

GNESD

**GLOBAL NETWORK ON ENERGY
FOR SUSTAINABLE DEVELOPMENT**

Facilitated by UNEP



Energy Access theme results

***Institutional Reforms and their Impact
in Rural Electrification: South And Southeast
Asia***

**Sub regional technical report by
Asian Institute of Technology, Thailand**

Ver. 10 May 2004

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INSTITUTIONAL REFORMS AND THEIR IMPACT ON RURAL ELECTRIFICATION: CASE STUDIES IN SOUTH AND SOUTHEAST ASIA

Sub-Regional “Energy Access” Study of South and Southeast Asia

Prepared for

Global Network on Energy for Sustainable Development

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April, 2004

Executive Summary

South and Southeast (S&SE) Asian countries are characterized as being densely populated and having low access to electricity. In fact, about 59.2% and 37.8%, respectively, of the total population do not have access to electricity. Moreover, rural areas of the subregion also suffer from low electrification levels — only 30.1% in South Asia and around 51% in Southeast Asia compared to 68.2% and 89.9% in the urban areas, respectively.

Some of the countries in the subregion are at various stages of economic reforms, but all of which are moving from a centrally or heavily regulated economy to a more market-driven economy. The economic reforms in S&SE Asia have also permeated the power sector. A cursory look at the evolution of the electricity sector in some countries in the subregion reveal that the reforms undertaken in electricity sector during the early years were primarily aimed at addressing the issues of providing electricity to the people and then increasing electricity coverage. Later, in order to increase electricity coverage, institutions were established or “carved out” from existing institutions to undertake national electrification programs to increase electricity coverage. In most cases, the electricity sectors remained under vertically integrated monopolies responsible for generation, transmission, and distribution but internal restructuring was undertaken for the purpose of increasing electricity coverage, especially in rural areas.

In recent years, the reforms focused on fundamental major restructuring of the sector: separation or unbundling of the generation, transmission, and distribution; change in ownership from public to private sector, or at least increase in private sector participation by deregulating generation; and restructuring of electricity tariffs and gradually removing subsidies to better reflect economic or true costs of electricity supply. All these changes have geared towards increasing economic efficiency of the sector and relieving the financial burden of electricity institutions by sharing the costs of electricity supply with the private sector and the electricity consumers. The subregion, therefore, cover a wide continuum on the reform scale and present an interesting case study for analysing the issues of electricity (a sub-sector of energy) access to the poor and the impacts of reform.

The objective of the study was to examine the reforms in the electricity sector that have crucial influence on electricity access. The study assessed whether the institutional restructuring and major reforms mentioned above had had impacts on the access to electricity among the poor. Three country case studies were chosen for assessment: Thailand, Bangladesh, and Vietnam. These countries in the subregion represented diverse economic standing as well as different approaches in increasing electricity access among the people. The selected reform measures in the three countries were assessed with respect to the following indicators:

- Electrification levels;
- Electrification rates;
- Average or per capita kWh consumption;
- Average electricity tariffs; and
- Electricity expenditures as percentage of total household expenditures.

As various reform measures were undertaken in the past, the study had chosen few reform measures for each country case study for assessment. In the absence of electricity and affordability data by income classes (poor and non-poor), the study used electricity data of rural and urban population as a proxy of the poor and the non-poor households, respectively¹.

For Thailand case study, three reform measures were chosen for assessment: 1) the ARE (accelerated rural electrification) programme based on the master plan initiated by the PEA (Provincial Electricity Authority) in 1974, which was the first major institutional reform that directly addressed issues on access to electricity; 2) Amendment of the EGAT (Electricity Generating Authority of Thailand) Act in 1992, which introduced major structural reform undertaken in Thailand electricity sector; 3) and series of tariff reforms during 1990-2000, which caused upward pressures on electricity tariffs of both the poor and the non-poor.

The growth in rural electrification in Thailand was relatively low in the early 1970s. Only 7% of the poor households had access to electricity. In the 1980s, with the implementation of the long-term national master plan for rural electrification by PEA, access to electricity by the poor households had remarkably increased and by 1988 reached 74%. Electricity access of the poor households had improved further in the 1990s and reached 98% in 2000. Access to electricity by the non-poor households had crossed 90% level beyond mid-1980s and reached more than 99% by 2000. The reforms in the 1990s, i.e., EGAT Act and tariff restructuring, seemed not to have significantly influenced the electrification level, as this was already at a very high level. The EGAT Act reform seems to have led to an increase in the overall average electricity consumption level, though the average consumption level for the poor had shown marginal increase. The tariff reforms undertaken in the 1990s resulted in a steady increase in tariffs. The consequent introduction of time-of-day tariff rates in 1990, automatic adjustment mechanism (or Ft) in 1991, and time-of-use tariffs in 1997 caused upward pressure on electricity tariffs. With the adoption of marginal cost pricing in 2000, tariff subsidies to PEA were reduced. This decreased the level of subsidy available to residential users in PEA area, both for the poor as well as the non-poor. This is reflected in continuous increase in electricity tariff for the poor households. After 1990, an increase in electricity expenditure for the poor households had been observed. Although there was a slowing down of the increase in average electricity consumption, the reform does not seem to have adversely affected the poor households.

In Bangladesh, the establishment of the REB (Rural Electrification Board) through the issuance of Ordinance Number LI of 1977 was the first major institutional reform in the power sector that emphasized rural electrification and aimed at increasing electricity access in rural areas. This institutional reform did improve the rate of electrification for the poor. In absolute terms, the number of electrified households had increased from more than 25,972 during the pre-reform period (1982) to more than 4 million households after the reform period (2000). The reform process appears to have made the contribution to enhance electricity access in Bangladesh.

¹ Table 7 under the methodology section shows the definition of the poor and the non-poor households for each case study

In Vietnam, the establishment of EVN (Electricity of Vietnam) in 1995 and the dedication of an office within EVN to aggressively pursue rural electrification led to the improvement of electrification levels and increase in electrification rates. Prior to EVN reform, the non-poor had very high electrification levels. Thus, the targeted rural electrification efforts resulted in a significant increase in electrification levels and higher electrification rates for the poor. From less than 50% prior to the reform, electrification levels climbed to 77% in 2001, about five years after the reform. The completion of the 500 kV line, which stretches from the north to the south of the whole of Vietnam in 1994, has been one of the key factors for the increase in electrification levels. Additionally, the introduction of various approaches by EVN in managing rural electricity had paved the way for increasing electricity access in rural areas.

The period subsequent to EVN reform saw significant increase in electricity consumption per capita for both the poor and the non-poor. During the time of the reform, there were subsequent increases in electricity tariffs. The increase in electricity tariffs for the poor, however, was not as much as that for the non-poor. Yet, the steady increase in tariffs for the non-poor starting 1994 had not dampened the rate of increase in electricity consumption of the non-poor but led, however, to doubling of the share of electricity expenditure in total household expenditure during the post-reform period.

The above findings essentially highlight that past institutional reforms initiated by the government targeting rural electrification were able to increase the electrification levels as well as consumption levels of the poor. Also, these reforms seem to focus also on moderating tariff to enable the poor's access to electricity. Recent reforms, which were focussed more on increasing economic efficiency and private participation did result in higher tariffs. It is difficult, however, to say whether recent reforms slowed down access of electricity of the poor, as the timing of the reforms was during the time when the majority of the poor household had access to electricity.

The results of the study were based on the analysis of a limited available data to derive the above-mentioned indicators. In some cases, assumptions had to be made to derive the needed indicators. A more rigorous assessment could have been done if disaggregated electricity and expenditure data by income groups for both urban and rural areas were available. It is, therefore, recommended that such disaggregated database be developed for better assessment of impact of electricity sector reforms on the poor's electricity access.

Table of Contents

1	Background on Energy Services for the Poor in South and Southeast Asia	10
2	Rationale, Objective and Scope of the Study.....	12
3	Power Sector Institutional Reforms in Thailand, Bangladesh, and Vietnam: Historical Perspective and Recent Reforms	14
3.1	Thailand	14
3.2	Bangladesh.....	16
3.3	Vietnam.....	18
4	Methodology	22
5	Assessment of the Selected Reform Measures: Thailand Case Study.....	27
5.1	Electrification Level.....	27
5.2	Electrification Rates	28
5.3	Electricity Consumption	29
5.4	Electricity Tariffs	31
5.5	Electricity Expenditure	33
5.6	Summary of Findings.....	35
6	Assessment of the Selected Reform Measures: Bangladesh Case Study	37
6.1	Electrification Levels	37
6.2	Electrification Rates.....	38
6.3	Electricity Consumption	38
6.4	Electricity Tariff.....	39
6.5	Electricity Expenditure	40
6.6	Summary of Findings.....	40
7	Assessment of the Selected Reform Measure: Vietnam Case Study	42
7.1	Electrification Levels	42
7.2	Electrification Rates.....	43
7.3	Electricity Consumption	43
7.4	Electricity Tariffs	44
7.5	Electricity Expenditure	45
7.6	Summary of Findings.....	45
8	Summary of Key Findings and Recommendations.....	47
9	Acknowledgement	47
	Annex I.....	53

List of Acronyms and Abbreviations

ADB	Asian Development Bank
AIT	Asian Institute of Technology
ARE	Accelerated Rural Electrification
BBS	Bangladesh Bureau of Statistics
BSS	Bangladesh Sangbad Sangstha
BMA	Bangkok Metropolitan Area
BPDB	Bangladesh Power Development Board
CEG	Commune Electricity Group
CPC	Commune Peoples' Committee
DEDE	Department of Alternative Energy Development and Efficiency
DEDP	Department of Energy Development and Promotion
DESA	Dhaka Electricity Supply Authority
DESCO	Dhaka Electricity Supply Company
ECA	Economic Consulting Associates
EGAT	Electricity Generating Authority of Thailand
EIRR	Economic Internal Rate of Return
EPPO	Energy, Policy and Planning Office
EVN	Electricity of Vietnam
Ft	Automatic Adjustment Clause
GDP	Gross Domestic Product
GWh	Gigawatthour
HDI	Human Development Index
IEA	International Energy Agency
IEV	Institute of Energy Vietnam
IPP	Independent Power Producer
JSC	Joint Stock Companies
kV	Kilovolts
kWh	Kilowatthour
LA	Lignite Authority
LRMC	Long Run Marginal Cost
MEA	Metropolitan Electricity Authority
MoE	Ministry of Energy
MV	Medium Voltage
NEEA	Northeastern Electricity Authority
NEPO	National Energy Policy Office
NESDB	National Economic and Social Development Board
NESDP	National Economic and Social Development Plan
NRE	National Rural Electrification
NRECA	National Rural Electric Cooperative Association
NSO	National Statistics Office
ORE	Office of Rural Electrification
PBS	Palli Biddut Samity
PC1	Power Company 1
PC2	Power Company 2
PC3	Power Company 3
PEA	Provincial Electricity Authority
PEO	Provincial Electricity Organization
PGCB	Power Grid Company of Bangladesh

PPC	Provincial People's Committee
PPP	Purchasing Power Parity
PSD	Power Service Departments
RE	Rural Electrification
REB	Rural Electrification Board
RPC	Rural Power Company
RTG	Royal Thai Government
SPP	Small Power Producer
TOD	Time-of-day
TOU	Time-of-use
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
US\$	US Dollars
WB	World Bank
WEC	World Energy Council
YEA	Yanhee Electricity Authority

