the same impact we attribute to electrification.

One way of controlling for these other factors is to examine the differentials at the commune level—at which level all households would benefit equally from better roads, the arrival of mobile phone coverage, or a new health clinic. The number of observations at the commune level is much smaller, so statistical significance is also lower, but the same patterns are observed at this level (with statistically significant differences in returns to education between electrified and unelectrified households in most communes).

Figure 19 shows the relationships for a selection of communes of different types of electrification. In most cases (and in all three cases shown here), the returns to education (that is, the slope of the trend lines) are greater for electrified households than for unelectrified homes.

FIGURE 17 RETURNS TO EDUCATION

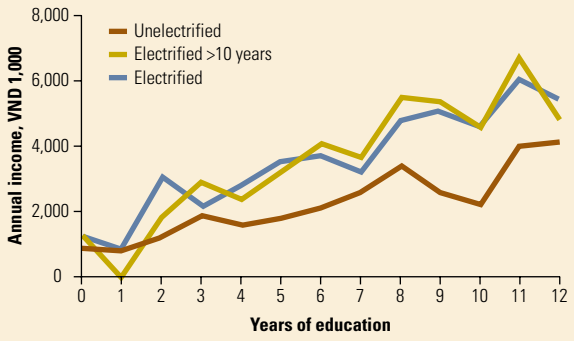
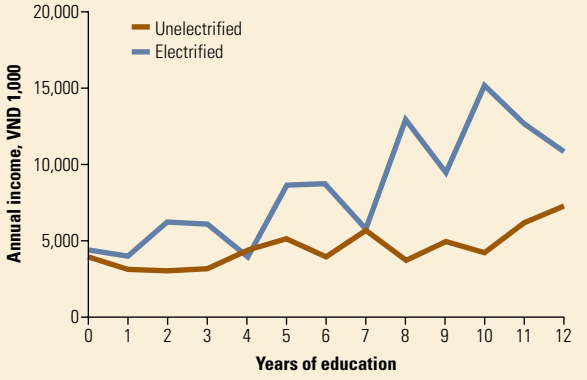


FIGURE 18 RETURNS TO EDUCATION, ETHNIC MINORITY HOUSEHOLDS



Whether the observed correlations are a consequence of having more time for productive activity, or being able to work more productively, or having more time and opportunity for further betterment is hard to judge, but what the hypothesis says is that rural electrification enables more educated individuals to realize that the benefits of that additional schooling is persuasive: A better-educated individual who spends evenings in the dark is not living to his full potential.

The impact on children's education. While the impact of electrification on already educated adults is clearly revealed by the survey, the question of whether electrification results in better study outcomes for children is less clear. Obviously, most of the better-educated adults who have been shown to benefit from electrification were themselves educated in unelectrified homes—and almost certainly in homes that did not have the distractions of television.

Though it is not possible to make definitive statements about ultimate educational outcomes, over a range of indicators the survey provides evidence of the positive benefits of electrification:[22]

- In rural areas, primary school enrollment is virtually universal, regardless of whether a child lives in a household with or without grid electricity.
- But once children make the transition from primary to middle school, school attendance improves significantly for households that have some form of electricity, and school attendance at all levels of households with either grid or off-grid systems is much higher than for those without any electricity at all. Generally, households with some form of electricity attend school at about a 10–15 percent higher rate than those without electricity, depending on the age group. Middle school attendance increased from 76 percent to 88 percent between 2002 and 2005.
- High school attendance is much lower for all survey groups, but lower still for those without electricity. Households with some form electrification (national grid, isolated grid, picohydro) had attendance growth rates above 10 percent. By contrast, the households without electricity in 2005 increased their high school attendance by only 4 percent.
- Overall, children growing up in households with electric lighting spent more time reading or studying than their peers living in homes without any electricity, as shown in table 11.

22. Because primary school enrollment was already virtually universal in 2002, electrification has no observable impact on school attendance for children aged 6–13 years.

TABLE 11 READING AND STUDY TIME SPENT BY CHILDREN OF VARIOUS SCHOOL AGES

Household electrification status in 2002	School age		
	Primary (6–12)	Middle (13–15)	High (16–18)
Reading or study time (minutes per day)			
Grid	82	100	108
Isolated system	68	67	82
No electricity	59	73	78
All households sampled	67	80	90

- More than 95 percent of families whose children gained more time to study at home because of electrification believe that the additional time devoted for study has improved their children's performance at school. The proportion of children spending most of their evenings studying is much higher for electrified households.

Having higher levels of lighting in the household appears to encourage more children to attend school, especially in the higher grade levels. Other recent research, with the same data using more advanced modeling techniques, basically confirms these results, such as Khandker and others (2009). Clearly, grid electricity in the household is no guarantee that children will stay on in school, but it is an important complement to educational programs in improving school attendance in the higher grade levels.

Income and Expenditure Patterns

The survey results reflect the significant progress in economic development over the past decades, which has extended even to the remote rural areas covered by the survey.

Results from the surveys conducted over six consecutive years showed that people's incomes went up considerably, especially in the period from 2005 to 2008, as shown in figure 20. Over the course of the survey period, median household income recorded in each survey doubled compared to the previous survey, from VND 6.3 million in 2002 to VND 11.2 million in 2005 and VND 24 million in 2008.

Household expenditures in the surveyed communes, by province, increased between 2002 and 2008 by 140 percent to 320 percent—with the highest increases occurring

FIGURE 19 RETURNS TO EDUCATION AT THE COMMUNE LEVEL

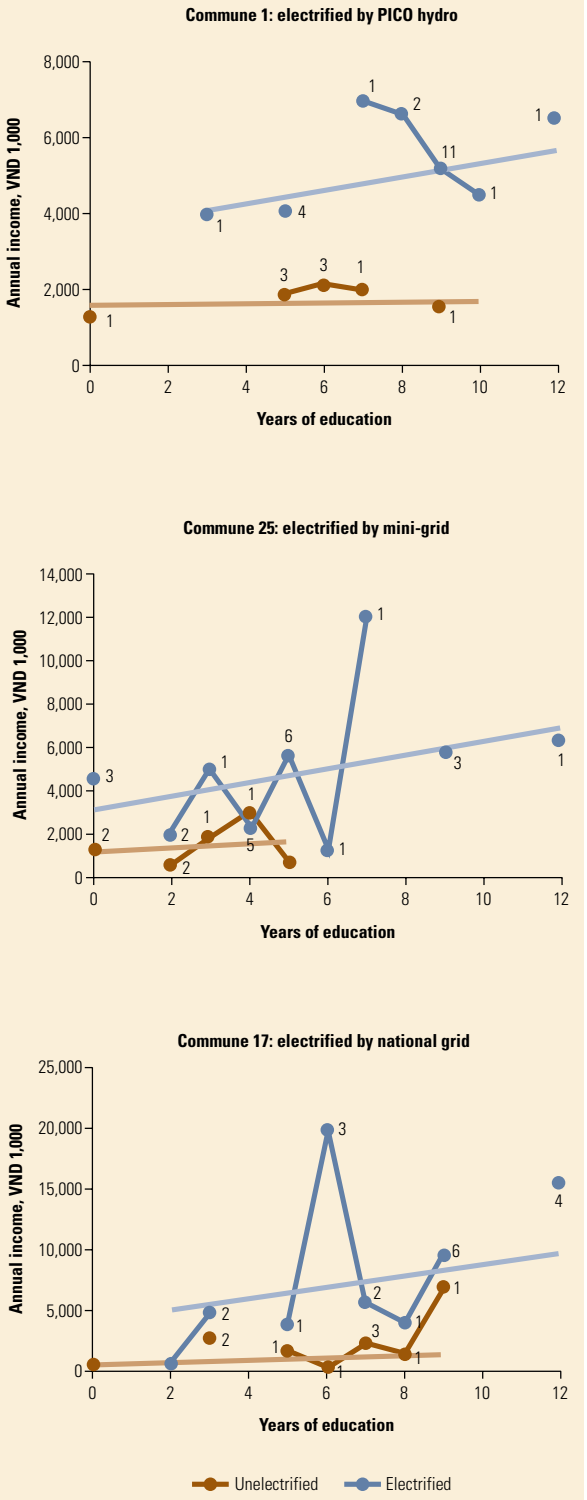
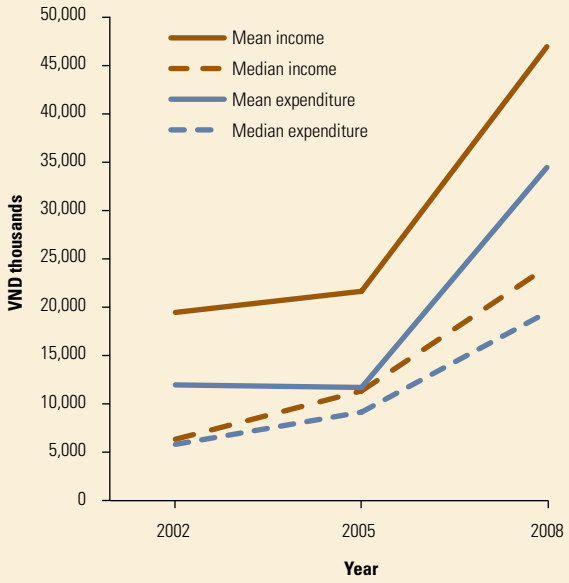


FIGURE 20 ANNUAL HOUSEHOLD CASH INCOME AND TOTAL EXPENDITURE, 2002–08



in the poorest provinces, and the lowest increases in the two provinces that were the best-off in 2002.[23]

It is difficult to attribute the changes in rural income and expenditure patterns specifically to rural electrification. Most of the changes in expenditure and income patterns are attributable simply to the overall increase in economic well-being. Indeed, as noted above, expenditures for electricity in electrified households account for only a small percentage of total household expenditure, and the principal determinant of whether a household is electrified is distance (and hence cost) from the electrified commune center, rather than household income.

In 2002, the average household income of unelectrified households (VND 20.7 million) was marginally higher than electrified households (VND 20.2 million), although this is explained by much higher-than-average incomes in Soc Trang Province, where significant numbers of wealthy farmers distort the averages. However, if one looks just at the incomes of the poorest quintile, the difference is sharp. Unelectrified households in this quintile had an average income of VND 1.74 million, one-third *lower* than electrified households in the same quintile (VND 2.8 million).[24] When one examines the average income of all households (across all quintiles), except those in Soc Trang, the association of higher incomes with electrification is clear, as shown in table 12: the better the electrification, the higher the income. Whether this association also implies causation, however, cannot be answered from the income data alone.[25]

Although the causality in the relationship between rural electrification and income is difficult to establish in the context of this survey, it is widely accepted that rural electrification can impact rural incomes through a variety of farm and nonfarm channels. Electricity impacts farm incomes primarily through increasing productivity, through switching from manual to machinery powered irrigation, adoption of electricity operated equipment for harvesting and processing. An example is presented in the photo, which shows a business, located in Tuyen Quang Province, that switched from processing rice and corn manually to using light machinery.

23. In nominal terms, average household incomes increased from VND 19.0 million in 2001 to VND 44.1 million in 2007, an increase of 232 percent. In real terms (at constant 2001 prices), the increase by 2007 was to VND 32.7 million, an increase of 72 percent: the average annual rate of 9.5 percent is somewhat higher than the national average GDP growth rate.

24. Similar patterns are observed in the expenditure data (see World Bank 2010).

25. The relevant question is whether households connect to the grid (if available) because they already have higher income to afford the connection cost and the cost of appliances when the grid arrives, or whether they gain higher incomes as a consequence of being electrified. Application of more advanced multivariate statistical techniques (in which many other factors can be held constant, and the impact of electrification alone can be isolated) is made difficult because of the early loss of the control group (because so many households were electrified by 2005, and almost no unelectrified households remain in 2008), and because in the early phases of electrification in the 1990s, communes targeted for electrification were indeed those that had higher incomes—and also were less remote. Khandker and others (2009) attempted to unravel the data with sophisticated statistical methods. They found that the biggest impact was on cash farm incomes, but with little impact on nonfarm income—explained by the farm productivity improvements associated with pump irrigation. This is a promising area of further research using the database now at hand.

TABLE 12 AVERAGE HOUSEHOLD INCOMES (millions of VND)

	2002	2008
Unelectrified	6.6	37.5
PICO system	10.9	none
national grid	12.5	44.5

TABLE 13 PERCENTAGE OF HOUSEHOLDS RUNNING A HOME BUSINESS OR SERVICE (percent)

	Unelectrified	Electrified
2002	17.3	21.2
2005	9.8	21.1
2008	12.7	20.2

The availability of electricity also creates opportunities for new businesses in manufacturing and services in farm areas, such as agricultural and forestry products manufacturing, agricultural production services, and leisure and entertainment services, and hence, creates jobs. Moreover, availability of electricity helps improve productivity and allows increased operating hours for existing nonfarm businesses, as seen in box 13.

The survey showed that household expenditures follow the classic pattern. In 2002, the poorest spend the largest proportion of their expenditure on food (60 percent), and the best-off the smallest (23 percent). Energy expenditures account for a very small proportion across all quintiles (between 2 and 3 percent), although agricultural expenses include diesel for irrigation pumping, and transport expenses include gasoline (for motorcycles).

As shown for selected provinces in figure 21, over the course of the survey, expenditure shares on food dropped sharply, while shares on education and other discretionary items (including appliances) increased. This again follows the general international experience on the consequences of improvement in economic well-being.

Changes in income composition were no less remarkable. In 2002, 72 percent of income in the surveyed household was derived from agriculture, only 11 percent from wages and salaries, and 11 percent from business. By 2008, however, the share from agriculture dropped to 56 percent, while that for wages and salaries increased to 17 percent, and that from business to 13 percent.

The percentage of households that reported a home business or service (table 13) was significantly higher for electrified homes (20.2 percent in 2008) than for unelectrified homes (12.7 percent).

Poverty Alleviation

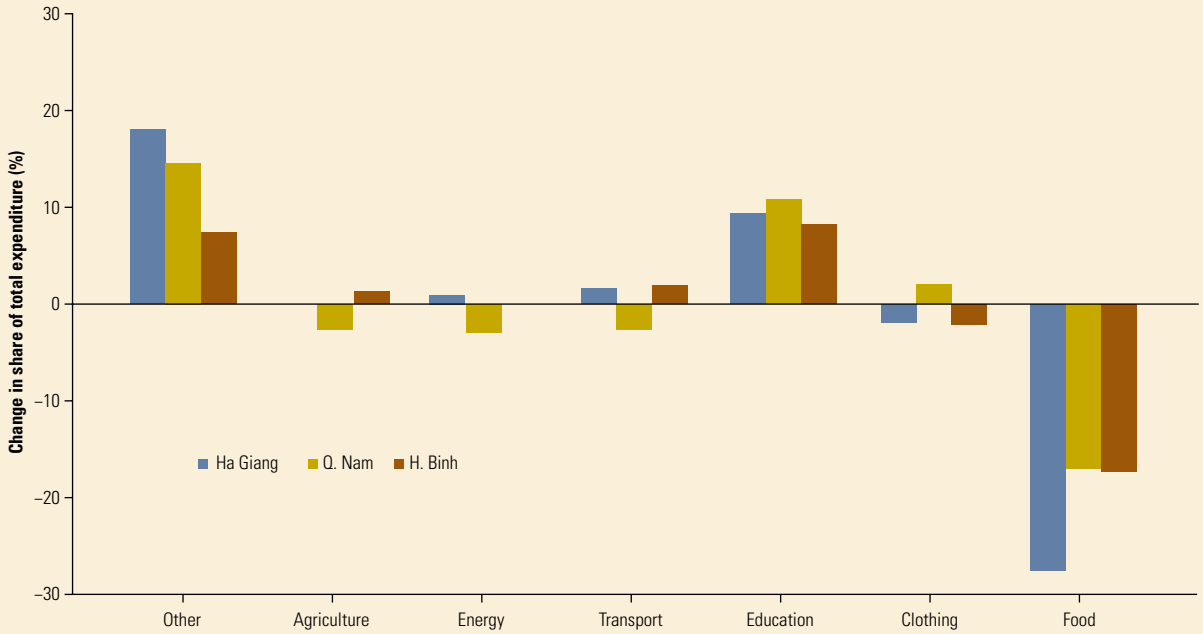
Poverty levels in Vietnam have fallen dramatically over the past decade (figure 22). This is reflected in the survey results. Although in 2002, 75 percent of households fell below the poverty threshold, by 2008 this had fallen to

BOX 13 A MORE QUALITATIVE DISCUSSION OF THE IMPACT OF RURAL ELECTRIFICATION ON INCOMES

Several personal accounts from farmers about the ways in which their lives were affected by rural electrification were gathered during interviews conducted during an evaluation of the First Rural Energy Project. Some examples are presented below:

- Phan Thanh Liem, an orchard grower in the Mekong Delta, increased returns in a short time by switching from manual to grid-powered irrigation. This allowed him to grow higher-return fruit trees, such as orange and pomelo, whose fruits could be exported.
- Along the coast, shrimp farmers switched from diesel- to grid-powered machinery, which reduced production costs by about a third, and began using electric turbo fans, so that shrimps could be raised at a higher density.
- In the north, sawmill owners such as Lien Hanh increased productivity up to 10 times by switching from handsaws to machines.
- Tran Huy Quang, a farmer in Tuyen Quang, realized significant returns after switching to cassava-processing machinery.

FIGURE 21 CHANGES IN EXPENDITURE SHARES, 2002–08

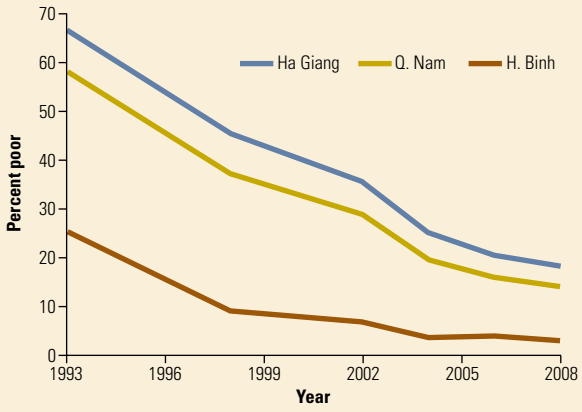


33 percent. These poverty rates are still very much higher than the national rural averages reported by the Vietnam Household Living Standards Survey (VHLSS)—35.6 percent in 2002 and 18.7 percent in 2008—although the gap has narrowed. In 2002, the poverty rate in sampled households was 2.1 times the national average for rural areas, but only 1.75 times the national average in 2008.[26]

However, the survey reveals little difference in poverty rates between electrified and unelectrified households. In both 2002 and 2005 there was little difference, but by 2008, while the percentage of electrified households in poverty fell further to 32 percent, the percentage of unelectrified households in poverty remained at 47 percent (figure 23).

The general reduction of poverty in the surveyed communes is testimony to the success of the government's poverty alleviation program. While the benefits of economic growth have accrued to all segments of society, it is the poorest groups—in this case, in the remote, rural areas, where minority ethnic groups constitute a significant proportion of households— that have benefited the most.

FIGURE 22 POVERTY RATE IN VIETNAM



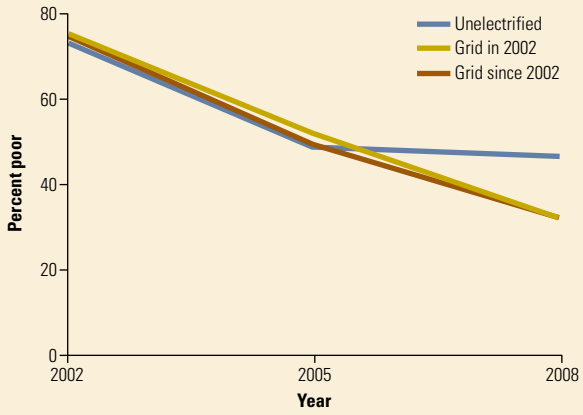
Source: VHLSS 1993, 1997, 2002, 2004, 2006, 2008 VHLSS; 2008 poverty rates are preliminary World Bank estimates; all others from the Government Statistics Office.

26. The Vietnam Household Living Standards Survey (VHLSS) is a series of nationally representative household surveys conducted by the Government Statistics Office (GSO) for the first time in 1993, then in 1997/98, 2002, 2004, 2006, 2008, and 2010. The 2008 VHLSS, published in August 2010, covers more than 9,000 households located in all provinces of the country. The VHLSS includes detailed information on household incomes and expenditures, poverty status, ownership of durables, including electrical appliances, and access to electricity, including monthly electricity payments. The results from the 2010 VHLSS have not yet been published.

At the same time, the results underscore the importance of providing the poorest households with assistance in connection costs. The survey finds that connection costs vary greatly, a reflection of the differences in distances of the more remote households to the commune connection points.[27] The policy of providing assistance appears to have changed over the years and is now more generous for households classified as poor (box 14).

27. The average among the 815 households that provided an estimate of connection cost to the national grid was VND 550,000 (median VND 400,000). Reported costs vary widely, with18 households reporting connection costs of more than VND 2 million. By contrast, the average connection cost to local minigrids was VND 755,000 (median VND 500,000). These connection costs are similar to the costs of pico-generators that were widely used in the northwestern provinces: in 2002, the average reported cost for pico units is VND 555,000 (about US$35), with a median of VND 400,000. About 10 percent of the units cost more than VND 1 million.

FIGURE 23 POVERTY ALLEVIATION AND ELECTRIFICATION



Note: The most recent poverty threshold is based on a benchmark of 2,100 calories per person per day, applied to per capita incomes rather than per capita expenditures (as used previously). In 2006, the Government of Vietnam set its official poverty lines at VND 260,000 per person per month for urban areas and VND 200,000 for rural areas. The poverty thresholds used in Figure 5 are based on this definition, adjusted over time using the midyear consumer price index. Since annual income and expenditure questions asked about these during the "past year", and since the surveys were conducted in spring of each year, the thresholds apply to the year previous to the survey year (so the VND 159,000 threshold in the 2002 survey is the value that applies for 2001).