List of Tables

Table 1: Access to electricity and per capita consumption in South and Southeast Asia.	10
Table 2: Poverty in South and Southeast Asia, 2000*	11
Table 3: Economic and demographic indicators of Bangladesh, Thailand, and Vietnam	13
Table 4: Electrification targets of the rural electrification master plan	15
Table 5: Status of the power sector institutional reforms before and after 1992	16
Table 6: Number of households/population, size and average income/ per household	24
Table 7: Definition of the poor and non-poor households for each case study	25
Table 8: Indicators, derivation, and sources of data	25
Table 9: Time-of-day and time-of-use tariff for retail customers	32
Table 10: Bulk supply tariff between EGAT and the distribution utilities (US Dollar/kWh)	33
Table 11: Electricity expenditure as % of total household income in 1976 and 1981	34
Table 12: Compounded annual growth rate of average income, average total expenditure, and average electricity expenditure per household between 1976 and 1981	34
Table 13: Compounded annual growth rate of average income, average total expenditure, and average electricity expenditure per household between 1990 and 1992	35
Table 14: Electrification level (%)	37
Table 15: Number of electrified households	38
Table 16: Cost associated with a new residential customer (US\$)	38
Table 17: Annual average electrification rates (%)*	38
Table 18: Electricity consumption per capita (kWh/capita)	39
Table 19: Compounded annual growth rate of total electricity consumption and population electrified between 1991 and 2000 (%)	39
Table 20: Average electricity expenditure as a % of average total household expenditure (%)*	40
Table 21: Electrification levels (%)	43
Table 22: Electrification rates* (%)	43
Table 23: Electricity consumption per capita (kWh/capita per annum)	44
Table 24: Average electricity tariff (1992 USD/kWh)	44
Table 25: Average electricity expenditure as percent of total household expenditure (%)	45
Table 26: Impacts of institutional and structural reforms in Thailand, Bangladesh, and Vietnam on the poor households	47

List of Figures

Figure 1: Electrification Level from 1978-2000	28
Figure 2: Electrification Rates* from 1984-2000	29
Figure 3: Electricity Consumption per Household during 1977-2002.....	30
Figure 4: Electricity Tariffs During 1978-2002.....	31
Figure 5: Electricity Expenditure as % of Total Household Expenditure	35
Figure 6: Average Electricity Tariff (1992 USD/kWh).....	45

1 Background on Energy Services for the Poor in South and Southeast Asia

About 59.2% and 37.8% of the total population in South and Southeast Asia, respectively, do not have access to electricity, [IEA 2002]. Furthermore, four out of five persons without access to electricity live in the rural areas, and this ratio has not changed over the last three decades. Indeed, rural areas suffer from low electrification levels. In South and Southeast Asia, the electrification levels in the rural areas are only 30.1% and 50.8%, respectively, compared to 68.2% and 89.9% in the urban areas [IEA 2002 and Montgomery 2003].

Table 1 shows the electrification levels of different countries of South and Southeast Asia. The disparity in electrification access is evident. Countries like Singapore, Malaysia, and Thailand have been successful in providing electricity to more than 80% of the population. On the other hand, in Bangladesh, Cambodia, Myanmar, and Nepal, electricity does not reach even 25% of the population.

The electricity consumption per capita also varies significantly in South and Southeast Asia. In Southeast Asia, Singapore has the highest per capita electricity consumption of 6,948 kWh, and Myanmar, on the lower end of the scale, has a per capita electricity consumption of only 69 kWh. In South Asia, India has the highest per capita electricity consumption of 355 kWh, and Nepal has the lowest at 56 kWh.

Table 1 Access to electricity and per capita consumption in South and Southeast Asia

Region	Country	Electrification level (% of total population)	Per capita electricity consumption in 2000* (kWh/capita)
South Asia	Bangladesh	31.0 (2000)	96 (2002)
	India	43.0 (2000)	355
	Nepal	15.4 (2000)	56
	Pakistan	52.9 (2000)	352
	Sri Lanka	62.0 (2001)	293
Southeast Asia	Cambodia	15.8 (1998)	78 (1999)
	Indonesia	53.4 (2001)	384
	Laos	33.0 (2002)	113 (1999)
	Myanmar	5.0 (2000)	69
	Malaysia	90.0 (2000)	2,628
	Philippines	54.0 (2002)	477
	Singapore	100.0 (2000)	6,948
	Thailand	98.5 (2002)	1,448 (2002)
Vietnam	77.4 (2001)	286 (2001)	

Sources IEA (2002); NSO, Thailand (2000); Temple, (2000); World Bank (2003b); ECA (2002a)

*Unless otherwise specified

The incidence of poverty tends to be high in countries with low electrification level and low per capita electricity consumption (see Table 2). For example, in Bangladesh, Nepal, and Laos, where the electrification levels are around 34% or lower, the incidence of poverty, measured in terms of households with income of not more than \$2 per day, is more than 70%.

Table 2 Poverty in South and Southeast Asia, 2000*

Region	Country	Population in %				
		Below National Poverty Line ²			Below Poverty Line \$2/Day	Below Poverty Line \$1/Day
		Total	Urban	Rural		
South Asia	Bangladesh	31	14.3 (2002)	39.8 (2002)	77.8	29.1
	India	35.0	37.3	32.4	86.2	44.2
	Nepal	42.0	23.0	44.0	82.5	37.5
	Pakistan	34.0	25.9	34.8	84.7	31.0
	Sri Lanka	25.0	**	**	45.4	6.6
Southeast Asia	Cambodia	36.1	40.1 (1997)	29.9 (1997)	**	**
	Indonesia	15.2	7.3	20.7	27.1	7.7
	Laos	46.1	24.0 (1993)	53.0 (1993)	73.2	26.3
	Malaysia	15.5	**	**	**	**
	Philippines	36.8	21.5	50.7	**	**
	Thailand	13.1	1.5	17.2	28.2	<2.0
	Vietnam	17	9.2	45.5	**	**

Source UNDP (2002); ADB, (2003); JICA (2003); NSO, Thailand (2000); Temple (2000)

* Unless otherwise specified; **Data not available

² An income level that is considered minimum sufficient to sustain a family in terms of food, housing, clothing, medical needs, and so on.

2 Rationale, Objective and Scope of the Study

The present study focuses on S&SE (South and South East) Asia as the countries in this subregion present a wide range of level of development, poverty, and access to electricity. The countries in the subregion are at various stages of economic reforms, but all are moving from a regulated economy to a more market-driven economy. S&SE Asia also represents diverse level of human development: the human development indices (HDI) range from as low as 0.478 in Bangladesh to as high as 0.762 in Thailand³. Electricity access, measured in terms of electrified households, also varies, from less than 30% in Bangladesh, Cambodia, Myanmar, and Nepal to more than 80% in Malaysia, Singapore, and Thailand.

One of the important areas in the economy affected by economic reforms is the energy sector. Energy has been an important issue and has become more so with the adoption of the millennium development goals to address poverty. The global focus has shifted to strategies to alleviate poverty, and energy access forms an integral part of the strategy.

In this regard, the S&SE Asian subregion also represents a wide continuum on the reform scale and provides interesting case studies for analysing the issues of electricity (a sub-sector of energy) access of the poor and the impacts of reform.

The power sectors in S&SE Asia are also in varying degrees of market reforms. A cursory look at the evolution of the electricity sector in these countries reveals that reforms can be broadly classified into two categories. First stage of reforms, undertaken in the early years of the electricity sector, were primarily aimed at addressing the issues of first providing electricity to the people and then increasing electricity coverage. These reforms were primarily “carving out” new institutions from existing institutions to undertake national electrification programs to increase electricity coverage. In most cases, the electricity sectors remained under vertically integrated monopolies responsible for generation, transmission, and distribution but internal restructuring was undertaken for the purpose of increasing electricity coverage, especially in rural areas.

The second stage of reforms is focused on fundamental restructuring of the sector: separation or unbundling of generation, transmission, and distribution; change in ownership from the public to private sector, or increasing private sector participation in generation; and restructuring of electricity tariffs and gradually removing subsidies to reflect better economic costs of electricity supply. All these changes have been geared towards increasing economic efficiency of the sector as well as increasing the resource inflow from private investment.

The objective of the study is to examine the reforms in the electricity sector that have had crucial influence on electricity access. The performance of the electricity sector in S&SE Asia in terms of electricity access and level of electricity consumption per capita may be attributed to many factors, among which are the institutional reforms

³ The human development index (HDI) measures the achievements of the countries in three basic dimensions: a long and healthy life; knowledge; and standard of living [UNDP, 2002].

that have taken place in these countries over the years. The focus of the study is to assess whether the institutional restructuring and reforms mentioned above have impact on the access of electricity among the poor. The usual indicator of electricity access is the national electrification level, measured as the proportion of total household population receiving electricity supply. However, this indicator does not reflect the differential benefit, from the national thrust of increasing electricity access, to the poor and the non-poor population. The study, therefore, aims to assess distinctively the impact of these reforms on the electricity access of the poor.

The study looks at the reforms in Thailand, Bangladesh, and Vietnam. The type of reforms in these countries, specifically the approaches for increasing electricity access to the poor (one large public-owned utility in Thailand, cooperative approach in Bangladesh, and mixed approaches in Vietnam) vary among the three countries, providing a good basis for comparison. The accomplishments of the reforms relative to their timing also vary significantly in the three countries. For example, Thailand seems to be the reference or normal case insofar as timing and accomplishments are concerned. Bangladesh started early on (almost the same time as Thailand) but its accomplishments are dismally low when compared to Vietnam that has started with crucial reforms much later. The three countries also represent three different economic standings. Thailand enjoys the highest per capita income while Bangladesh is at the bottom end. Vietnam lies in between the two countries. Thus, these three countries represent the spectrum of countries in the region. See Table 3.

Table 3 Economic and demographic indicators of Bangladesh, Thailand, and Vietnam

Indicator	Country		
	Bangladesh	Thailand	Vietnam
Population (in million) in 2001	133.3	62.8	79.5
Annual population growth in % (1975-2000)	2.4	1.7	2.0
GDP per capita (US\$), 2000	320.3	1874.1	411.3
GDP (PPP Billion US\$), 2000	209.9	388.8	156.8
GDP per capita annual growth rate, % (1990-2000)	3.0	3.3	6.0

Source UNDP (2002); World Bank (2003b); IEA (2002)

3 Power Sector Institutional Reforms in Thailand, Bangladesh, and Vietnam: Historical Perspective and Recent Reforms

3.1 Thailand

The PEO (Provincial Electricity Organization) was created in 1954 to generate and distribute electricity to all areas of Thailand except the Bangkok municipal areas, which were the responsibility of the MEA (Metropolitan Electricity Authority). In 1960, PEO became the PEA (Provincial Electricity Authority). PEA was established to standardize electricity distribution in the provinces. The main objectives of PEA were to improve and accelerate the provision and distribution services of electric energy, and to generate own revenues for further expansion. PEA also continued to manage and operate 178 electric networks (taken over from PEO) that provided electric service to the customers in the local municipal areas and nearby communities by supplying electricity mainly generated from isolated diesel power plants.

In 1969, the EGAT (Electricity Generating Authority of Thailand) was formed to rationalise and consolidate the functions and responsibilities of various organizations created to meet electricity demand⁴. EGAT was made responsible for power generation and transmission. The distribution and retail service functions were under the responsibility of MEA and PEA, though PEA till 1975 continued to install isolated diesel- generating plants, especially in the remote areas where connection to EGAT grid was not financially viable.

Due to the continued low level of rural electrification (in 1970s only 15% of rural villages were electrified), PEA started a new approach in electrification in 1974: the 25-year “National Plan for Accelerated Rural Electrification”, served as the master plan for rural electrification in the country. This was the first institutional restructuring to effectively address the electrification issues in the country. The long-term plan was divided into 5-year plans in line with the 5-year NESDP (national economic and social development plans) of the country, each with specific targets for increasing electricity access in rural areas (Chullakesa 1992). Table 4 shows the electrification targets of the master plan from the third to the seventh NESDP. The strategy underlying the new approach was increased emphasis on grid rural electrification and restructuring of the institutional structure.

⁴ In the early 1960s, the government established other various agencies to provide and distribute electricity to some areas: 1) The Lignite Authority (LA), in 1960 to supply electricity in the far north and south of the Thailand; 2) the Northeastern Electricity Authority (NEEA) was established in 1962 to provide electricity in the northeast where the hydro-electric plant was situated; 3) Private franchises which were managed as electric utilities by private concessionaires in their concerned areas.

Table 4 Electrification targets of the rural electrification master plan

NESDP	Period	Electrification target, % electrified villages
3 rd Plan	1972-1976	30
4 th Plan	1977-1981	50
5 th Plan	1982-1986	76
6 th Plan	1987-1991	94
7 th Plan	1992-1996	98-100

To address the problems of rural electrification, PEA declared the formation of the ARE (Accelerated Rural Electrification) programme (under the 4th NESDP) for the whole of rural Thailand⁵. The ORE (Office of Rural Electrification) was established within PEA to carry out the electrification projects⁶. This was the second set of institutional restructuring to address the low level of rural electrification, which was thought as an important tool in addressing rural growth and poverty reduction. The office was dissolved when the programme was completed, but proved to be a cost-effective approach from management perspective.