BOX 14 RURAL ENERGY PROJECT ICR SURVEY FINDINGS ON RURAL ELECTRIFICATION AND POVERTY

A separate, short survey was carried out in order to assess the impact of the REP on poverty in the poorest communes in the northern areas of Vietnam. The survey involved in-depth interviews in six communes in three districts in three provinces. This participatory survey also confirmed the benefits of rural electrification. In all the communes surveyed, poverty rates significantly declined over the project implementation period, as shown in table 14.

TABLE 14 POVERTY RATES IN COMMUNES SURVEYED

Commune	2000 (%)	2004 (%)
Chieng Hkeo	14.1	11.9
Chieng Trung	40	36
Tu Vu	32	18
Phuong Mao	33	24
Tro Quang	31	17
Thai Nien	28.5	9.9

Source: Vietnam Rural Energy Project, Implementation Completion and Results Report, 2007.

Part C

Lessons Learned from Vietnam's Rural Electrification Experience

C1

Introduction

The rural electrification effort in Vietnam has been one of remarkable achievements, with the share of households with electricity access growing from 2.5 percent in 1975 to 96 percent by 2009. Through a remarkable and unparalleled effort, the country succeeded in providing access to more than 80 million people over the course of 33 years—from 1.2 million people having access to electricity in 1976 to about 82 million people having it in 2009.

The government's efforts addressed a wide array of challenges along the way, and successfully balanced the sometimes competing interests of local, provincial, and central governments. Government programs, combined with support from development partners in the later years, created an institutional structure for rural electricity supply, which bodes well for long-term, sustainable development.

Needless to say, some portions of the Vietnamese experience with rural electrification are specific to the social, political, and cultural context of the country, and hence, some parts of Vietnam's experience may not be easy to replicate elsewhere. An example is the unique opportunity presented by the focus on unification of the country after the war, which in turn contributed to the broad support for the 500 kV line to connect the northern and southern parts of the country. Another is the abundance of generation resources that became available in the early 1990s, which, combined with the completion of the 500 kV line, made it possible to respond to society's strong demand for electricity.

Certain features of Vietnam's experience, especially the ways in which the government managed to tackle the challenges that emerged, can provide useful lessons for other countries. Bearing in mind the uniqueness of Vietnam's circumstances, the decisions and approaches that are highlighted can be adopted and tailored to other country contexts. In an effort to derive lessons from Vietnam's experience, part C discusses factors that led to the success of rural electrification in Vietnam and highlights important strategic and practical choices made at critical junctures. The lessons learned are broken down into those that involve lessons from the perspective of the government, and that can inform strategies of other developing countries in their efforts to expand access to electricity, while the latter part involves lessons and conclusions from World Bank experience, which can be of relevance during the development of projects in the future.

C2

Lessons from Vietnam's Success in Rural Electrification

The following is a discussion of the strategies, implementation approaches, and practical choices that can help explain Vietnam's success in extending electricity access to a significant portion of its population in a relatively short time.

Vietnam's success in rural electrification can be explained by a range of factors, including the following:

- Unwavering government commitment that is responsive to strong demand from society;
- Long-term vision, gradual approach, prioritization, and flexibility;
- Sharing of costs by all stakeholders and mobilization of various resources;
- Clear allocation of responsibilities among all levels of government, sector participants, and consumers;
- EVN's emergence as a strong champion for rural electrification after 1999;
- Making technical choices suitable for sector status and priorities;
- Ensuring the economic and financial viability of rural electricity supply while establishing and maintaining financial controls.

These factors and their implications are explored below.

Unwavering Government Commitment in Response to Strong Demand from Society

Up until the *Doi Moi* reforms of 1986, household electricity access in rural areas had been a by-product of electricity supply for agricultural and industrial sectors, which had been the focus of the electrification efforts in a resource-constrained environment. The implementation of *Doi Moi* policies contributed to a general improvement in the living standards of rural populations, through allowing greater business opportunities, increased educational attainment, and higher rural household incomes. As Vietnam became more engaged in international trade, and moved from being a rice importer to a rice exporter, there was need to increase rice production for exports, which necessitated increased quantities of electricity supply for irrigation. The demand from rural households, coupled with the growing needs of agriculture and industry, made electricity a priority for the country.

In anticipation of the wide range of benefits from electrification, as summarized in part B, rural households in Vietnam grew increasingly eager to gain access to electricity. Over time, the strong demand for electricity access became embedded in the fabric of societal life in the country, and it had become customary for people to talk about electricity everywhere, as discussed in section A4. Higher rural incomes also rendered electricity supply and appliances more affordable for rural households over time. However, it is important to note that, even before the significant increase in their incomes, rural people had a rather high willingness to pay for electricity.

The presence of very strong demand for electricity is not unique to Vietnam, and one can easily argue that strong demand for electricity is present almost everywhere in the world. What was distinctive about the Vietnamese experience was how this strong demand translated into action and, eventually, results. The local and central governments listened to the people, and were responsive to their strong desire for electricity access.

Providing electricity to a significant portion of Vietnam's rural population was achieved in a relatively short time, thanks in large measure to the unwavering national commitment to rural electrification as part of a recipe to alleviate poverty and achieve balance between rural and urban development. Decision makers recognized the strong societal demand for electricity, and by the early 1990s, electricity access rates had been made a key indicator for the yearly socioeconomic development assessment of every commune, district, and province.

Local and central government authorities made rural electrification a priority, and mobilized their resources to make it possible. The central government's commitment to rural electrification was built into its five-year plan and 10-year strategy. In 1999, the Ministry of Industry issued a policy paper outlining the objectives and principles to be followed in rural electrification. This paper provided clarity and a clear direction for the government's approach and helped accelerate the program in its initial stages. The same year, the allocation of responsibilities for rural electrification was formalized for the first time, and rural electrification program was branded as one of "State and People, Central and Local, Working Together." The Electricity Law was approved in 2004. In subsequent years, the provincial governments issued the necessary regulations.

Lesson 1: Vietnam's success can be credited to unwavering national commitment to rural electrification. A significant feature of Vietnam's experience has been the bottom-up manner in which the drive for rural electrification materialized. Local authorities' responsiveness to strong societal demand and their choice to accord adequate priority to this issue were critical factors for success, and the culmination of this into a national agenda item was a key factor for success. Government commitment at all levels—central, provincial, and local—has been a key component of the Vietnamese experience with rural electrification. There was persistent dedication and collaboration among central government policy makers and provincial, district, and commune level authorities, as well as with EVN and local communities. Once rural electrification targets were set and pledges to support rural electrification were made, policy makers stood by them, and never back-tracked from what was originally promised.

Long-Term Vision, Gradual Approach, Prioritization, and Flexibility

Vietnam's rural electrification effort involved a systematic and long-term vision, implemented through a gradual program, focused on tackling the most immediate challenges first, and maintaining flexibility while determining the specifics in later stages.

The government made a strong commitment to provide electricity to people in rural parts of Vietnam, and elaborated on how it intended to achieve its objectives through long-term plans, sector strategies, and policy papers. A central part of this long-term vision was that the country's electrification target would be achieved primarily through grid extension.

The efficiency and sustainability of the program was built up through a systematic staging of sequenced interventions, designed based on the resources available. Similarly, institutional changes were achieved through systematic and gradual steps, implemented over the long term.

Vietnam's priorities and challenges have evolved over time, which was reflected in the country's rural electrification effort. The issues encountered during the course of the rural electrification effort were constantly changing and the challenges that had to be tackled were daunting. There was not one unified master plan at the outset; Vietnam started one way, and has continually evolved in the way it tackled the challenges, which themselves were changing.

In Vietnam's experience, the focus was to fix the most immediate problem, and set others aside to be dealt with later. The challenge of the early stages—that of providing simple connections—evolved into one of securing quantity of supply and quality, while meeting ever-burgeoning urban and rural energy demand, as rural electrification made progress. Several examples of this preference and choices made during the course of the program are provided below and are discussed in detail elsewhere in this book:

- **Prioritization of productive uses versus households.** Initially, there was a focus on productive uses, in the resource-constrained environment of the postwar years. The shortage of generation capacity focused attention on the industrial and agricultural sectors. This was linked to a straightforward question of national survival at a time when the resources and options available to the country were rather limited. Policy makers gave priority to

electrifying areas with high potential growth in productive uses of electricity, since these areas were expected to provide a large amount of new revenue for the companies involved. In addition, these productive uses of electricity would eventually translate into greater household income in the newly electrified areas, leading to greater consumption, which, in turn, would promote the overall financial viability of rural electrification. The focus on productive uses indeed had a significant impact. Following the economic growth resulting from the *Doi Moi* years, and aided by the availability of new generation and the 500 kV line, the country was able to gradually shift its focus to household electrification.

- **Quantity versus quality of supply.** Up until the late 1990s, there was an apparent focus on obtaining "supply of any sort." This was a deliberate choice in light of the strong desire of rural populations to obtain electric service, and their accompanying willingness to pay for connections without necessarily being concerned about the quality of service in the earlier days. This ability to take advantage of the willingness to pay, by households that were able to pay in the initial stages, allowed the expansion of coverage with limited financial resources. Moreover, the rapid growth in electrification was made possible by the availability of multiple arrangements for building, managing, and operating rural energy supply networks, without minimal technical requirements on the equipment or material to be used, or requirements for the maintenance of the systems. However, over the years, consequences of this approach began to emerge, as discussed in parts A and C.
- **Electrification of commune centers versus households.** Over time, the focus of rural electrification efforts shifted from more economically active areas, commune centers, and being financed through customer contributions to a large extent, to less developed areas, isolated villages, and being financed through greater support from the government and its international partners.
- **Design of rural networks.** There was also a shift in the way rural networks were conceived of and implemented; moving from an environment with no planning, and no technical standard, with losses nearing 50 percent; to a setting where government priorities were clearly articulated, and technical standards for rural electrification introduced, and losses declining to around 7 to 10 percent.
- **Institutional arrangements.** In the initial stages of rural electrification, Vietnam worked with existing structures, such as agricultural cooperatives and communes. Over time, new institutions were set up, and when they no longer met the objectives, they were dissolved or absorbed into other entities, as was the case of the transition from the CEG model to LDUs, which are now being absorbed by PCs or are being consolidated.

Lesson 2: The key to Vietnam's success has been flexibility, adaptability, and willingness to correct mistakes, but above all, continuing to move forward. The rural electrification effort involved an evolving strategy that was anchored by very clear objectives, implemented gradually, and fine-tuned over time to reflect changing priorities. The central government, in collaboration with various levels of local authorities and stakeholders, continually assessed how to move the program forward. Different approaches were adopted for different periods, each with their own challenges. It has proved useful to provide for flexibility in the design and implementation of rural electrification programs. All of this was done without losing sight of the overarching goal that electrification is about national solidarity and is a high-level political goal.

The Vietnamese government maintained a long-term vision in its rural electrification effort. An important factor for success was the setting of targets for a gradual program, based on a realistic analysis of what could be achieved, given the resources available.

In the mid-1990s, the government carried out an exercise to estimate the costs and benefits of gradually providing electricity to rural communes. As part of this effort, cost estimates per household electrified and electricity consumption were recorded, and the MPI undertook a similar analysis of the costs and benefits of rural electrification options in its "Proposal for Rural Electrification up to 2000," which was completed in 1997 and approved in 1999. As discussed in section A5, the Fifth Power Development Master Plan (2000–10) contained an estimate of investment needs associated with power system investment and expansion to meet the 90 percent household electrification target.

The findings of the various analyses were communicated to the public. This way, communities in rural areas were given a sense of the cost of system expansion, and when they could expect to receive electricity in light of the resources available. This enabled the program to build a good foundation and maintain the costs of rural electrification at reasonable levels. The preparation of a plan based on objective principles helped manage expectations and enabled the program to build a good foundation and maintain the costs of rural electrification at reasonable levels.

The clear communication of how much the government was setting out to do enabled the management of expectations of what could be achieved. In the end, program implementation exceeded expectations. Thanks to careful planning and appropriate allocation of system responsibilities to the central government, the provinces, and local utilities, grid expansion in rural areas moved much faster than the pace anticipated in the system plans.

Lesson 3: Transformation in the rural sector needs to be seen in a long-term context. A long-term vision, combining steps to be taken gradually, based on a realistic assessment of what can be achieved within one's means, has been a critical factor of success. The communication with stakeholders, concerning the assessment of what can be achieved in light of resources available, can help maintain costs at reasonable levels, manage expectations, and keep political pressure up to expand to unsuitable areas at a minimum.

Sharing of Costs and Mobilization of Multiple Sources of Funding

The dedication and commitment of central, provincial, district, and commune authorities translated into the sharing of costs and responsibilities for the management and ownership of rural electricity networks across different levels of government and the people.

A combination of multiple sources of financing was used for building and expanding rural electricity systems, with the relative share of each changing over time. These included (a) customer contributions; (b) commune, district, province, and central government budgets; (c) special surcharges from urban customers; (d) private investors; (e) borrowing; (f) retained depreciation from EVN; and (g) international donors.

The ways in which costs were shared among stakeholders changed over time. Before 1999, all capital costs associated with MV and LV systems were paid for by consumers and local authorities. From 1999 onward, along with the transfer of responsibility over MV networks to EVN, EVN began paying for MV assets, and thereafter, started taking over LV systems as well. EVN's share of capital costs for rural electrification has been increasing over time. In various policy documents issued in the late 1990s, the central government committed to using its own resources to supplement those of provincial and local communities, in order to share some of the costs of rural electrification, particularly for connecting remote and poorer households.

The central premise of the cost-sharing approach was the mobilization of multiple funding sources, instead of relying solely on central government resources for financing rural electrification investments. Sharing of costs associated with building new LV and MV networks was a main factor underlying the rapid way in which Vietnam managed to expand access to such a large proportion of its population. Not only was it pivotal to solving the problem of financing of the remaining investments, but also the government's support to local entities helped ensure the continuation of the success of the rural electrification program in Vietnam. Cost sharing by local communities, in particular, ensured a sense of community ownership, and sustained local commitment to the proper operation and maintenance of rural electricity systems.

Lesson 4: The presence of cost sharing among different parties has been an important contributor to the success of Vietnam's rural electrification program. In addition to making financing and building of rural systems easier, cost sharing helped create a sense of ownership in the parties involved. The provision of financial support by provincial, commune, and district authorities, as well as by the prime minister's office, was a critical element of success in ensuring the rapid increase in access to electricity in rural areas.

In addition to various sources of financing within the country, the Vietnamese government successfully mobilized financing from its international partners. Experience in other countries has shown that international development agencies prefer projects that have clear objectives, where funds are disbursed for the purposes agreed, and can be shown to have met objectives. Indeed, the presence of a clear program with achievable goals and cost sharing by multiple sources has proved to be very effective in ensuring the availability of external financial resources for supporting Vietnam's rural electrification program.

The government's financial commitment to rural electrification, along with the establishment of a special rural electrification department within EVN, contributed to better coordination of program implementation and achievement of program objectives. The issuance of policy statements and other official policy documents was useful in formalizing this commitment and sending a clear message to all stakeholders about it.

The rural electrification program was driven by the central government, while its international partners supported the rural electrification program by providing the needed finances to accelerate program expansion, especially after the most readily available local resources had been

exhausted. The involvement of Vietnam's international partners provided not only financial resources, but also enabled the sharing of international experience, technical capabilities, and expertise on program management.

Lesson 5: A well-formulated and properly communicated program with achievable goals and investments from multiple sources has proved to be very effective. The issuance of policy documents outlining the principles underlying this program was useful in formalizing the government's commitment and sending a clear message to all stakeholders that government resources would be available to backstop local resources.

Clear Allocation of Responsibilities among All Stakeholders

Vietnam's rural electrification success has relied on a cooperative approach involving commitment and support from all levels of the society. The engagement of all levels of government in decision making and implementation of the program has been a critical factor of success for the continuity and sustainability of rural electrification in Vietnam. The process involved major political decisions, working with provinces and local decision makers to ensure fairness, sharing of financing needs and management responsibilities, and ensuring significant social and economic impact.

Local communities and decentralized distribution companies were an important part of the way the rural electrification challenge was tackled. The principle of sharing responsibilities, conceived early on, has led to a successful rural electrification program that will pay dividends well into the future.

The country relied on both central and decentralized support for the implementation of its rural electrification program. The central government and provincial and local authorities agreed on a locally centered institutional framework, involving rural communities closely in the management and operation of local LV networks, to build a large, financially sustainable customer base. This cooperative approach has led to many benefits involved in accelerating the program.

Especially until the late 1990s, the government allowed a very flexible approach to the organization of the sector. The separation of responsibilities for MV and LV systems, as well as the multiplicity of entities being allowed to build, manage, and operate rural networks, proved to be very effective in facilitating the rapid expansion of access.

Lesson 6: An important factor in Vietnam's success in rapidly increasing the number of households with access to electricity was that the responsibilities were shared among various stakeholders. This collaboration-based approach can be credited with making it possible to move forward with the rural electrification effort on all fronts, and possibly much faster than what could have been achieved had the effort relied on the resources and capabilities of one central entity. The government's offering a lot of flexibility in terms of constructing, managing, and operating local electricity networks in the early years made a critical impact on the expansion of access to electricity.

EVN's Emergence as a Strong Champion for Rural Electrification

As discussed in section A4, soon after its establishment, EVN conducted a pilot activity involving the electrification of eight communes in different provinces in Vietnam. EVN stayed out of the rural electricity supply business because of the apparent unprofitability of the business. Although the company had recognized the strong demand for rural electrification and the government's desire to rapidly provide access to rural areas, EVN was deterred by concerns over the financial aspects of rural electrification and the limits on its own financial capacity.

A major turning point came with the issuance of some critical government decisions, including the 1999 policy paper, the 135 Program for Poverty Reduction, Decision 22, Decree 45, and the Electricity Law, through which the government clarified the division of institutional responsibilities in the rural electricity supply business, introduced principles for financing investments and covering costs, and instituted financial controls on the sector. Decision 22, issued in 1999, clarified the allocation of responsibilities for management of rural electricity networks, clearly delineated EVN's role and responsibilities, and assigned EVN in charge of MV networks. Decree 45, dated 2001, provided for various means of government support for rural electrification investments, and required the licensing of rural electricity suppliers. Decree 45 also provided measures for ensuring the financial viability of rural electrification for EVN, through sharing of costs, lower interest rates, and certain tax benefits.

Through these actions, the central government made it possible, and even more importantly, profitable, for EVN

to participate in rural electrification. The government's initiatives equipped EVN with the mandate and resources it needed to take the lead in rural electrification in a financially sustainable way. The resulting change of course in the organization of the rural electricity supply sector had considerable impact on the pursuit of the access agenda.

EVN's decision to get involved in the rural energy supply business, after the initial delay, was a significant step toward ensuring that the rural networks met certain technical requirements, since the rural networks had to comply with EVN's system requirements. Initially, the company was actively involved in the development of MV networks. By the early 2000s, EVN had become the driving force for program expansion, providing about three-quarters of the capital costs necessary to extend electricity in rural areas.

Lesson 7: AThe policy and regulatory measures introduced by the government, equipping EVN with the mandate and resources it needed to perform its leadership role in a commercially sustainable way, were critical components of Vietnam's success in rural electrification.

In the case of the expansion of access through large-scale grid extensions, a precondition of sustainability is to secure interest, commitment, and dedication from the country's main utility(ies). This can be achieved by making it possible for the utility to participate in rural electrification on terms that enable it to meet its commercial objectives. The utility should be equipped with a clear mandate and provided with the resources it needs to perform its leadership role in electrifying rural areas through grid extension.

Making Technical Choices Suitable for Sector Status and Priorities

The fastest development of rural networks in Vietnam took place in the mid-1990s, and at that time EVN was in charge of MV systems up to the commune level, while the responsibility for building, managing, and operating LV networks was assigned to local authorities and communities. This separation of responsibilities between MV and LV networks was a well-intended, practical, and effective way of sharing the costs of rural electrification, and indeed delivered strong results. However, because there were no uniform national technical standards at that time, some issues had to be dealt with in the long term. The rapid buildup of networks in the mid-1990s was carried out without even minimal uniform technical standards for equipment and materials used. This eventually led to issues with system performance, including low efficiency, large losses, low quality of supply, and even major issues with safety, resulting in costs that had to be recovered. In the medium term, these included the costs associated with the purchase of additional electricity to compensate for high losses in low-efficiency systems, backup generation equipment and fuel, devices for compensating for low quality power supply and replacement, and/or repair of damages to end user equipment because of poor reliability. In the longer term, the additional costs included the costs of repairing low-quality equipment and rehabilitating networks, as well as transaction costs associated with moving between different organizational arrangements. In most cases, the additional costs ended up ultimately being borne by rural households. Therefore, this situation, combined with the lack of financial controls, rendered new connections and the use of electricity expensive for some households.

The introduction of national technical standards in the late 1990s was a major turning point that eventually brought about improvements in power supply quality, alongside a significant reduction in technical losses, costs, and tariffs, which in turn helped provide significant long-term savings. The two photos (following) contrast examples of rural systems built without and with technical standards. A significant development in this regard were the technical specifications developed during the preparation of the World Bank–financed REP. The technical specifications developed at that time, and later adopted by MOI, standardized the design and characteristics of rural networks, promoted better network quality, reduced technical losses, and avoided the application of urban standards, which were unnecessarily sophisticated and expensive for low-density areas. In the later years, with the design and building of a distribution system that complied with national standards, and using suitable equipment, technical losses were reduced in some cases from 40–50 percent down to 8–10 percent, further helping to reduce effective tariffs, increase consumption, and provide significant long-term savings. While developing MV networks in a certain area, EVN helped build local capacity through providing training to local people and assisting local authorities in system planning and design.