The earlier reforms were more in terms of institutional redesigning and structural changes, but the overall control of the sector remained in public domain. In 1992, EGAT Act was amended allowing IPPs (independent power producers) and SPPs (small power producers) (with less than 90 MW capacity) to generate electricity. EGAT remained the sole transmitter in the country. As of August 2003, 60 SPPs were generating close to 3,800 MW and selling more than 2,000 MW to EGAT⁷.

The Act also allowed EGAT to “engage in business concerning electric energy or in continuity with EGAT’s activities, by means of establishing private limited companies or public companies limited; collaborating with other local or international entities in business concerning or in continuity with the activities of EGAT; or holding shares in any company.”

Between 1990 and 2000, alongside the restructuring in the generation sector, a series of tariff reforms was also undertaken: the introduction of time-of-day tariffs in 1990, the adoption of automatic adjustment formula in 1991, the introduction of time-of-use tariffs in 1997, and the removal of cross-subsidies in 2000.

In 2002, the Very Small Renewable Electricity Power Producers Programme was also launched to allow small-scale power producers to sell electricity to the grid. This aimed mainly at the pig farms and food processing industries in the rural sector for

⁵ Aside from the ARE programme, PEA also launched other various programmes and projects to accelerate rural electrification. Few of these are: Villages Electrification Projects, (for North-eastern and South-eastern, and other provinces); Volunteer Self Development Village Electrification Project (villages located in sensitive areas); New Village Development Programme (aimed at encouraging local people to take active participation in the development process under the mobilization and supervision of the government); and Normal Rural Electrification or NRE programme. NRE was regarded as the best means to accelerate the extension of electricity service as it allowed all unelectrified villages to provide either cash or in-kind contributions to accelerate their connection to the grid [PEA, undated].

⁶ ORE was responsible for planning and implementing the ARE programme as a package under single management.

⁷ Most SPPs generate for own use and sell excess electricity to EGAT.

generation capacities of under 1 MW. Yet it has potential for contributing community-based rural electrification.

The changes in Thailand's electricity sector as a result of the latest reforms are summarized in Table 5.

Table 5 Status of the power sector institutional reforms before and after 1992

	Before 1992	After 1992
Generation, transmission	EGAT was fully responsible for generation and transmission	Private sector (SPP and IPP) was allowed to generate power. EGAT however remains the sole purchasing agency of electricity and transmission.
Distribution and retail services	MEA was responsible for distribution in Bangkok Metropolitan area and two adjoining provinces. PEA was responsible for the remaining provinces of the country.	MEA and PEA ⁸ retain monopoly in distribution and retail in their franchise areas.
Regulation	Since the three utilities are state enterprises, the government through the Prime Minister Office indirectly controls its management. The government however directly controls the pricing and investment policies of these utilities as mandated in their respective acts, EGAT Act, MEA Act and PEA Act.	Status Quo, though the Government is in the process of setting up a regulatory body.
Tariff	<ul style="list-style-type: none"> ▪ Introduction of time-of-day tariffs in 1990 ▪ Adoption of automatic adjustment formula in late 1991 	<ul style="list-style-type: none"> ▪ Time-of-use tariff was introduced in 1997 ▪ Removal of cross-subsidies in 2000 ▪ Current tariff (2002) is set by taking into consideration the following: <ul style="list-style-type: none"> - Marginal costs - Load pattern - Revenue requirement based on the Rate of Return - Revalued asset at the level of 8 per cent) - Uniform tariff for each individual category of consumers to be applied nationwide by retaining the subsidy for consumers under the residential category whose consumption volume was small.

3.2 Bangladesh

The BPDB (Bangladesh Power Development Board), a public sector organization and a vertically integrated utility, was the sole agency responsible for generation, transmission, and distribution of electricity throughout the country until 1977. However, due to operational difficulties, its activity was predominantly concentrated in urban and sub-urban peripheries. It was unable to improve access to electricity for

⁸ PEA has initiated an internal organizational restructuring to prepare for its eventual privatisation. The key approach of the model chosen to privatise and restructure PEA is to separate the business of operation and maintenance of its distribution networks from the retail sales business. Aside from this, work force plans including personnel management system were reviewed to achieve well-defined roles, responsibilities and accountabilities. The redeployment arrangement was planned in line with the new structure [PEA, 2001].

people living in the rural areas, which constitute 90% of the total geographical area of the country (REB 2002). To address the issue, the government of Bangladesh undertook institutional reforms to increase rural electrification with the objective of uplifting the economic and social standing of the country. The REB (Rural Electrification Board) was created on 29 October 1977 through the issuance of Ordinance No. LI of 1977, with government's intention of expanding and improving distribution network in the rural areas through the universal principle of co-operative⁹. The objectives of REB include the following (REB 2002):

- Make electricity available to all;
- Ensure reliable and quality supply of electricity;
- Provide electricity at a reasonable price;
- Enhance poverty alleviation by bringing rural areas under electrification, and minimizing income disparity between rural and urban areas.

Rather than the standard model of being sole transmitter and distributor of electricity to end users, the REB approach divested the distribution of power to end-users through the electric cooperatives or PBS (*Palli Biddut Samities*) to ensure local ownership and participation. The responsibility of managing a PBS's financial and operational activities are entrusted with the member-consumers themselves in accordance with set rules of the PBS. Each customer is a member of the PBS, which prepares a master plan on electrification for its members and forecasts load growth of the area it covers. REB, however, prescribes the by-laws for the PBS as well as operational technical and administrative standards of rural electrification. Additionally, REB assisted the PBS in planning and designing of the distribution network; conducting initial organizational activities relating to institutional development; constructing substation and electric lines; providing training to PBS personnel; and monitoring management, financial, and system operational activities. In 2002, 67 PBS supply 4.2 million electricity connections.

The next major institutional change in the power sector took place in 1991. Dhaka Electric Supply Authority (DESA) was established to manage the distribution system of Dhaka city, which had been the responsibility of BPDB. The main aim was to improve the performance of the distribution system in metropolitan areas. Unfortunately, neither the BPDB nor DESA achieved acceptable levels of efficiency and, in the early 1990s, major multilateral donors withdrew all financial support from generation, transmission, and distribution administered by BPDB and DESA (Murphy et. al, 1999). Thus, the government amended DESA Act in April 1998 to rationalise the boundary of operations between DESA and REB. All areas outside the redefined boundary of DESA have been handed over to REB. Thus, with the take over of REB on BPDB's and DESA's distribution lines, substations, and assets as well as management, REB's area coverage had increased.

Continuing further with the *unbundling* of BPDB, PGCB (Power Grid Company of Bangladesh) was established in 1996 to take over transmission business from BPDB. Similarly, DESCO (Dhaka Electricity Supply Company) was created in 1996 to take over part of the distribution systems of DESA and to reduce system loss as well as

⁹The establishment of REB is based on the feasibility study made by National Rural Electric Cooperative Association (NRECA) and Gilbert Commonwealth of the United States of America financed under United States Agency for International Development (USAID) fund.

improve bill collection rate in the urban areas. DESCO, which was created under Companies' Act of 1994, is intended for corporatisation.

Further, to address the electricity supply shortage, the government decided to open generation to private sector in October 1996 through the issuance of "Private Sector Power Generation Policy of Bangladesh". The IPPs (independent power producers) started generating electricity from 1998. As of 2001, IPPs generated about 690 MW capacity comprising 15% of the total generating capacity of the country. The BPDB remains the sole purchaser of power generated by IPPs and sells electricity to distribution utilities.

The opening up of generation enabled REB to incorporate a RPC (Rural Power Company) to install a 70 MW power plant for selling power to the national grid. The plant was commissioned in February 2000, and RPC is planning to construct another 70-MW plant at the same site financed through mobilizing domestic resources from the PBS. The electricity generated by RPC is sold to BPDB for further distribution.

Further, REB has shifted focus to decentralized power generation with the aim to service inaccessible areas. It installed in 1996 about 750 solar photovoltaic (SPV) systems covering an area of 29 sq km. (8,500 households and 21 villages). Also, it completed the commissioning of three charging stations and electrifying of one health center. It also set up the first 62 kW Solar PV Pilot Project that is now operational. This is currently used as a demonstration unit to create the initial confidence of rural consumers in the technology (Huq, 2002).

3.3 Vietnam

Before 1995, the Ministry of Energy (MoE) had administrative control over the organizations in the electric power sector of Vietnam.¹⁰ The IEV (Institute of Energy Vietnam) was in-charge of power sector development planning. Generation, transmission, and distribution to rural as well as urban areas were the responsibility of the regional power companies¹¹. Each regional power company had provincial electricity offices at the provincial level and electricity sub-offices or branch offices at the district level. The goal of electrification was to contribute to the objectives of national economic programmes focused on ensuring the production of food supply, production of consumer goods, and export commodities. Thus, rural electrification was driven by food security issue as reflected in the priority set for rural electrification (Hanh 1992):

¹⁰ The Ministry of Energy was also responsible for the coal sector.

¹¹ Power Company 1 (PC1) covers the Northern Mountainous and Red River regions and three provinces of the North central coast. Power Company 2 (PC2) covers the Mekong River Delta and the South with a total of 19 provinces. Power Company 3 (PC3) covers central coast, central highland and three provinces of the North coast. Each of the Vietnamese provinces has an electricity authority called Provincial Electricity Authority, or provincial office, which operates through branch offices. The provincial office is responsible for construction of the distribution line, infrastructure development, and feasibility study for expanding the electricity network in new areas. The branch office is responsible for the construction and maintenance of the lines up to the meter, record of the use of electricity, and collection of bills.

- Electricity supply for rural areas, by the following priority in decreasing order:
 - Vital agricultural areas (rice cultivation) requiring electric water pumping for irrigation and drainage;
 - Areas close to the main line of the national grid, including district and municipalities' chief towns;
 - Mountainous areas, especially those having mini- and micro-hydro power plant project;
- Granting an equal priority to other important sectors in the country such as industry, transport, and urban electricity demand.

The first major structural change in the power sector was initiated in January 1995. All electricity sector activities were consolidated under a management holding company—the EVN (Electricity of Vietnam). EVN was brought under Ministry of Industry, which was created by merging the Ministry of Energy, Ministry of Light Industry, and the Ministry of Heavy Industry. The Institute of Energy became one of the 34 “business units” under EVN. The Power Sector Policy Statement issued by the Ministry of Industry on 1 December 1995 provides the framework for restructuring the sector:

- Rationalize power sector institutions and functions;
- Commercialize the operations of sector entities through financial and management restructuring;
- Introduce an appropriate legal and regulatory framework for the sector;
- Adopt appropriate bulk and retail electricity tariffs, both in terms of tariff level and tariff structure;
- Encourage and introduce private sector capital and direct participation in the sector;
- Introduce electricity conservation and load management practices; and
- Prepare and implement a plan to bring electricity to rural areas.

To accelerate rural electrification, EVN established a rural electrification department that was responsible for defining overall approach and approval of rural electrification projects. It was also made responsible for identifying funds for rural electrification projects (ECA, 2002). However, implementation of rural electrification has remained the responsibility of the power companies, as well as the provincial and branch offices of EVN.

In August 1997, the power sector policy was updated with the provision of electricity access to the national economy and the entire population of Vietnam (with high emphasis on rural electrification) became one of the main priorities. The focus of rural electrification was changed from agriculture and small industries to households. The strategy earlier was to electrify all provincial capitals and district towns and then gradually extend the network to surrounding communes¹². The priorities for rural electrification changed as follows:

- Communes in provinces where the share of electrified communes and households were lower than the targets, and where electrification costs are reasonable;
- Non-electrified communes in the North, South, and Central regions;

¹² On average, each commune has ten villages and 500 households [Otaki, 2003].