In general, there can be various combinations of entities involved in, and technical requirements for building rural networks. If there is one national utility building the rural network, the need for uniform national technical

Examples of systems built without and with technical standards

standards can be a less pressing concern, as the utility would be highly likely to use consistent technical practices and equipments while building its network. In case there is more than one actor, there are choices to be made with respect to technical standards. The first is allowing these multiple actors to build rural networks without uniform technical standards. The second option is requiring the multiple actors to build rural networks according to uniform technical standards. There are trade-offs and long term consequences associated with each option. As Vietnam's experience shows, the first option can be faster, cheaper, and more effective in increasing access in earlier stages of a rural electrification program, when the priority is rapidly increasing the number of connections, the latter options can be more suitable after the initial challenge of connecting people is overcome, and focus can shift to quality and regulation.

Lesson 8: In Vietnam, the MV-LV split, and the presence of multiple actors in the mid-1990s, proved very effective in terms of facilitating the rapid expansion of access, but the absence of uniform technical standards at that time also led to issues that had to be addressed in the future. Unified national technical standards were introduced in the late 1990s, when electricity access rates had exceeded 60 percent, and made a significant impact in terms of improving power supply quality, reducing technical losses, tariffs, and costs.

As electricity access levels change, so do sector priorities. Early on in a rural electrification effort, when access rates are low, the priority is delivering simple connections to as many people as possible. With higher electrification rates, focus can shift to ensuring quality of supply. There are trade-offs and long-term consequences associated with various combinations of options for allocating responsibilities and technical requirements for building rural networks. What matters is the selection of combinations that are appropriate and feasible, in light of the current circumstances, sector priorities, and the capacity of the sector participants.

Technical standards are essential for ensuring the supply quality and long-term sustainability of a system. If there are multiple entities that can build and operate rural electricity networks, policy makers will need to be aware of the trade-offs involved, and, based on the electrification status and sector priorities, determine the most appropriate time and manner to introduce uniform standards for rural networks.

Ensuring the Economic and Financial Viability of Rural Electricity Supply…

Ensuring the economic and financial viability of rural electrification is often difficult, but it is essential. Being able to ensure the financial viability of rural electrification is a challenge faced by numerous rural electrification initiatives across the world. In fact, extension of electricity supply in many developing countries has been hampered by the fear that rural programs will put a strain on the financial viability of the PC implementing the program. This fear is not unwarranted, because many programs that started with good intentions ended up financially draining the companies involved. Such experiences have prevented many utilities from spending enough time and resources maintaining the systems, undertaking repairs, and addressing issues immediately. The result for those with an electricity connection is poor service, including widespread brownouts and blackouts. Supply outages are an obvious way to reduce the costs associated with rural electrification, but they also lead to a reduction in

benefits. Another way utilities have dealt with the high cost of rural electrification has been to impose high connection charges on new customers. In some countries, charging customers as much as US$500 for a connection is not unheard of. Such a high connection fee obviously pays the distribution company for the upfront costs of the investment, but it also means few rural or poor people can afford new service.

This was also experienced in Vietnam in the early years following EVN's establishment in 1995. As discussed in section A5, after an analysis it carried out, EVN initially did not want to engage in rural electrification because of the relatively high cost per household electrified and low electricity consumption recorded, which would translate into unsatisfactory financial results for EVN. Only after a series of policy statements by the central government provided assurances for financial support to the system and clarified the organization of the sector, did EVN get more engaged in the business.

The resolution of concerns over the financial viability of rural electrification involved a variety of approaches:

- The country's approach to organizing rural electricity supply and the insistence on some measure of cost sharing among various stakeholders helped reduce the initial investment burden on the EVN and PCs to a certain extent, and allowed them to remain financially viable while extending MV networks.
- Starting in 1999, a series of policy statements and decisions by the central government articulated a variety of options for supporting EVN, including central government budget, retained capital depreciation funds, soft loans, and funds from international development agencies.
- Once connected to the grid, electricity customers were required to pay for the continued operation of the system. This approach allowed the distribution companies to become more oriented toward providing service to their paying customers, rather than building the system with subsidies and then poorly maintaining them because of poor revenue flows from consumers. For example, for the communes electrified under the REP financed by IDA, this culminated in a requirement that at least 60 percent of households in a commune would connect when the project was completed and pay the requisite operational tariffs, thereby providing cash flow right from the start.
- Local management of bill collection, by entities that are part of the local communities, combined with the widespread culture of payment present in Vietnam, enabled the avoidance of financial drains caused by the lower prices charged to rural consumers. Therefore, bill collection for rural electricity runs rather smoothly, and there is not a large issue with nonpayment of electric bills.

The culture of payment is likely to have a significant bearing on the success of rural electrification. Although it may not be possible to replicate Vietnam's strong culture of payment in other countries, nevertheless, the practice of local involvement in management and operations of rural electricity networks, and particularly bill collection, can be easily adopted by other countries. The service agent model that was adopted in the early 2000s is a good illustration of the way in which this can be done. The service agent model helped ensure accountability within local communities and minimize nonpayment, in addition to reducing system losses and lowering system operation and management costs for the PCs. Overall, the involvement of local people in the management and operation of the LV system played an important role in ensuring the success and sustainability of the scaling-up of electricity access.

Lesson 9: As Vietnam's experience demonstrates, ensuring sustainability of the rural electricity supply business is critical. The culture of payment is likely to make a significant difference in ensuring the success of rural electrification. Although the culture of payment or specific institutional models applied in Vietnam may not be directly replicable in other countries, the principles of cost sharing, local involvement in management and operations of rural electricity networks, and particularly bill collection, can be easily adopted by other countries.

… While Establishing and Maintaining Financial Controls

In Vietnam's case, once households were connected, however, they were responsible for paying their electricity bills in full. As discussed in part A, the lack of financial controls, especially in the early 1990s, led to some rural households being faced with very high electricity prices. In some cases, the poor could not get electricity, or it was available at a higher cost than they could afford. In other instances, households on different sides of the same street would pay different prices for electricity.

In the later years of the program, assistance became available for poor households that could not fully afford to pay for their connections. Essential actions in this direction are the introduction of tariff ceilings for rural areas,

and the government's announcement of its intention to provide financial assistance for LV main lines in remote, mountainous areas, and service drop for poor households with Decree 45.

The issuance of Decision 21 in 2009, when a single nationwide tariff was introduced, was one of the important steps toward improving the sustainability of electrification investment in the more remote and poor regions. With this decision, the PCs were allowed to recover operating costs through the tariff charged to all consumers in their territory. In effect, this meant that the tariffs paid by relatively lower-cost consumers cross-subsidized the remote and poor consumers.

Lesson 10: While allowing reasonable returns to investors, on the one hand, attention should be paid to making new connections and use of electricity as affordable as possible. When grid extension covers customers who cannot afford to pay for the full cost of connections, there should be mechanisms to compensate the investors.

Setting Future Policy in Light of Results from Implementation

Actual results from implementation of rural electrification can be useful in informing future policy actions. For example, during the panel survey discussed in part B of this book, feedback gathered from households has generated some interesting policy lessons that can inform future actions:

- **The reliability of supply in the remote areas presents some significant problems, as reflected in continued expenditures for candles and kerosene.** To some extent, these problems are the result of the shortcomings in the LDUs that were responsible for supply in many of these areas in earlier years, problems that have been recognized in the design of the follow-on activity, the RE2, and in the reforms that have transferred these LDUs to the PCs. However, the main explanation is that the survey results simply reflect the national picture. The years between 2002 and 2008 were characterized by many periods of national shortages and rotating power cuts that were suffered in rural as well as urban areas.
- **The targeting of direct assistance to poor households will be crucial in the last mile.** The survey showed that the remaining unelectrified households have a significantly higher poverty rates than the electrified households. Therefore, it will be important to direct targeted assistance at these households to ensure that appliances of appropriate design are provided and that the costs of connection are reimbursed. There is strong support in the literature that connection subsidies have better targeting performance than lifeline rates.
- **Stimulating productive use in rural areas remains a problem.** The survey points to the constraints in replacing diesel-powered equipment by electric motors, most notably the high initial cost involved in replacing equipment. It is well understood by diesel users that electric equipment is much cheaper to run than diesel engines, which suggests that rural electrification projects should include providing assistance for equipment replacement, perhaps through some combination of equipment leasing scheme, preferential buyback of diesel engines, or an electricity surcharge for nondomestic use. However, such schemes are likely to function only if power quality can be assured.

Lesson 11: Results and information from implementation of rural electrification efforts, and monitoring and evaluation in general, will be useful inputs into future policy actions. These results, through validating (or negating) initial assumptions and giving an indication of emerging implementation issues, can help ensure that the policies and decisions reflect and address realities on the ground.

C3

Recommendations to Other Countries in Light of Vietnam's Experience

Following is a summary of the recommendations that can be derived in light of a review of Vietnam's rural electrification experience. This list is by no means an exhaustive list of all steps that need to be taken while embarking on a rural electrification program, but rather a reflection of the major themes that emerged from a look back to Vietnam's remarkable accomplishments and an effort to understand the factors underlying these achievements.

Recommendation 1: When embarking on a rural electrification program, the government should make a strong commitment to a long-term plan focused on gradually achieving what is possible with the resources available. The availability of a long-term vision, founded on the principle of living within one's own means, can help ensure the sustainability of rural electrification. Once that commitment is made, however, the government should adhere to the objectives it set out to achieve and the actions that were promised.

Recommendation 2: The government's commitment to a long-term and gradual rural electrification effort, the principles and priorities, and the expected outcomes must be clearly communicated to all stakeholders, in order to clearly set its course and manage expectations.

Recommendation 3: The focus of rural electrification efforts should change over time, as results are achieved. There should be a strong commitment to forward movement, flexibility, adaptability, and willingness to make and correct mistakes. The design of a rural electrification program should leave room for midcourse changes, provided they are consistent with predetermined principles.

Recommendation 4: Engaging all stakeholders and ensuring their buy-in early in the process is essential for long-term success of rural electrification.

Recommendation 5: It is advisable for decision makers to institute arrangements for sharing costs, in order to mobilize the various financial resources to finance a large-scale rural electrification effort. Cost-sharing arrangements need to be carefully designed to ensure the ownership and dedication of the related parties, but not surpass their payment capacity.

Recommendation 6: While the sharing of costs is a must, policy makers should deliberate carefully on the most suitable arrangements for the allocation of responsibilities for building, managing, and operating rural networks.

Recommendation 7: If decision makers wish to undertake large-scale grid extension, it is crucial to find a way to ensure interest, commitment, and dedication by the country's main utility(ies). In order to ensure this, governments should allow the utility(ies) to participate in rural electrification on terms that enable it to meet its commercial objectives. The utility should be equipped with a clear mandate and provided with resources it needs for performing its leadership role in rural electrification.

Recommendation 8: If policy makers are interested in involving multiple entities in the rural electrification effort, it is advisable to enable and encourage bottom-up solution. In Vietnam, bottom-up solutions were the centerpiece of the rural electrification story, and involvement of local communities, communes, districts, and provinces was a major driving force, especially in the early years.

Recommendation 9: If multiple entities are allowed to build, manage, and operate rural networks, it is critical for decision makers to be aware of the trade-offs involved in the various options and their long-term consequences. It will be important for decision makers to carefully weigh the benefits and costs of introducing some kind of minimal technical standards for rural systems and equipment specifications. What matters is the selection of combinations that are appropriate and feasible, in light of the current circumstances, sector priorities, and capacity of the sector participants.

- In the early stages of a rural electrification effort, when the priority is to expand access to electricity rapidly, allowing multiple entities to build rural networks, without imposing uniform technical requirements, as was the case in Vietnam until the late 1990s, is likely to provide the fastest expansion of access. However, while choosing this approach, decision makers should be aware of the costs that may be incurred in order to address the consequences of these decisions in the medium and longer term.
- If decision makers wish to focus on the longer-term sustainability of rural electrification, particularly in the more advanced stages of a rural electrification effort, they may wish to explore the possibility of introducing some kind of minimal technical standards that should be adhered to by the multiple entities while building rural networks. In this case, decision makers should expect to move more slowly, as was the case in Vietnam after 2004.

Recommendation 10: As a general principle, policy makers should carefully design and institute mechanisms for adequately compensating entities involved in rural electrification and ensuring the financial sustainability of the rural electricity supply in the long term.

Recommendation 11: As the rural electrification program advances, decision makers may wish to establish some degree of financial control over the entities involved in the rural electricity supply, while allowing a reasonable return.

Recommendation 12: In the early stages of a rural electrification program, decision makers may wish to undertake a comprehensive analysis to determine priority areas. Prioritization of productive uses of electricity in the early stages of a rural electrification program can be a very effective way of driving the development of the system, recovering costs, generating revenue for future system expansion, contributing to the overall financial viability of rural electrification, and supporting broader economic development. The focus on productive uses in a resource-constrained environment—as was the case in the early stages of Vietnam's experience, when the MV backbone was developed with a clear objective of providing energy for irrigation and other productive uses, and to increase output—was a very practical choice and had significant impact.

Recommendation 13: Once basic constraints with respect to availability of supply are overcome, priorities can shift to household electrification, in order to capture the full potential benefits from rural electrification. It is advisable to make connections as easy as possible for households, both physically and financially. This can be achieved through allowing flexible payment mechanisms and enabling users to finance their share of connection costs.

Recommendation 14: It is also crucial to ensure affordability of the connections and energy use by the poor. Decision makers may wish to consider options for ensuring the financial viability of supplying to poor and/or remote areas, and compensate investors when customers cannot afford to pay for the full cost of connection. Depending on the circumstances, affordability of new connections and electricity use can be ensured through several channels, including through setting prices or through subsidies. However, timing, phasing, and targeting of such measures will be important, to make sure those who are willing and able to pay contribute their share of the connection costs.

Recommendation 15: Policy makers may wish to identify the most suitable way to institute and/or enhance the culture of payment in their countries. This can be achieved through local participation, cost sharing, instilling a sense of ownership in the management and operation of the network, and creating local employment.

C4

Lessons from World Bank Experience

In this section, lessons from the World Bank experience in supporting Vietnam's rural electrification program are discussed. It is important to note that the main accomplishments, and therefore the spotlight, belong to the government's program. When the World Bank began working with the government on rural electrification, access to electricity had already been provided to more than 50 percent of the country's households. This section focuses on lessons learned from the World Bank's experience in supporting the realization of the government's objectives, and in particular, assisting with the daunting task of extending electricity access to the remaining half of the country's rural households, through a series of investment projects, technical assistance, and policy dialogue.

Several lessons have been learned from the World Bank's experience in supporting the achievement of the government's priorities for rural electricity in Vietnam. Three central themes emerge:

- Supporting government priorities as part of a gradual program that involves a long-term commitment to a series of projects and that may change in strategy and design;
- During preparation, engaging all stakeholders and ensuring their buy-in early in the process and mobilizing local experience and knowledge; and
- At project design, focusing on flexibility, buy-in from all stakeholders, local participation and commitment, and cost sharing, and aligning implementation arrangements with institutional realities and capacities.

Supporting Government Priorities as Part of a Gradual Program

The fundamental principle underlying the government of Vietnam and World Bank partnership on rural electrification was the provision of support to the achievement of the government's objectives as part of a programmatic approach. The program design was done in collaboration and through continued discussions. The government, EVN, and IDA worked together in formulating projects for the realization of the government's priorities and identifying solutions to problems.

Lesson 12: The World Bank project experience with rural electrification in Vietnam has shown that the establishment of a well-defined program, where fundamental principles, institutional arrangements, and the use of financing have been agreed on in advance, helps ensure efficiency and effectiveness during implementation. The programmatic approach that was adopted enabled the delivery of new projects in a relatively short period.

At the outset of cooperation in the rural energy sector, four major projects were planned to assist the implementation of Vietnam's rural electrification program. The cooperation would begin with addressing the most urgent issues at the time, and carefully preparing for the subsequent and more difficult interventions. A brief summary of these projects and their primary areas of focus are provided below.

- In the case of the **Rural Energy Project**, approved in May 2000 and involving a US$150 million IDA credit, the focus, consistent with government preferences, was entirely on rapid expansion of access to rural areas without electricity and specifically on increasing the number of basic connections. It was decided that the issues of rehabilitation of quality of supply and institutional aspects would be taken up in later operations.
- Indeed, with the **Second Rural Energy Project**, approved in November 2004 and providing a US$220 million IDA credit, the focus shifted to the rehabilitation of existing LV systems, further expansion of access, and development of institutions to ensure service delivery at the retail level.
- In 2008, the **Rural Distribution Project** was initiated, with US$150 million in IDA financing. This five-year project was designed to improve the reliability and quality of the MV networks bringing electricity to local distributors and build the capacity of regional PCs to act as independent participants in the power sector.
- In May 2009, the provision of another US$200 million in the form of **Additional Financing for the Second Rural Energy Project** was approved by the World Bank's Board of Executive Directors. This additional financing was intended to address a shortfall of financing resulting from increased costs associated with original project activities, and to scale up project coverage and rehabilitate LV and MV networks in a greater number of communes.

Lesson 13: There should be a clear, yet flexible, roadmap for achieving the government's objectives and for showing how World Bank support should support them. This roadmap should be the basis for designing specific interventions. Instead of designing a large project to address the whole set of issues in the rural energy sector, the approach involving the phasing of individual projects and designing each project to address the most critical issue of the time, and then addressing remaining issues in later projects, has proved effective. Policy dialogue and investment operations are best run on separate but parallel tracks, with each informing the other; hence the importance of flexibility in the roadmap.

Project Preparation

Investment in preparation before designing a project is essential. Extensive time and resources should be set aside to work out important aspects of project design, and for consultations with policy makers, local authorities, project beneficiaries, and people that will be affected by the system. For example, in the case of REP preparation, the team responsible for project design visited more than 100 communes in 30 provinces over a period of 9 months before finalizing the design of the project.

In preparing specific rural electrification projects, the role of prior, informed consultations cannot be overemphasized. Consultations are a critical input to garnering community support and involvement in project preparation and implementation. During the preparation of REP, extensive consultations took place, and written commitments were obtained from rural residents, communes, districts and provinces. The layout of the distribution lines was certified by those affected. The practice of documenting major stakeholders' commitments to the project and associated implementation requirements can be a useful step toward assuring that project design is workable, and can help avoid issues during implementation.

It is crucial to engage local experts for their experience and knowledge early on, alongside international experts during project design. Especially for rural electrification projects, conventional ideas will benefit from fine-tuning based on local conditions and constraints of the country context. An emerging lesson has been not to follow others blindly, but rather to find one's own way based on international experience and the wisdom of the people who know the local circumstances.

It is also important to focus on the essential objectives to be achieved in a single project, which, as noted above, should be seen as part of a longer-term program. This point is clearly demonstrated by the series of rural energy projects in Vietnam, where the earlier projects focused on accelerating access to the rural areas, while the later projects spent more effort on rehabilitation of the existing systems.

Lesson 14: During project preparation:

- It is important to keep in mind that a single project can't solve all the issues in the sector, and it should be seen for what it is—ideally, a step in a longer-term program.
- Extensive time and resources should be set aside to work out important aspects of project design, and for consultations.
- Engaging all stakeholders and ensuring their buy-in early in the process is essential for the long-term success of rural electrification.
- It is essential to mobilize local experience and knowledge as much as international experience.

Project Design and Implementation Arrangements

Allowing for flexibility in project scope and implementation arrangements. The lesson learned from experience in designing and implementing World Bank projects supporting rural electrification is that flexibility is essential, both in term of physical scope and approval, to allow for fast adjustment to unexpected conditions—cost savings—that may arise in implementation and increase the benefit of the project. For example, under the REP, there were numerous subcomponents that had to be implemented in difficult areas through the course of a long period. During the implementation of REP, the need for rapid adjustments emerged, and changes had to be made along the way.

Lesson 15: A key factor of success in implementing World Bank projects focused on rural electrification projects has been flexibility. There needs to be a certain degree of flexibility built into the project scope and implementation arrangements. As long as the changes are consistent with objectives and principles agreed at the outset, the process for their review should be determined ahead, and should be kept as simple as possible. Project outcome indicators should reflect the assessment of what can be achieved.

Incorporating cost sharing and clear allocation of responsibilities into project design. In the case of REP, the primary responsibility for the implementation of the project was assigned to EVN. EVN provided overall guidance to the project, while the three PCs took over the detailed implementation of the project. The use of EVN and the PCs helped both expedite the project implementation and the corresponding expansion of access to the rural households, while also ensuring compliance with national standards that would enable the reduction of technical losses. After construction, however, the PCs were to increase participation in the management of LV networks through joint stock companies, service agents, or cooperatives.

Rural electrification projects have a relatively lower financial rate of return (FRR) than other investment projects. Rural electrification projects are strengthened through the sharing of costs and allocation of responsibilities among stakeholders. Therefore, these projects should be designed in a way that allows, if not encourages, the mobilization of funding from other sources. For instance, under REP, financing and other contributions were required from multiple parties. PPCs agreed to pay compensation for land acquisitions. The PCs took responsibility for construction of the initial projects up to the households and provided their contribution in the form of training local staff. All households in the communes involved in the project had to make a written commitment to cover their share of initial capital investments and regular payments to cover the operating costs of the electricity networks. Provincial authorities provided support to the poorest households. International donors provided long-term soft loans.