- Communes in which households would partly contribute to electrification and were able to pay;
- Communes with a development potential for agriculture, forestry, and handicraft production;
- Communes in mountainous and remote areas with an investment plan for development;
- Communes under the social priority programme, which suffered especially during the two wars;
- Communes in which investment in infrastructure would decrease migration, nomadic farming, and deforestation; and
- Communes receiving development assistance from international donors for infrastructure development.

At present, rural electrification in Vietnam is managed using various modes to represent building, ownership, management, and operation of rural electricity networks. In general, power companies sell electricity to the local units at the substation level at a wholesale price set by the government. From the substation level, local units are responsible for the electrical service through the management modes. There have been six main management modes used in the country (ECA 2002b):

Commune electricity group (CEG). This model is most common in the country as it accounts for over 70% of the total number of communes having access to electricity. A CPC (Commune Peoples' Committee) establishes a CEG that is authorized to buy power at bulk tariff price from the Power Company and sell at retail price to households. Investment in the communes' local distribution networks mainly come from a wide variety of sources including household initial contributions or connection charges, local authority budgets, direct government subsidy, local construction company and EVN;

Private electricity agents. A CPC can invest in low voltage electricity networks funded through local community budget including household contributions. A private agent is entrusted to manage the electricity networks and to sell electricity to customers;

Private or public utility. Under this model, a private/public enterprise can build low voltage network using its own fund. The utility can buy electricity from a substation at the bulk tariff and sell to households at a retail price approved by the CPC;

Provincial Power (and Water) Company. The Provincial People's Committee (PPC) gives authority to provincial water and electricity companies to construct and manage low voltage networks. The company can also buy electricity from a substation at bulk tariff and sell to the households at a retail price approved by the PPC.

Power service department (PSD) of the provincial electricity branch of EVN. This model is applied throughout Vietnam but is more common in the south under PC2. PSD, as a direct arm of regional PCs, operates either at the provincial or district levels and follows all procedures and policies of EVN. PSDs are responsible for network installation and maintenance, customer connection, meter reading, and revenue collection (based on the tariffs set

according to national government decree). The district branch office manages the local network and is responsible for selling electricity to households.

Cooperatives. Cooperatives¹³ can also manage low-voltage network. They can rent or lease payment to the local authority for use of the network. Funding may come from cooperatives' own budget or other sources. In the past, the financial accounts of cooperatives combined agricultural and electricity services. Thus, income from electricity service had been used for agricultural purposes. This resulted in insufficient funds for electricity repair and maintenance. On the other hand, cooperatives organized just for electricity purpose have performed well and are technically more competent (ECA 2002b);

EVN retail sales. Under this model, EVN is directly responsible for investment in and management of low-voltage lines and meters at household levels. In late 1997, the Prime Minister of Vietnam assigned EVN managing rural electricity supply by selling power directly to individual households starting 1998, and to be implemented gradually (COWI et al 1999).

There is an interest in the development of other management modes that involves private participation, particularly leasing mode and JSC (joint stock companies). In fact, two pilot JSC projects have been developed to date, one in the south and one in the north (ECA, 2002b).

The introduction of various modes for financing, constructing, and managing rural electrification projects has allowed flexibility in and sped up the process of increasing electricity access to rural Vietnam.

¹³ Cooperatives are formed and operated according to the Law of Cooperatives, which implies some favorable funding conditions. They may be agricultural cooperatives that have expanded their activities in electricity service, or they may be purely electricity cooperatives.

4 Methodology

The study seeks to analyse the impact of power sector institutional reforms in the provision of electricity access to the poor. As various institutional reforms have been undertaken in the past, the study has chosen a few reform measures for each country case study. The term “reform” in this study should be understood in its “wider meaning”. The term refers to “any major changes to the institutional structure of the electricity industry or any important management change aimed at improving the poor’s access to electricity”. Power sector reforms as normally understood refer to allowing market forces to govern investment decisions and are driven by the efficiency argument. Traditionally, the government as owner, operator, and regulator of power sector has maintained substantial tariff subsidies to medium and low-income consumers and has been slow to grant adequate tariff increases that are required for cost recovery. These policies are believed to have encouraged inefficiencies and ineffective utilization of resources. All these government actions have reduced the ability of most utilities to arrange financing for new generating capacity from retained earnings (if there is any) and service their debt obligations and continued their reliance on government bailouts. This situation and the ensuing high economic growth rates and resultant demand for electricity required greater funds for creating new capacity. The lack of government as well as utility resources in creating capacity has created a situation for involvement of private sector in augmenting the resources.

Developing nations have pursued various types of reforms to address the above situation. Under commercialization, governments maintain ownership of electric utilities but remove subsidies and preferential fiscal policies, while requiring full recovery of capital, operations, and maintenance costs. For many nations, commercialization precedes privatisation that can include the purchase of power from private power producers, the sale of existing facilities to private firms, and independent regulation. Nations may also choose to restructure their electricity sectors by "unbundling" utilities into independent firms that individually provide generation, transmission, distribution, and retail services. Finally, reforms have also included competition for wholesale power and, less often, retail services. The objective of these reforms is to improve efficiency of resource utilization and increase the rate of capacity creation to meet the growing demand.

Apart from these set of reforms, earlier to the privatization oriented reforms, reforms have been undertaken in institutional structure to improve the delivery mechanisms for targeted groups. A few examples of such changes are creation of Rural Electricity Corporation in India, and the creation of Rural Electrification Board in Bangladesh, among others.

Within S&SE Asia the normally understood process of reform was initiated in 90s and has been undertaken to limited extent. The present study mostly focuses on the reforms of institutional nature within the paradigm of centrally planned power sector.

In view of this, the following reform measures have been chosen for examination under the country case studies:

- **Thailand:** Three reform measures have been chosen for assessment:
 1. *PEA-ARE approach:* The “new approach” in rural electrification through the implementation of ARE programme was based on a master plan initiated by PEA in 1974. This was the first institutional restructuring to effectively address the electrification issues in the country.
 2. *EGAT Act:* This refers to the Amendment of EGAT Act in 1992, which allowed IPPs and SPPs to generate power and EGAT to engage in business activities related to energy. This signaled the restructuring and privatization of Thailand electricity sector.
 3. *Tariff reforms during 1990-2000:* Alongside the major structural reform in the 1990s, a series of tariff adjustments took place in Thailand electricity sector in 1990, 1991, 1997, and 2000. The study will include an analysis of the impacts of these tariff reforms on electricity access.
- **REB/PBS:** The establishment of REB in Bangladesh through the issuance of Ordinance No. LI of 1977 was the first major institutional reform in the country’s power sector that emphasized on rural electrification, aiming to increase electricity access to rural areas.
- **EVN:** Establishment of EVN in 1995 and creation of a dedicated rural electrification department under it to target planning and execution of rural electrification is the focus of reform assessment in Vietnam.

As the main objective of the study is to look into the impacts of the reform measures on the poor’s electricity access, it is necessary to define the poor and the non-poor population. The analysis presents a challenge because the reforms being analyzed were not specifically targeting the poor and the non-poor separately. The data collection from power utility perspective has been solely focused on total households electrified and level of consumption. Wherever data on electricity consumption by income classes are available, these have been collected primarily with focus on consumption surveys or poverty assessment surveys. So, in most cases, the available data have not been intended for assessing power structure reforms in addressing electricity access by the poor.

In the absence of data on electricity access and electricity affordability by income classes, the study used rural population as a proxy for the poor households and urban population for the non-poor households. This assumption is entirely applied for all the indicators used in the study for the case of Bangladesh and Vietnam where few data are available. For Thailand, the study had also taken non-municipal (village or rural) areas and municipal (urban) areas (including sanitary areas)¹⁴ that lie outside Greater Bangkok metropolis and fall under PEA’s coverage¹⁵ to represent the poor and the non-poor households¹⁶, respectively. The rationale for using the proxy is that in these

¹⁴ Non-municipal areas are villages or rural areas while municipal areas are urban areas that lie outside the Bangkok metropolis.

¹⁵ Areas under PEA coverage include central (except Bangkok, Nonthaburi, and Samutprakan), northern, northeastern and southern regions. Bangkok, Nonthaburi, and Samutprakan are under MEA coverage.

¹⁶ In Thailand, group of provinces in each region constitute strata. In the Central Region, however, Bangkok metropolis was considered a separate stratum. Each stratum was divided into three sub-strata

countries, household income and expenditure in rural areas (in the case of Bangladesh and Vietnam) and non-municipal areas (rural), in the case of Thailand, are lower than in urban (municipal) areas. For example in 2000, in Thailand, average household income in municipal areas is about twice of that in non-municipal areas (Table 6). Similarly, rural areas have higher poverty levels than in urban areas. The drawback of this measure, however, is that the study ignores the fact that there are also poor people living in the urban areas and, similarly, that there are also non-poor households living in rural areas.

Table 6 Number of households/population, size and average income/ per household

	Urban	Rural
Thailand* (2000)		
Number of Households (million)	3.1	11.03
Average Household Size (persons)	3.4	3.8
Monthly income (Baht)	14,572	8,455
Bangladesh (1996)		
Number of Households (million)	3.6	18.5
Average household Size (persons)	5.3	5.25
Monthly income (Taka)	7972.71	3658.15
Vietnam (1999)		
Number of households (million)	3.96	12.08
Average household size (persons)	4.4	4.8
Monthly income (thousand Dong)	2,322.3	1,080.3

Sources NSO (2000); BBS (1997); World Bank (1992-1993 and 2002) and COWI (1999)

* Excluding greater Bangkok metropolis

Moreover, for the Thailand case, due to data problem, the study used another option, electricity consumption band, to represent the poor and the non-poor households: consumers using 150 kWh per month or less represent the poor whereas consumers using greater than 150 kWh per month are considered non-poor. Information on such categorisation is available starting 1989. The study, therefore, adopted this option for Thailand for parameters such as average electricity consumption and average electricity tariff. One drawback of using these consumption bands as a proxy, similar to assuming the poor are in non-municipal areas and the non-poor in municipal areas, is that it is very likely that there are electrified households consuming 150 kWh or less in municipal areas¹⁷, and conversely but to a lesser extent, electrified households consuming more than 150 kWh in non-municipal areas.

In summary, the definition of the poor and non-poor households for each case study is given in Table 7.

in accordance with the local administration of the Public Administration Department: municipal areas, sanitary units, and non-municipal areas. Municipal areas and sanitary areas refer to urban areas (outside the Bangkok metropolis) while non-municipal areas are villages.

¹⁷ This could be due to low penetration of electrical appliances.

Table 7 Definition of the poor and non-poor households for each case study

Household	Thailand	Bangladesh	Vietnam
Poor	-Non-municipal areas* -150 or less kWh per month per household**	Rural areas	Rural areas
Non-poor	-Municipal areas* -greater than 150 kWh per month per household**	Urban areas	Urban areas

* This proxy data was used in the parameters electrification level, electrification rates, and electricity expenditure of the poor and the non-poor households.

** This proxy data was used in the parameters electricity consumption per household and average electricity tariffs paid by the poor and the non-poor households.

Table 8 gives the set of indicators used in the study to assess the chosen reform measures.