Lesson 16: Another success factor for the implementation of World Bank projects has been the building of effective partnerships among EVN, local authorities, and communities, and specifically through the sharing of costs and responsibilities among stakeholders. Cost-sharing arrangements need to be carefully designed to ensure the ownership and dedication of the related parties, but not surpass their payment capacity. It is important to determine the most appropriate ways of combining different funding sources and allocating costs proportionally. On the other hand, it is advisable to allocate responsibilities in a way that will not hamper the coordinated construction, management, and operation of the systems themselves.

Ensuring local community involvement. A project that ensures some form of early returns to the local community has a greater chance of success. It is essential to have a strong focus on involvement and buy-in from local stakeholders, both in terms of tailoring the project to their needs and requiring their contribution.

Keeping the local community involved in all phases of the works associated with the project is a useful means of ensuring local participation and commitment to the project. This can be achieved through providing opportunity for participation in construction contracts or making sure that adequate numbers of people join the project immediately after completion.

Providing for local participation in the construction and operation of the new rural electricity supply networks was an important element of success under the REP. The project was designed in a way to ensure local participation in all phases of the work.

- **Design of LV systems.** All layouts of distribution lines passing through a given commune required approval by the commune leadership. On completion of the distribution lines, the local leadership had to sign off on its adequacy and quality. They also

indirectly monitored the construction, as they were required to connect to the system as soon as it was completed and begin paying for the electricity. The decision to decentralize decisions on such aspects to the local agencies proved effective in successfully implementing the project and exceeding the targets that had been originally set for the number of communes and households electrified.

- **Construction of LV systems.** It had been decided that contracts for construction work would not be awarded as turnkey projects to a single contractor, but instead, the focus would be on maximizing participation by local entities. During the construction of individual local networks, local participants were given an opportunity to bid for construction contracts or provide other services in support of construction. Local authorities were given the authority to approve the completion of all local contracts by the contractors. As a result of this approach, more than 600 contracts were assigned to local contractors. Although this high number of small contracts meant that a significant amount of resources would be required for supervising these contracts, the decision to proceed with multiple contracts enabled a very rapid pace of electrification, while the decision to engage local contractors provided employment to the local communities, built capacity for future activities, and helped ensure local support for the successful operation of the rural networks.
- **Management and operation of LV networks.** After the completion of construction, it was agreed that the communes would participate in the operation and maintenance of the local systems. The PCs provided training to a large number of local people, who then became "service agents" responsible for routine technical and commercial operations and maintenance, such as meter reading, billing, collections, monitoring of rights-of-way, and minor repair of in-house wiring. This approach combined several benefits: (a) reduction in operating costs; (b) additional employment opportunities for local residents; (c) better routine right-of-way checks; (d) faster communication in case of emergency; (e) greater ownership by the commune and a high level of payment; and (f) an increase in the safety awareness of the community.

Under the RE2, the strong commitment and close involvement of local authorities in the project implementation was also very beneficial, especially in terms of making the project site clearances much easier and ensuring continued engagement of local people in project implementation.

Lesson 17: Participation of the local people needs to encompass all elements of the project—from design to operations. Ensuring local participation in all aspects of the project can help mobilize and maintain local support and commitment to rural electrification, while ensuring a rapid pace of electrification, creating employment, building local capacity, and thereby laying the foundation for the sustainable management and operation of the networks.

Keeping sight of the ultimate benefits of rural electrification. As discussed in part B, the results and impacts of rural electrification projects in Vietnam were the focus of a multiyear panel survey. Findings of the survey confirmed some of the main assumptions made at the time of the REP design:

- **That the welfare benefits of rural electrification significantly exceed the costs of extending the grid in most remote rural areas:** In fact, the investment costs per household were only US$340.
- **That once the grid had been extended to remote communes, the connection rates would grow rapidly over the early years:** By 2008, 21 out of the 42 communes in the survey and all the surveyed households were connected; in the communes where the lowest connection rates had been observed, 79 percent of sampled households were connected.
- **That average electricity consumption would increase over time:** While real incomes in the survey communes grew at an annual rate of 9.5 percent, average electricity consumption rose by 8 percent per year.

Aligning project scope and implementation arrangements with institutional realities. As a general rule, project design and implementation arrangements should make it as easy as possible for project-implementing entities, and should be mindful of the resources and capacity of the parties involved.

Recent project experience has shown that the institutional realities on the ground have a significant impact on the extent to which rural electrification projects can be implemented and reach their objectives.

A case in point is the separation of responsibilities for MV and LV systems, which was conceived with the best of intentions as a way of sharing the costs of rural electrification. However, this approach, which had proved very effective in terms of facilitating the rapid expansion of access, also led to practical implementation difficulties

that had been neither foreseen nor intended. The separation of responsibilities between MV and LV systems had a significant impact on the implementation of the RE2. At the time of project preparation, around 2003 and 2004, the rehabilitation of MV and LV networks and the improvement of management of LV systems had become critical issues in need of being addressed. At that time, EVN was in charge of the MV networks, while the LDUs were in charge of LV networks. EVN was not in a position to be able to absorb the LV systems because of its financial and institutional capacity. Because of the separation of the responsibilities for building, managing, and operating the MV and LV systems, project implementation also had to be split into two separate parts. Project activities dedicated to MV systems would be implemented by PCs, while project activities involving LV systems would be implemented by the provinces.

This separation of the responsibilities for the MV and LV portions of the project led to challenges during implementation because of the divergence in capabilities of, and hence project implementation speed by, the PCs and the LDUs. This resulted in delays in implementation of some components. The MV and LV system investments envisaged under the project required a lot of coordination, and sometimes issues during implementation, with respect to ensuring consistency of system design and timing of construction. Overall, the project resulted in a lot of coordination being needed by all parties involved.

A practical takeaway emerging from this experience is that, in designing projects, task teams have to be aware of the trade-offs involved with respect to the realities on the ground and the timetable for preparation and implementation of investment projects. If task teams become aware of potential issues that can potentially lead to implementation difficulties, and if it is not feasible, desirable, or timely to attempt to make changes in the institutional framework, projects should be designed with those implementation challenges in mind.

As discussed under lesson 13, the phased approach, involving a series of individual projects, each designed to the most critical issue of the time, while leaving issues that cannot be immediately addressed to later projects, and conducting policy dialogue in parallel, has been effective.

As a general rule, project design and implementation arrangements should make it as easy as possible for project-implementing entities, and should be mindful of the resources and capacity available.

Lesson 18: As a general rule, project design and implementation arrangements should make it as easy as possible for project-implementing entities, and should be mindful of the resources and capacity of the parties involved. The implementation of all project activities by one entity, or by multiple entities with similar capabilities, working in a highly coordinated manner, can help make project implementation progress smoothly.

In case of mismatches between capabilities of different implementing agencies, efforts should be made to address them through policy dialogue, technical assistance, and support during project preparation, to the extent possible, should time and resources permit. Where addressing the concern is not immediately possible because of lack of resources, the presence of pressing needs for, and/or urgency of project activities, project implementation arrangements should be designed with a realistic view of what can be achieved in light of the institutional arrangements.

APPENDIX

The 1999 Rural Electrification Policy Paper

This is a lightly edited English translation of the original government of Vietnam policy paper.

Socialist Republic of Vietnam

Independence—Freedom—Happiness

Policy on Rural Electrification

Objectives of the Policy

Expanding electrification in rural, mountainous and island areas (hereinafter referred to as rural electrification) is a key element of the Government of Vietnam's overall strategy to combat rural poverty and provide for more equitable growth. Around 60 million (or 80%) of Vietnam's population of 75 million is rural. By the end of 1998, while 75% of the rural communes have access to electricity, only half of the rural households are actually connected. An estimated 25 million Vietnamese are still living without electricity. By the end of 2000, the Government plans to have 80% of rural communes and 60% of the rural households connected.

To achieve this rural electrification target the consistent application of a common policy is required at all levels. The adoption of a common set of principles and policies will maximize the impact from the limited resources available such as financial, human resources etc. Based on other decisions and documents issued by the Prime Minister, this document reflects the Government of Vietnam's policy towards the upgrading and expansion of rural electricity networks in the nation and the provision of acceptable levels of service to all rural consumers.

Basic Principles

The purpose of rural electrification is to deliver electricity efficiently and reliably to rural consumers in order to improve their standard of living and ability to earn income. The following principles will guide the valuation, development and implementation of the rural electrification in Vietnam:

- Rural electrification includes the extension of power grid to those areas that have no access to electricity and upgrade of the existing rural power system.
- Rural electricity supply will be based on both grid-based and off-grid systems.
- Rural electrification should be undertaken gradually in line with available financial resources. The provision and allocation of investment, maintenance service, and power supply must ensure the level of financial caution in respect of debt and internal generated capital of Electricity of Vietnam, Power companies and other related revenue earning entities.
- Priority should be given to those areas which have the capacity to enhance the pace of agricultural productivity, modernization and economic restructuring of strategic areas.
- The responsibilities for investing, managing and operating rural electricity networks and providing supply and service functions should maximize the use of local authorities, local people and local investors.

- The costs of operations, maintenance and the economic depreciation of rural electrification infrastructure and supply should be financially recovered from the revenues earned by EVN, PCs and other operating entities in Vietnam's power sector. The Government of Vietnam should provide a transparent subsidy for investment in rural electrification networks and supply infrastructure when these are deemed commercially unviable by revenue earning entities in Vietnam's power sector.
- Electricity supply for rural consumers should be considered a commercial service; except for those areas Government has subsidy policy when it is deemed to be socially necessary and consistent with the objective of equitable development. All entities who are responsible for the final delivery of electricity service to rural consumers should have an adequate financial incentive to continue in business and maintain an acceptable level of service.

The Policy Framework for Rural Electrification

1. Project Selection Criteria

The selection of unserved areas and individual communes for electrification should be consistent with the Government's socio-economic development objectives and should include, among others, the following principles:

- that communes should have a potential for economic development so as to ensure that energy consumption will be sufficient to justify the investment in economic terms that are defined as below:
  - The methodology for conducting the economic evaluation of any rural electrification project will be based on regulations to be issued by the Government.
  - A rural electrification project is defined as the capital investment decision for a medium-voltage and low-voltage system including all associated downstream investments. A typical rural electrification project would therefore cover multiple communes.
  - Only those rural electrification projects—would be selected for investment if they are able to demonstrate a minimum economic internal rate of return (EIRR) of 12%.
  - Especially difficult communes selected for electrification under a specific project should achieve a minimum EIRR (probably 8%).
  - Those communes that have EIRR below the above criteria will be electrified under a specific decision by the Government.
- that the connection of communes to the grid should be the least-cost solution to supply electricity;
- that the selection should be done following a process whereby local groups, i.e. local community and households, will have an opportunity to participate.