Table 8 Indicators, derivation, and sources of data

Indicator	Derivation	Source of data
Electrification levels	<i>Thailand:</i> Based on actual National Statistics Office (NSO) survey <i>Bangladesh:</i> Due to limited data, figures were mainly based on various studies and few surveys made in the past. <i>Vietnam:</i> Data were not derived. Figures were based on studies made in the past	<i>Thailand:</i> NSO Household socio-economic survey (various years) <i>Bangladesh:</i> ADB electric utilities (1983); BBS Household socio-economic survey (BBS 1993, 1997); Temple (2000) <i>Vietnam:</i> World Bank study (1994); COWI et al Rural Energy Master Plan (1999); EVN annual report (2001)
Electrification rates	<i>Thailand:</i> Compounded annual growth rate during the available years <i>Bangladesh:</i> Compounded annual growth rate during the available years <i>Vietnam:</i> Compounded annual growth rate during the available years	<i>Thailand:</i> PEA annual report (various years) <i>Bangladesh:</i> ADB electric utilities (1983); BBS Household socio-economic survey (1993, 1997); Temple (2000) <i>Vietnam:</i> World Bank study (1994); COWI et al Rural Energy Master Plan (1999); EVN annual report (2001)
Per capita electricity consumption	<i>Thailand:</i> Total reported electricity consumption over the number of customers by consumption category <i>Bangladesh:</i> Total electricity consumption (including non-residential use) over population per category (urban, rural, and national). Due to inconsistencies in the data of number of households, the study preferred to use population in rural, urban areas <i>Vietnam:</i> Residential electricity consumption by area (rural, urban, total) over number of households by area	<i>Thailand:</i> PEA annual report (various years) <i>Bangladesh:</i> ADB electric utilities (various years); BBS Household socio-economic survey (1979, 1981, 1989, 1993, 1997); REB (2000) <i>Vietnam:</i> EVN Power Consumption Database (2001)
Average electricity tariffs	<i>Thailand:</i> Total revenue over total electricity use by consumption category. Tariffs were converted to 1992 US Dollars <i>Bangladesh:</i> less information available thus, the study did not assess this indicator <i>Vietnam:</i> Data were adopted from EVN reports and converted to 1992 US Dollars	<i>Thailand:</i> PEA annual report (various years) <i>Vietnam:</i> EVN statistical report (2003)
Electricity expenditure	<i>Thailand:</i> Ratio of electricity expenditure to total expenditure per household based on NSO survey <i>Bangladesh:</i> Ratio of electricity expenditure to total expenditure per household based on BBS survey <i>Vietnam:</i> Data were adopted from surveys and studies made in the past	<i>Thailand:</i> NSO Household socio-economic survey (various years) <i>Bangladesh:</i> BBS Household socio-economic survey (1979, 1981, 1989, 1993, 1997) <i>Vietnam:</i> World Bank 1993 Living Standards Survey quoted in World Bank (1994); COWI et al Rural Energy Master Plan (1999)

Except for Bangladesh, where data was not available on electricity tariffs, all the three country case studies used all the parameters for evaluating the impact. Average electricity tariffs were converted to 1992 US dollars for easy international comparison, if the need arises later. 1992 was set as the reference year because this is the earliest year tariff data was available for Vietnam.

5 Assessment of the Selected Reform Measures: Thailand Case Study

Thailand case study covered three reform measures for assessment: the PEA-ARE, EGAT Act, and tariff reforms. To address the pre-reform and post-reform data of PEA-ARE, the study defined 1980 as the period of divide. Although PEA-ARE was initiated in 1974, electrification process took some time to translate the approach into an action plan and to develop the necessary procedures. Hence, between 1974 and 1980, electrification through the PEA-ARE approach was not yet fully implemented. For the EGAT Act in 1992 and tariff reforms from 1990, the point of divide is set at 1992.

5.1 Electrification level

PEA was established in the 1960s and efforts on rural electrification during that period were focused on using isolated diesel-generating plants. Though somewhat successful, the growth of electrification was relatively low. During 1960-1970, the number of villages electrified increased to 2,446 villages with an average of 245 villages being electrified every year. However, 45,000 villages in the country remained without access to electricity in 1970 and only 15% of rural villages were electrified. During the early 1970s, only 7% of the poor households had access to electricity. In 1978, prior to the PEA-ARE reform, only about 19% of the total households received electricity supply. By 1984, total electrification level had reached around 43% and by 1986, electrification level climbed to 86%. By 1990, two years prior to the amendment of EGAT Act and tariff reforms, total electrification level in PEA area was already very high, more than 91%. During the post-EGAT Act and tariff reforms, electrification level had been stable at the high 90s even for the poor households. This, therefore, demonstrates that the Accelerated Rural Electrification programme of PEA based on a master plan had been successful in increasing electrification level of the poor and the non-poor households in the country. Figure 1 shows the electrification level on a household basis.

PEA rural electrification programme did not distinguish between poor and non-poor households. The large gap between the electrification levels of the poor and non-poor prior to 1990s could be due to the process by which villages were connected to the grid. Within the framework of the PEA master plan, a methodology was developed to rank the villages according to the following criteria: proximity to the grid, accessibility by road, village size, number of expected customers in the first five years, potential agriculture and industrial loads, number of commercial establishments, and extent of public facilities. This process, which continued up to 1990, would have placed the poor households at some disadvantage as far as the above criteria were concerned. Normally, consumers were not required to pay an initial sum as a contribution to the cost of the grid connection. However, if households could afford to contribute to capital cost of electrification, they were prioritised for electricity connection. A 30% contribution led to higher ranking and a 100% contribution led to immediate action to electrify a village¹⁸.

¹⁸ Statistics show that 602 villages (out of 60,222) contributed the full amount of the cost of electrification while 18,066 villages contributed 30%. In practice, most of the contributions were not

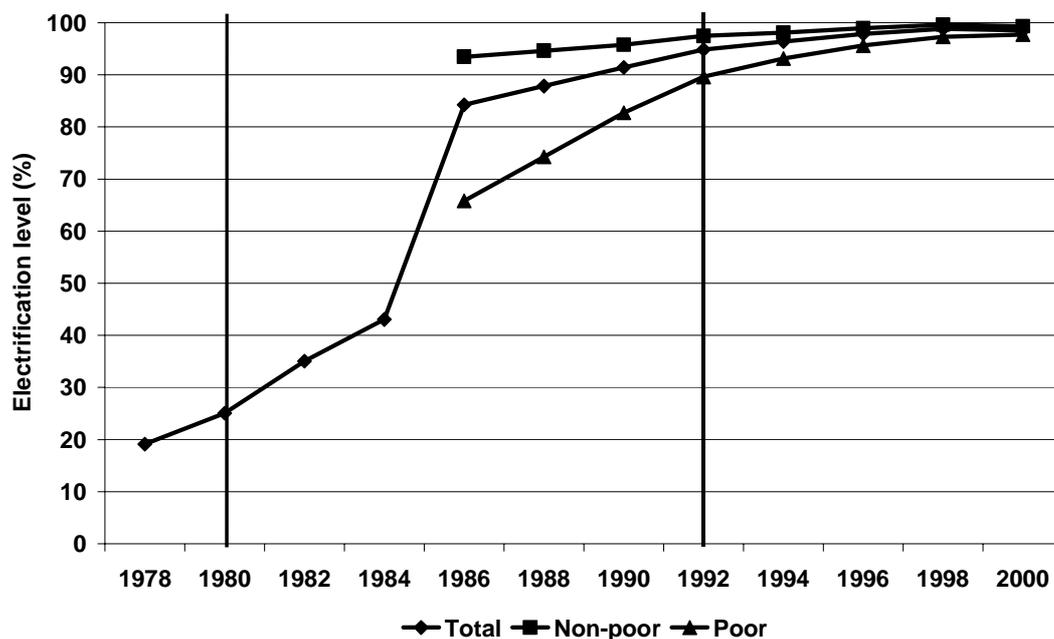


Figure 1 Electrification level from 1978-2000

Source NSO Household Socio-economic Survey (various editions)

PEA Annual Report (various issues)

Chulalongkorn University via <http://www.chula.ac.th/INSTITUTE/IPS/>

5.2 Electrification rates

Figure 2 shows that the overall electrification rate peaked during 1984 to 1986. The PEA-ARE reform probably accelerated the increase in electrification coverage, as reflected in the level of electrification.¹⁹ The trend of electrification rates, however, had been generally declining over the years. This overall declining trend is a reflection of the increasing high levels of electrification of the poor and the non-poor households.

Moreover, between 1988 and 1992, the poor recorded higher electrification rates than non-poor indicating more new residential connections of the poor than non-poor. Between 1994 and 1998, however, new residential connections were more on the non-poor households. The compounded annual growth rate of electrification of the poor dropped to 0.69% during 1996-1998 from 2.3% between 1994-1996. The drop in the electrification rate maybe due to the financial crisis that struck the country beginning mid-1997. Between 1998 and 2000, the electrification rate of the poor households recovered to 2.5%.

paid by the households themselves but by few individuals and by politicians securing local development funds [Tuntivate, et. al., 1997].

¹⁹ But since the data for the two categories is available starting 1988, by the time the high level of electrification was achieved, therefore, it would not be possible to analyse the impact on the two categories.

On the other hand, the structural reform in the 1990s that had focused on increasing private investments in the generation sector to meet the growing demand from late 1980s to early 1990s did not directly affect electrification levels and rates. However, the reforms allowed the matching of supply with increasing demand and thus sustaining the increasing electrification levels. Similarly, the tariff reforms during 1990s through 2000 did not have direct impacts on electrification levels and electrification rates. Though aimed at rationalizing electricity consumption by reflecting its economic costs, the tariff reforms would have contributed to the financial sustainability of the electrification programme. The automatic tariff adjustment introduced in 1991 recovered increases in costs beyond the control of the utility. The tariff adjustments in 2000 slowly removed the price cross subsidies from high to low consumption electricity consumption groups.

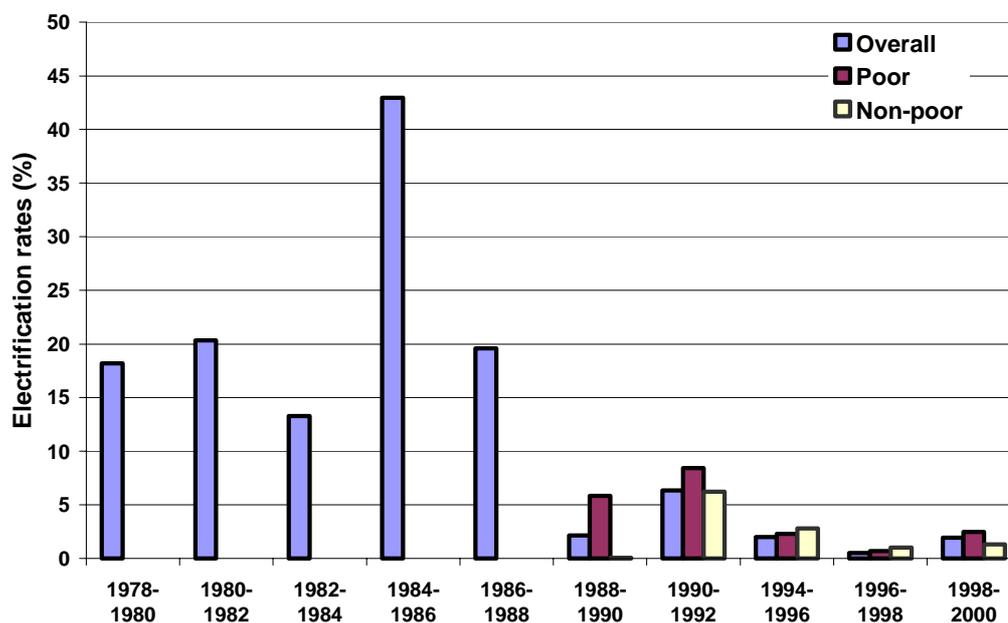


Figure 2 Electrification rates* from 1984-2000

*Compounded annual growth rate during the given period

Source NSO Household Socio-economic Survey (various editions)

PEA Annual Report (various issues)

Chulalongkorn University via <http://www.chula.ac.th/INSTITUTE/IPS/>

5.3 Electricity consumption

Electricity consumption per household for the poor is defined as the ratio of total electricity consumption of all residential customers²⁰ consuming 150 kWh per month or less to total number of residential customers in the same consumption category. Similarly, electricity consumption per household for the non-poor refers to the average electricity consumption in the greater-than-150 kWh per month consumption category. However, data on electricity consumption disaggregated into these two consumption categories are only available from 1990.

²⁰ 1 customer is equivalent to 1 household.

The overall average level of consumption starting 1980 showed a stable trend till 1986 after which an increasing trend was observed. The average consumption level of the poor households starting 1990 doesn't show a consistent level of increase until 1992 and continued to have a non-increasing trend the following years. The consumption level of the poor showed a marginal increase in 1998 and stabilized around that level. The average annual consumption growth of the poor for period 1992-2000 is estimated at 1.5% whereas that of the non-poor household grew annually by 3% during the same period (Figure 3).

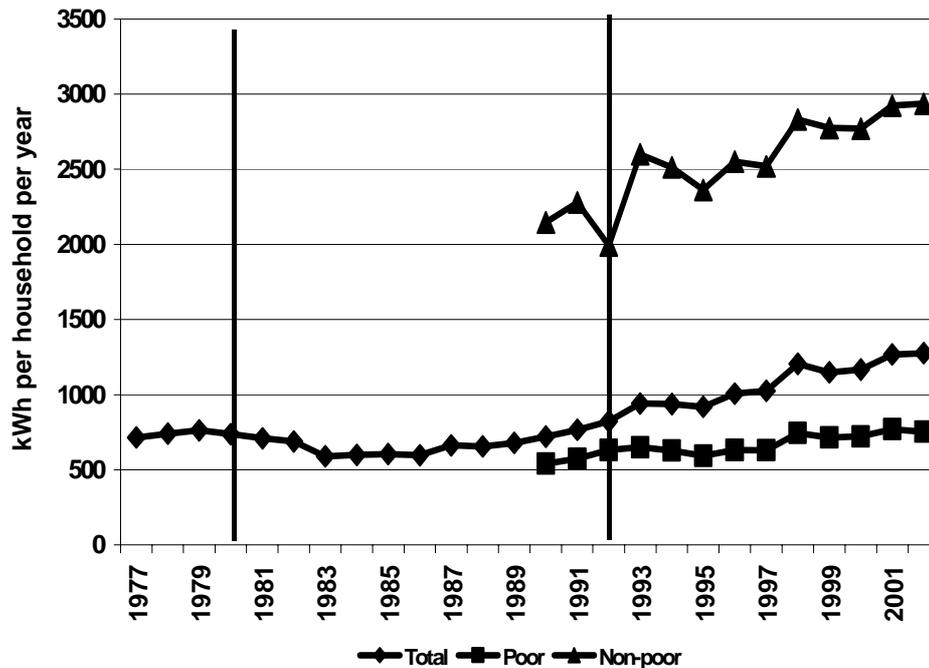


Figure 3 Electricity Consumption per Household during 1977-2002
 Source PEA Annual Report (various issues)

Three factors influence the household electricity consumption level: household income, electricity availability, and electricity tariff. Income levels of both poor and non-poor households in Thailand as well as electricity supply have shown continuous increase. Increasing income should result in an increase in demand for electricity. With electricity available, this demand will be met and raise electricity consumption level. The other factor influencing the demand is tariff (see discussion on electricity tariffs in the next section), which remained constant for the decade of 80s and sharply increased in the 90s. Despite these positive factors, the total average level of consumption per household improved marginally during the 80s. Given the fact that the total residential electricity consumption and total consumer connections of PEA had been increasing almost at the same rate of 12.3% and 12.7% per year, respectively, between 1980-1991, the stable average level of consumption per household is possibly due to the faster increase in connections of the poor households during that time. The EGAT Act of 1992 would have contributed to sustaining the increase in average electricity consumption by making electricity available and meeting increasing demand. Meanwhile, the tariff reforms that had caused an upward pressure on electricity tariffs would have slowed down the increase in average electricity consumption during the 1990s.

5.4 Electricity tariffs

Alongside the structural reforms in the power sector in the 1990s were reforms in retail electricity tariffs that have caused an increase in electricity price²¹ during this period, as can be seen in Figure 4.

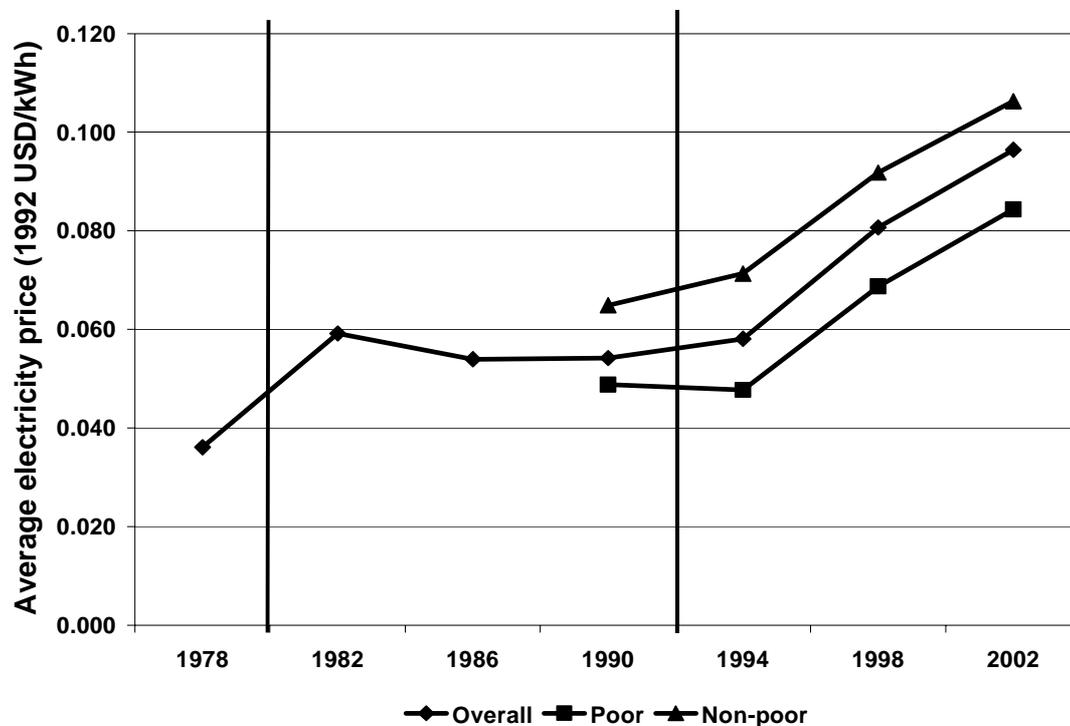


Figure 4 Electricity Tariffs During 1978-2002
Source PEA Annual Report (various issues)

As a first step in the tariff reforms, time-of-day (TOD) tariff was introduced in 1990, which was followed-up by time-of-use tariffs (TOU) in 1997. One of the objectives for introducing TOD (and later TOU) tariffs was “to have actual economic costs of production reflected by the tariff and to promote efficient use of energy, in particular to promote lesser use of electricity during the peak period of the system, which help reduce the long-term investment in power generation...”²²

Customers such as small residential, government institutions and pumping of water for agricultural purposes are billed only energy charge (Baht/kWh). Other customer categories (e.g. large residential, small general service, etc.) pay both energy and demand charges (Baht/kW) classified by voltage level and by time-of-day or time-of-use (See Annex 1 for customer categories or tariff schedules). In general, TOD and TOU tariffs are applicable to customers with monthly consumption of at least 355,000 kWh or where demand is more than 2,000 kW. Beginning 1 January 1997, customers

²¹ Expressed in terms of average electricity revenue (i.e., ratio of total revenue from electricity sales to total electricity consumption)

²² This was incorporated in the resolution endorsed by the Cabinet in 1991 for the improvement of electricity tariff rates in Thailand.

paying TOD tariffs have had an option to pay TOU tariffs instead (Table 9). However, TOU tariffs have been mandatory for new customers from 1 October 1997.

Table 9 Time-of-day and time-of-use tariff for retail customers

Time of Day tariff for retail customers					
Voltage level	Demand charge (baht/kW/month)			Energy charge (baht/kWh)	
	Peak (18:30-21:30)	Partial peak (08:00-18:30)	Off-peak (21:30-08:00)		
≥ 69 kV	224.30	29.91	0		1.0208
12 - 33 kV	285.05	58.88	0		1.0582
< 12 kV	332.71	68.22	0		1.0862

Time of Use tariff for retail customers					
Voltage level	Demand charge (baht/kW/month)	Energy charge (baht/kWh)			Service charge (baht/month)
	Peak (09:00-22:00)	Mon - Sat Peak (09:00-22:00)	Off-Peak	Sun	
≥ 115 kV	102.80	1.5349	0.6671	0.6062	400
69 kV	158.88	1.6292	0.6769	0.6153	400
12 - 33 kV	200.93	1.7736	0.6861	0.6236	850
< 112 kV	214.95	1.8891	0.7283	0.6616	850

Source NEPO (2000)

The third source of change in electricity tariffs was the automatic adjustment mechanism (Ft). The Ft formula was introduced in December 1991 following the deregulation of the petroleum industry (earlier in September 1991). Initially, Ft was an additional charge that allows electric utilities to “automatically” recover (that is, without being subjected to the usual tariff review and adjustment process) changes in fuel costs. Ft was allowed under four circumstances:

- if current tariff structure gives average tariff level different from the “price cap”;
- if costs of fuel and energy purchased by EGAT change (e.g., due to currency exchange rates);
- to recover part of DSM expenses (but only until EGAT incorporates DSM expenses in its long term plan); and
- if costs of operation and maintenance, transmission and distribution change.

The first three adjustments were done monthly, while the last one was done annually. Ft was designed to be revenue neutral.

The fourth source of change in electricity tariff was the adjustments made in 2000, following recommendations from a study commissioned by then NEPO (National Energy Policy Office)²³. The study recommended adoption of marginal cost pricing.

Prior to this, EGAT subsidized PEA by charging a lower bulk supply tariff to PEA and recovering the difference from sales to MEA. This bulk rate remained in force

²³ Now called the Energy Policy and Planning Office (EPPO) and part of the new Ministry of Energy.

until September 2000. From October 2000, when by then PEA had already covered most of the rural areas of the country, MEA and PEA would pay the same bulk supply tariff (Table 10). PEA, however, continues to receive subsidy in the form of lump sum financial transfer from MEA at the end of each financial year, allowing it to charge lower retail rates than MEA.

Table 10 Bulk supply tariff between EGAT and the distribution utilities (US Dollar/kWh)

	Before Dec 1991	Dec 1991-1994	Jan 1995-Sep 2000	Oct 2000-Dec 2000
MEA	0.035	0.035	0.035	0.042
PEA	0.025	0.023	0.026	0.042

1US\$ = Baht 42 as of December 2002

Source NEPO (2000)

PEA further subsidizes residential customers consuming less than 150 kWh per month by charging them a lower tariff, as compared to the greater than 150 kWh category (this is the so called “lifeline” rate)²⁴. This cross-subsidy has continued post 2000.

With the adoption of marginal cost pricing in 2000, tariff subsidies to PEA were reduced. This decreased the levels of subsidy available to residential users in PEA area, both for the poor as well as the non-poor. Within the residential sector, the small consumers or the poor households receive a greater subsidy than large consumers or the non-poor even after 2000. While the country recognizes the need to implement marginal cost pricing, it has not been able to fully implement these prices in view of the need to subsidize provincial and small energy consumers (<http://www.worldenergy.org/>, 2003).

Further, the NEPO study also recommended unbundling of the Ft formula into generation, transmission, distribution, and retail charges and exclusion of DSM charges and foreign exchange fluctuations, which are now borne solely by EGAT and the other electric utilities.

In sum, tariff reforms after 1992 have caused increases in average electricity price both for the poor as well as the non-poor²⁵.

5.5 Electricity expenditure

The ratio of electricity expenditure to total household expenditure was very high in 1976 but declined in the post-PEA-ARE reform period (Table 11).

²⁴ Under the current tariff structure there is no energy charge for residential consumers using up to 5 kWh per month, but there is a fixed service charge of Baht 8.19 (US\$ 20). For residential consumers using more than 5 kWh, consumers pay a progressive energy charge based on the monthly kWh consumption, and a fixed service charge of Baht 8.19 for consumption not exceeding 150 kWh per month or Baht 40.90 for consumption above 150 kWh per month.

²⁵ As stated earlier, in the case of Thailand the households with monthly electricity consumption less than 150 kWh are assumed to represent the poor while the households with monthly electricity consumption more than 150 kWh are assumed to represent the non-poor in this study.