2. Investment in Rural Electrification

The policy for investment in rural electrification is as follows:

- The medium-voltage distribution network down to the output side of the 6–35/0.4 kV distribution transformer will be the responsibility of Electricity of Vietnam the national Power Companies (PCs). The low-voltage distribution network from the output of the 6–35/0.4 kV distribution transformers to the main lines outside homes will be the responsibility of local authorities.
- The connection cost from the low voltage lines outside homes to the consumer meter as well as internal home wiring will be undertaken by consumers.
- The Power Companies (PCs) could invest in the low-voltage distribution network using funds directly provided by the Government. In case of investment provided by loan funds, the PCs will only conduct the project when financial rate of return (FRR) is 10% and up.
- The consumer meter will be financed by the entities that are assigned responsibility of operating the low-voltage network for providing the service of electricity supply to the consumer.
- The People's Committee of the Province and central cities will be responsible for all land, contributions from local budget and steering of site clearance and resettlement meeting the requirements for construction of the medium voltage and low voltage systems.

3. Ensuring Appropriate Design Standards and Construction Quality

All rural electrification investment from the medium-voltage level down to the consumer meter will have to meet nationally promulgated design standards. Ministry of Industry will issue nation-wide applied design standards for rural electricity networks.

Electricity of Vietnam will undertake the responsibility of certifying/ensuring that the medium and low-voltage rural network invested by the PCs meets national design standards.

Departments of Industry in the provinces and central cities will undertake the responsibility of evaluating rural electricity network projects that are designed and invested by other investors to meet national design standards and existing regulations. An agreement on design standards

with Electricity of Vietnam or the PC(s) if an electricity network needs to be connected to the national grid.

The Power Companies and local network owners/operators are obliged to meet the nationally promulgated design standards.

4. Diversifying Ownership and Management Responsibilities for Rural Electrification Networks and Supply

The Government of Vietnam encourages the diversification of investment and management forms in the provision of electricity to consumers.

- Foreign and local investors are encouraged to invest in generation of power to supply rural electrification networks.
- The Government will not limit the participation of entities and individuals in owning, managing rural network and supply businesses, provided that these activities are in compliance with legal regulations. Different operation and management schemes will be encouraged and applied depending on the local situation providing the mechanisms are transparent and incentives appropriate.
- The low-voltage network developed by the PCs may be leased or sold to a business entity that may have sufficient operating capacity and be assigned the responsibility of operating the low-voltage network.

5. Incentives for Local Rural Electricity Supply Businesses

To encourage local investment, management and operation of rural electrification networks and supply businesses, local entities and individuals participating in these activities will be ensured as to the following:

- To purchase bulk power at the low voltage output side of the PCs' 6–35/0.4 kV distribution transformers at the price level defined by the Government.
- To be offered an adequate return on invested equity or an adequate distribution margin to cover the costs of operation, maintenance and a reasonable profit.

6. Encouraging Decentralized On-Grid Generation Supply

To encourage investment in economic decentralized generation in the low voltage grid, the PCs will offer *avoided* cost capacity and/or energy payments to potential decentralized generators (*avoided* cost capacity and/or energy payments are the highest price that the power purchaser can afford to buy electricity from outside generation source instead of their self investment, generation and transmission to the consumers).

These avoided cost capacity and/or energy payments will be linked to the load profiles and location at which this power is supplied to the network. Electricity of Vietnam will specify and proclaim the principles for establishing these avoided cost payments.

7. Incentives for off-grid supply

For some mountainous communes and island areas not being able to connect to the national grid, respective provinces will establish the on-spot/local generation projects suitable with the specific conditions of each location such as diesel, small hydro power, solar power, etc.

The Government will encourage foreign and local investors participating in investment, local generation businesses for electricity supply to consumers, especially in remote areas where the national grid cannot reach.

8. Retail Price

The Government through its assigned price setting authority will establish a ceiling price for retail supply to rural consumers.

This retail price ceiling will be readjusted/increased if the overall financial subsidies made available through the differential pricing of bulk power to urban and rural power distribution companies are inadequate to sustain acceptable financial performance for EVN, the PCs and other rural electricity supply business entities. (This financial performance is as follows: self-financing ratio is 30%, debt service ratio is 1.5 and debt/equity ratio is 60:40.)

The mechanism of subsidizing the price of electricity to rural consumers should ensure that there are incentives for: (i) efficient purchase of bulk power by the supply entity; and (ii) entities responsible for electricity delivery to cover costs

9. Funding Arrangements for Rural Electrification

The Government of Vietnam will ensure the following when providing funds to EVN, PCs and other business entities for investment in rural electrification:

- Refundable or partially refundable capital sources from multilateral and bilateral loans will be allocated as special budget funds aimed at investing in rural electrification once the investment is determined appropriate.
- Loan funds can be on-lent at the preferable interest rate to the PCs and only served for rural electricity projects of special purpose, although these projects are economically feasible but having financial rate of return below 10%.

Bibliography and Further Reading

Asian Institute of Technology. 2004. "Institutional Reforms and Their Impact on Rural Electrification: Case Studies on South and Southeast Asia." Version 10. Prepared for the Global Network on Energy for Sustainable Development (GNESD). Sub-Regional Technical Report by Asian Institute of Technology, Pathumthani, Thailand. http://www.gnesd.org/Downloadables/Energy_Access_I/Technical_report_AIT_ver_10_May_2004.pdf

Barnes D., V. Tuntivate, and K. Fitzgerald. 2008. "The Welfare Impact of Rural Electrification: A Reassessment of the Costs and Benefits." Washington, DC: World Bank.

COWI Consult. 1999. "Vietnam Rural Energy Master Plan Study." Final report submitted by consultants to Electricity of Vietnam (EVN) and the World Bank (unpublished).

Economic Consulting Associates Ltd and Mercados de Energía S.A. 2002. "Emerging Lessons in Private Provision of Rural Infrastructure Services—Rural Electrification in South East Asia: Cambodia, Laos, Vietnam." Washington, DC: World Bank.

Hanh N. V. 1992. "Rural Electrification in Vietnam." In *Rural Electrification Guidebook for Asia and the Pacific*. Economic and Social Commission for Asia and Pacific, Asian Institute of Technology Commission of the European Communities, Bangkok, Thailand, pp. 456–469.

Khandker, Shahidur R., Douglas F. Barnes, Hussain A. Samad, and Nguyen Huu Minh. 2009. *Welfare Impacts of Rural Electrification: Evidence from Vietnam*. World Bank Policy Research Working Paper No. 5057. Washington, DC: World Bank. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1476699

Malhotra, Anil Kumar. 2007. *A Passion to Build: India's Quest for Offshore Technology. A Memoir.* Lulu Press. www.lulu.com.

HLSS (Vietnam Household Living Standards Survey). 1993, 1997, 2002, 2004, 2006, 2008. Hanoi: General Statistics Office.

Vietnam Institute of Energy. 2001. *Fifth Power Master Development Plan 2000–2010 with a View to 2020*. Hanoi.

Vietnam Institute of Energy. 2007. *Sixth Power Master Development Plan 2005–5015 with a View to 2025*. Hanoi.

Vietnam Institute of Sociology. 2009. *Monitoring the Benefits of Rural Electrification in Vietnam: Evaluation Surveys for 2002–2005.* Hanoi.

Vietnam Institute of Sociology. 2010. "Impacts of Rural Electrification in Vietnam." Hanoi.

World Bank. 1994. *Vietnam: Rural and Household Energy Issues and Options*. Report No. 161/94. Washington, DC: World Bank.

World Bank. 1996. *Rural Energy and Development: Improving Energy Supplies for Two Billion People*. Washington, DC: World Bank.

World Bank. 1998. *Fueling Vietnam's Development: New Challenges for the Energy Sector*. Report No. 19037–VN. Washington, DC: World Bank.

World Bank. 1999. "Vietnam Development Report 2000: Attacking Poverty." Country Economic Memorandum, Report No. 19914–VN. Washington, DC: World Bank.

World Bank. 2000a. *Power Sector Reform and Restructuring in Vietnam: Final Report to the Steering Committee*. Washington, DC: World Bank.

World Bank. 2000b. "Project Appraisal Document for the Vietnam Rural Energy Project." Washington, DC: World Bank.

World Bank. 2002. "The Electricity Law for Vietnam: Status and Policy Issues." ESMAP Formal Report 259/02. Washington, DC: World Bank.

World Bank. 2004. "Project Appraisal Document for the Second Rural Energy Project." Report no. 29860, Washington, DC: World Bank.

World Bank. 2007. "Vietnam Rural Energy Project, Implementation Completion and Results Report." Report No. ICR485, Washington, DC: World Bank.

World Bank. 2008a. "Project Appraisal Document for the Vietnam Rural Distribution Project." Report No. 41345, Washington, DC: World Bank.

World Bank. 2008b. "The Welfare Impact of Rural Electrification: Reassessment of the Costs and Benefits." World Bank Independent Evaluation Group (IEG). Washington, DC: World Bank. siteresources.worldbank.org/EXTRURELECT/Resources/full_doc.pdf.

World Bank. 2008c. *The Welfare Impact of Rural Electrification: A Reassessment of Its Costs and Benefits.* Independent Evaluation Group (IEG). Washington, DC: World Bank

World Bank. 2010. "Program Document for the First Power Sector Reform Development Policy Operation." Washington, DC: World Bank.

VIETNAM

- PROVINCE CAPITALS
- NATIONAL CAPITAL
- RIVERS
- MAIN ROADS
- RAILROADS
- PROVINCE BOUNDARIES
- INTERNATIONAL BOUNDARIES

PROVINCES:

1 Lai Chau
2 Dien Bien
3 Lao Cai
4 Ha Giang
5 Cao Bang
6 Son La
7 Yen Bai
8 Tu Yen Quang
9 Bac Can
10 Lang Son
11 Phu Tho
12 Vinh Phuc
13 Thai Nguyen
14 Bac Giang
15 Quang Ninh
16 Ha Noi
17 Bac Ninh
18 Hung Yen
19 Hai Duong
20 Hai Phong
21 Hoa Binh
22 Ha Nam
23 Thai Binh
24 Ninh Binh
25 Nam Dinh
26 Thanh Hoa
27 Nghe An
28 Ha Tinh
29 Quang Binh
30 Quang Tri
31 Thua Thien Hue
32 Da Nang
33 Quang Nam
34 Quang Ngai
35 Kon Tum
36 Gia Lai
37 Binh Dinh
38 Phu Yen
39 Dac Lac
40 Dac Nong
41 Khanh Hoa
42 Binh Phuoc
43 Lam Dong
44 Ninh Thuan
45 Tay Ninh
46 Binh Duong
47 Dong Nai
48 Binh Thuan
49 T.P. Ho Chi Minh
50 Ba Ria-Vung Tau
51 Long An
52 Tien Giang
53 Dong Thap
54 Ben Tre
55 An Giang
56 Vinh Long
57 Tra Vinh
58 Kien Giang
59 Can Tho
60 Hau Giang
61 Soc Trang
62 Bac Lieu
63 Ca Mau

JANUARY 2010

The World Bank

The World Bank Group
Asia Sustainable and
Alternative Energy Program
1818 H Street, NW
Washington, DC 20433 USA

www.worldbank.org/astae