Table 11 Electricity expenditure as % of total household income in 1976 and 1981

	Pre-reform	Post-reform
	1976	1981
Average	3.7%	1.6%
Non-poor	3.8%	1.9%
Poor	3.6%	1.1%

Source NSO (1976, 1981)

Between 1976 and 1981, electricity tariffs grew from 0.03 US 1992 Dollar/kWh to 0.05 US 1992 Dollar/kWh. During the same period, the electricity expenditure declined annually by 12.5% and 4.5%, respectively for the non-poor and the poor. However, based on the Household Socio-economic Survey made by NSO, income for poor and non-poor households was increasing at the rate of about 11% and 12%, respectively, per annum between 1976 and 1981. Similarly, total expenditure for the poor and non-poor households was also rising annually at the rate of around 10% and 11%, respectively, during the same period (Table 12). The decline in electricity expenditure has been brought about by significant decrease in consumption levels of the poor and non-poor households in 1981.

Table 12: Compounded annual growth rate of average income, average total expenditure, and average electricity expenditure per household between 1976 and 1981

	Average Income per household	Average total expenditure per household	Average electricity expenditure per household
Non-poor	10.56%	9.73%	-12.5%
Poor	12.58%	11.22%	-4.57%

Source NSO (1976, 1981)

Figure 5 reveals that prior to EGAT Act along with the tariff reforms in the 1990s, the ratio of electricity expenditure to total income had been increasing. In 1992, a swift decline in the ratio occurred both for the poor and the non-poor households. For poor people, the decline could be explained partially by the 4% reduction in electricity tariff from 0.049 US Dollar/kWh in 1991 to 0.048 US Dollar/kWh in 1992. For the non-poor, given the increasing tariff and consumption level between 1991 and 1992, the decline in the ratio of electricity expenditure to total household expenditure may be brought about by the faster annual growth rate in income (31%) and lower growth rate in electricity expenditure (8%) during the same period (Table 13).

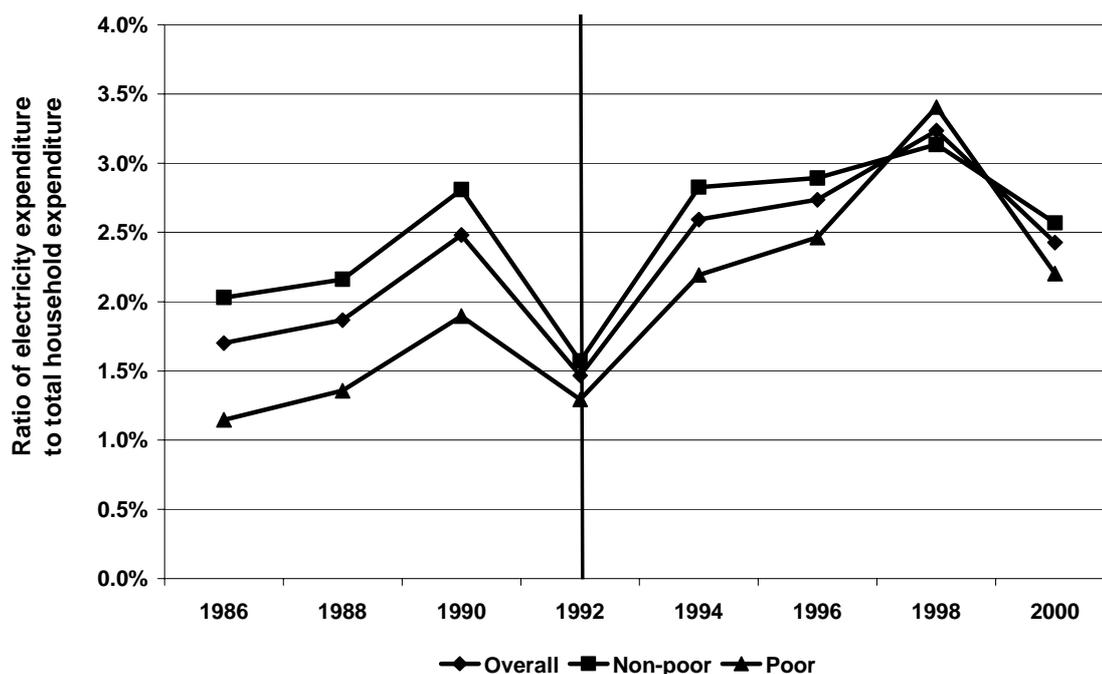


Figure 5 Electricity expenditure as % of total household expenditure
Source NSO Household Socio-economic Survey (various editions)

Table 13 Compounded annual growth rate of average income, average total expenditure, and average electricity expenditure per household between 1990 and 1992

	Average Income per household	Average total expenditure per household	Average electricity expenditure per household
Poor	17.4%	102.8%	38.3%
Non-poor	31.1%	93.3%	8.01%

Source NSO (1990, 1992)

Moreover, the increase in the electricity expenditure ratio after the reform may be explained by the increase in tariff as a result of the tariff reforms undertaken in recent years posing substantial negative impact especially to the poor households. In fact, in 1998, the ratio of electricity expenditure to total household expenditure of the poor had been at the highest level at 3.4% crossing the levels of the non-poor and that of the overall average. The period also coincides with the stagnant increase in electricity consumption of the poor.

5.6 Summary of findings

The Accelerated Rural Electrification programme of PEA based on a master plan had been successful in increasing electrification levels of the poor, which by 1990 were close to the levels of electrification for the non-poor. The PEA-ARE approach connected more than 80% of the poor household to the grid by 1990, over a period of 15 years. The stable tariff rates for poor during the 1980s possibly helped in increasing the electricity access to the poor.

The power sector reforms in the 1990s, EGAT Act, and tariff restructuring, seemed not to have influenced the electrification level or rate, as these were already at very high levels. EGAT Act does seem to have led to increase in the overall per capita

electricity consumption level, though, the average per capita consumption level for the poor during this period has shown a smaller increase and also doesn't show any increasing trend, rather increase in consumption in jumps. The tariff reforms undertaken in the 1990s resulted in steady increase in tariffs. The levels of subsidy available to PEA areas further decreased with the removal of cross-subsidy by EGAT from MEA areas in 2000. This is reflected in continuous increase in tariff for poor households. The period after 1990 also saw an increase in electricity expenditure for the poor households. The same period also saw a slow down in the increase in consumption, but did not seem to have adversely affected the poor households.

6 Assessment of the Selected Reform Measures: Bangladesh Case Study

The present section analyses the impact of institutional restructuring and creation of REB (Rural Electrification Board) on electricity access to poor. Although REB was created in 1977, the first PBS (Palli Biddut Samity) was established in 1980 and began its operation at the end of 1981. The study, therefore, had taken 1982 as the period of divide to assess the reform impact.

6.1 Electrification levels

In 1976, only about 3% of the total population in the country had access to electricity. Until 1977, BPDB was the only agency involved in the distribution of electricity (aside from being responsible for generation and transmission). However, power distribution network had concentrated mainly in the urban centres and suburban peripheries. As such, the vast rural areas in the country had had no access to electricity (REB, 2002). By 1982, few years after the Rural Electrification Board had been established, about 26,000 or 0.2% of the poor households were being supplied electricity. At that time, 40.7% of the non-poor households had electricity access (Table 14). By 1991, electrification improved significantly both for the poor and the non-poor, although the electrification level of the poor households remained at a very low level at 3.7%. The next 10 years (i.e., 1991-2000), or about 20 years after the REB/PBS reform took place, saw marked improvement in the electrification level of the poor households. By 2000, 19% of the poor households and 80% of the non-poor households had access to electricity.

Table 14 Electrification Level (%)

	Pre-reform	Period of divide	Post-reform	
	1976	1982	1991	2000
Total	3	5.1	15.1	31.0
Poor	-	0.2	3.7	19.0
Non-poor	na	40.7	73.7	80.0

Source ADB (1983); BBS (1976, 1985, 1993, 1997); Temple (2000)

Though the gap between the electrification levels of the poor and non-poor remain enormous, the absolute number of electrified poor households remarkably increased from 25,972 in 1982 to more than 4 million households ten years through the REB/PBS reform period (Table 15). Though in terms of electrification level, non-poor show a much greater achievement, the total number of electrified poor households had caught up with the total number of electrified non-poor households. This positive development should be stressed considering the reform process had made a significant positive contribution to enhance energy access for the poor.

Table 15 Number of electrified households

	Pre-reform	Period of divide	Post-reform	
	1976	1982	1991	2000
Total	411,664	842,482	2,983,414	8,143,623
Poor	No data	25,972	610,330	4,064,197
Non-poor	411,664	816,510	2,373,084	4,079,429

Author's calculation based on ADB (1983); BBS (1976, 1985, 1993, 1997); Temple (2000)

On the other hand, one of the reasons of the low level of electricity access by the poor could be the high upfront cost of getting connected to the electricity network. Under the PBS system, customers (or PBS members) must be prepared to spend US\$15 to US\$23 as an initial investment including cost of house wiring, membership fee, and security deposit (Table 16). This investment cost associated with a new residential connection might be too expensive for poor people to get electricity access.

Table 16 Cost associated with a new residential customer (US\$)

	Initial cost (US\$)
Membership Fee	0.4
Security Deposit (considering minimum cost)	3.0
House wiring	12.0-20.0
Total	15.4-23.4

Source NRECA (2000)

6.2 Electrification rates

Table 17 shows the growth in electrification during the second decade of the REB/PBS reform. The annual average electrification rate in rural areas during this period was five times that in the urban areas. The REB/PBS reform did accelerate the rate of electrification of the poor, and the higher growth is essentially because the reform intends to improve electrification levels of the poor.

Table 17 Annual Average Electrification Rates (%)*

	Pre-reform up to 1982**	1982 to post-reform period	Post-reform
	1976-1982	1982-1991	1991-2000
Total	7.8	15.1	10.2
Poor	NA	42.0	21.6
Non-poor	7.4	12.6	4.6

*These are compounded annual growth rates between the given periods, where data is available.

** As there are no other available data before 1982 (period of divide), the annual growth rate of electrification during the pre-reform period was estimated using 1976 and 1982 data.

6.3 Electricity consumption

Table 18 shows the electricity consumption per capita of the poor and the non-poor in Bangladesh. The table shows that during the post reform period, the growth rate of overall electricity consumption per capita in the country had decreased by more than 4.2% annually between 1982 and 1991. Between 1991 and 2000, an annual increase

of 1.5% in the overall per capita electricity consumption had been observed. Data were not available to show the electricity consumption per capita for the poor and the non-poor during the pre-reform period.

Table 18 Electricity consumption per capita (kWh/capita)

	Period of divide	Post-reform	
	1982	1991	2000
Total	430.0	291.5	334.0
Poor	Na	140.7	28.3
Non-poor	Na	330.3	638.4

Source ADB (various years); BBS (various editions) REB (2000)

The results of Table 18 also reveal that after REB/PBS reform, the electricity consumption per capita of the poor had declined substantially by more than 16% per year between 1991 and 2000. This may be explained partially by the higher annual growth rate of poor population electrified (21.6%) compared with the annual growth rate of the poor's total electricity consumption (1.8%) between the period 1991 and 2000. By 2000, the level of electricity consumption per capita of the poor was estimated at 28.3 kWh/capita. As such, the low utilization of electricity could be due to inadequate electricity supply and access (Murphy, et al, 1999).²⁶

The case of the non-poor households is rather the reverse. Between 1991 and 2000, the per capita electricity consumption of the non-poor had been increasing by more than 7% per annum. The annual growth rate of total electricity consumption of the non-poor had also been rising faster by around 13% compared with the annual growth rate of non-poor population electrified (4.6%) during the same period (Table 19).

Table 19 Compounded annual growth rate of total electricity consumption and population electrified between 1991 and 2000 (%)

	Electricity consumption (%)	Population electrified (%)
Poor	1.8	21.6
Non-poor	12.6	4.6

Meanwhile, the results in Table 18 should be treated with caution. In the absence of data for residential electricity consumption, the per capita electricity consumption is based on the total electricity consumption (including non-residential electricity uses) in the urban (non-poor) and rural (poor) areas as well as at the national level.

6.4 Electricity tariff

Data on electricity tariffs in urban and rural areas for Bangladesh were not available and were difficult to derive due to limited information. Thus, assessment had not been made on the impact of the reform using electricity tariff as an indicator.

Meanwhile, latest available information shows that since 1997, average retail electricity tariffs have been adjusted semi-annually due to changes in foreign

²⁶ At the utility side, there are also a number of problems leading to low utilisation and inadequate access to electricity [Murphy, et al, 1999]: Load shedding and voltage variation that discourage individuals and firms from accessing and consuming electricity; operating inefficiencies; high system losses; poor bill collection; inadequate tariff structures leading to financial losses; and lack of enough funds available for expanding the distribution system and new connections.

exchange rates and fuel cost increases. The average retail tariff paid by the poor (i.e. rural) households was 4.9 US cents per kWh (Taka 50 = US\$1) in 2000 (NRECA 2000)²⁷. On the other hand, since October 2001, the government has been increasing tariffs in the non-poor (i.e. urban) areas so that both tariffs in the poor and the non-poor areas are equalized. The third and latest round of tariff increases in the non-poor areas was in September 2003, which increased average tariff of the non-poor (i.e. urban) households by 6-11%. Under the new rate, the average retail tariff of the non-poor households is 4.3 US cents per kWh (Taka 58.4 = US\$1) in 2003 (BSS, 2003). Therefore, the non-poor pay lower tariff compared to the poor (i.e. rural) households in Bangladesh.

6.5 Electricity expenditure

An assumption had been made in deriving the percentage of electricity expenditure to total household expenditure in Bangladesh. The survey made by Bangladesh Bureau of Statistics (BBS) during 1973-1974 included information regarding percentage of expenditure for fuel and lighting as well as the proportion of expenditure that went to electricity per household and per area (rural, urban, and national). The succeeding surveys made between 1976 and 1996, however, did provide expenditure for fuel and electricity per household but did not give information on the proportion spent on electricity by households. Considering the limited information, the study made use of the proportion of electricity to total expenditure for fuel and lighting during 1973-1974 and assumed the same proportion for other succeeding years. Thus, the indicator may only be an indicative figure rather than an actual picture.

Table 20 gives the fraction of income spent by households on electricity. The table shows that the overall electricity expenditure of households in the country accounts for a very small portion of their monthly expenditures. In case of the poor households, the ratio is even more negligible. Average electricity expenditure as a percentage of total household expenditure in the case of the poor changed negligibly even after the REB/PBS reform period.

Table 20 Average electricity expenditure as a % of average total household expenditure (%)*

	Pre-reform		Post-reform		
	1973-1974	1976-1977	1985-1986	1988-1989	1995-1996
Total	0.037%	0.029%	0.033%	0.023%	0.023%
Non-Poor	0.381%	0.271%	0.273%	0.237%	0.211%
Poor	0.004%	0.003%	0.004%	0.003%	0.003%

Source Bangladesh Bureau of Statistics (1979, 1981, 1989, 1993, 1997)

*1982 data is not available

6.6 Summary of findings

The institutional reform in Bangladesh improved the rate of electrification for the poor. Although the level of access among the poor might be low, the absolute

²⁷ This is the average retail tariff of those who are consuming <300 kWh consumer band. However, effective 1 January 2002, rationalization of tariffs with the objective of decreasing lifeline consumption to 100kWh from 300kWh per month had been implemented by the government.

numbers of electrified poor households are as big as for electrified non-poor households. The changes should also be viewed as positive considering the reform process had made a significant contribution to enhance energy access for the poor. However, while there have been important achievements made, poor households continue to suffer from low electrification level. Under the cooperative approach, each household that wants electricity service should contribute to financing the cost of connections. For the poor households, this represents a very high upfront cost.

7 Assessment of the Selected Reform Measure: Vietnam Case Study

This section analyses the impact of the establishment of EVN and the creation of a dedicated electrification department under it. The study had taken 1995 as the period of divide to assess the institutional reform impact.

7.1 Electrification levels

Before the reform, only a few poor households living in rural areas in the northern, central, and southern part of Vietnam were receiving electricity. Based on the estimates by regional electricity supply companies, the share of poor households connected to electricity service was 2.5% in 1975 (Table 21). From the mid-1980s, extensions of the network were intensified with the construction of 35 kV distribution lines in the northern mountainous area (COWI et al, 1999). The proportion of the poor households with access to electricity grew to 13.9% in 1990 and around 49% 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 medium voltage network rather than extension of service to unelectrified areas (WB, 1994]. When the new medium voltage lines were built, the first priority was still the connection of irrigation/drainage pumps to the grid in order to extend cultivated areas and increase their productivity. Connection of the poor households remained a by-product of this mainline development. An exception was the supply to mountain regions where, for social and political reasons, the government placed importance on connecting households.

Following the establishment of EVN in 1995, the electrification levels of the non-poor in Vietnam, which had been at a very high level, improved further to approximately 100%. Yet the reform has had a greater impact for the poor households. From less than 50% just prior to the reform, electrification levels climbed to 77% in 2001, just about five years through the reform. Despite the fact that the non-poor already had high electrification level, several factors did contribute to the fast improvement in electrification levels of the poor. From a policy perspective, the priority shift from agriculture and small industries to households upon the establishment of EVN was translated into more household connections. From implementation strategy perspective, the introduction of various approaches by EVN had offered a lot of flexibility in terms of financing, constructing, and managing local electricity networks.²⁸ From a technical or engineering perspective, the completion in 1994 of the 500 kV line that stretches from north to south of the whole of Vietnam facilitated connection of the villages to the main grid and thus increased national electrification levels.

²⁸ Allowing different modes of accessing electricity in the rural areas has increased the possibility of local participation and support. Indeed, most of the communes receive electricity through the Commune Electricity Group, which is established by the local community authority to buy and sell electricity.

The national electrification level, however, is an average and hides the regional disparity. For example in 1998, while 82% of the villages in the Red River Delta (a region in Vietnam) used electricity for industry and everyday life, only 37 % of communes in the central highlands and in northern mountains provinces received electricity. These latter areas could not be connected to the main power grid. Thus, the government encourages local authorities in these areas to initiate decentralized energy projects and the private sector to invest in them.

Table 21 Electrification levels (%)

	Pre-reform						Post-reform	
	1975	1985	1989	1990	1992	1993	1998	2001
Average						61.3	na	na
Poor	2.5	5.5	11	13.9	48.4	48.7	63	77
Non-poor	na	na	Na	na	91.2	91.3	Approximately 100%	na

Source World Bank (1994); COWI et al (1999); EVN (2001)

NA - not available

7.2 Electrification rates

Table 22 gives the rate of electrification for the poor and the non-poor in Vietnam. The table highlights the effectiveness of reform in targeting the poor household. The rate of electrification of the poor households, which was lagging at 2%, increased to nearly 10% per annum during the post-reform period. In the case of the non-poor households, electrification level was further improved after the EVN reform. However, there was no data available to show the electrification rate during the post-reform period.

Table 22 Electrification rates* (%)

	Pre-reform	Post-reform
	1992-1993	1996-2001
Poor	2.1	9.9
Non-poor	3.1	-

*Compounded annual growth rate

7.3 Electricity consumption

Table 23 shows that the EVN reform had resulted in the improvement of electricity consumption per capita in Vietnam. The level of per capita electricity consumption of the poor increased from about 34 kWh per year in 1992 to 85 kWh in 1998 and 92 kWh in 2001. In the case of the non-poor, the level of electricity consumption per capita grew from 144 kWh from 1992 to 315 kWh in 1998.

The impact of the reform on electricity consumption may be said to be more significant for the poor than the non-poor based on the growth of electricity consumption per capita. Per capita electricity consumption of the poor grew by more than 17% per year between 1992 and 1998, while that of the non-poor, by 14%. Despite the higher growth rate, the disparity in consumption levels is high. In 1998, for instance, the electricity consumption per capita of the non-poor is close to four times that of the poor.

Table 23 Electricity consumption per capita (kWh/capita per annum)

	Pre-reform		Post-reform					
	1992	1993	1996	1997	1998	1999	2000	2001
Poor	33.71	38.54	71.73	64.78	85.19	77.09	84.77	91.59
Non-poor	143.61	164.66	na	na	314.82	na	na	na

Source EVN, 2001a; EVN (2001); World Bank (1994); COWI et al (1999)

NA - not available

7.4 Electricity tariffs

Around the time of the reform in 1995, electricity prices in Vietnam had been almost regularly increased. Tariffs were adjusted in August 1994, June 1995, April 1996, and April 1997 (which took effect on 15 May 1997). However, the May 1997 average retail tariff was way below the long-run marginal cost of around 8 US cents per kWh. In securing the loan from ADB for the Central and Southern Vietnam Transmission and Distribution Project, the government of Vietnam agreed to implement tariff increases before July 1999 (to 5.2 US cents per kWh) and April 2000 (to 6.2 US cents per kWh).

Towards rationalizing electricity prices, the government planned to:

- raise average retail tariff to about 7 US cents/kWh by 1999 and take all measures necessary to realize a self-financing ratio of not less than 30% for the electricity sector as a whole; and
- introduce a cost-based bulk transfer price for bulk power sales to the distribution companies.

However, data presented in **Table 24** and **Figure 6** show that the reform had put a lid on the growth of tariff for the poor and gradually raised tariffs for the non-poor.

Table 24 Average electricity tariff (1992 USD/kWh)

	Pre-reform		Post-reform			
	1992	1994	1996	1998	2000	2002
Non-poor	0.019	0.038	0.041	0.044	0.045	0.052
Poor	0.016	0.032	0.032	0.032	0.032	0.035

Source EVN, 2003

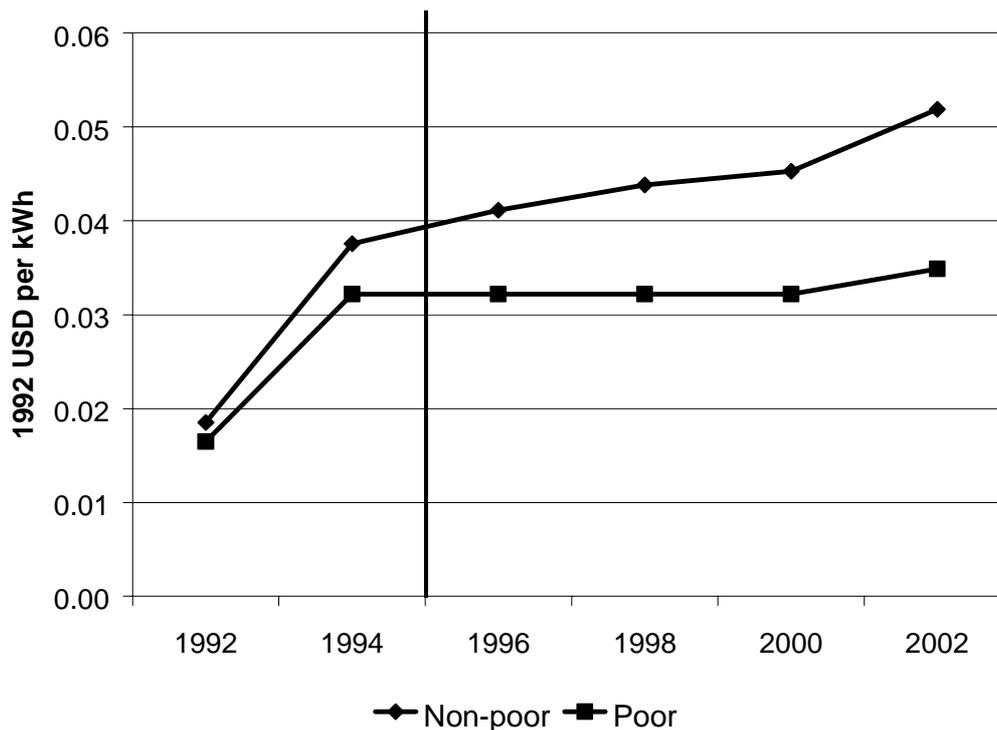


Figure 6 Average electricity tariff (1992 USD/kWh)
Source EVN, 2003

7.5 Electricity expenditure

Table 25 presents data on the share of household expenditure on electricity in total household expenditure, which had grown after the EVN reform period for both the poor and the non-poor households. The poor recorded a tripling and the non-poor a doubling of this figure. In the case of the poor, the increase in the share of electricity expenditure had been primarily due to the increase in the level of consumption, as the tariff levels were unchanged during the post EVN reform. However, in the case of the non-poor, the increase had been due to both increases in the level of consumption as well as tariff level. But the interesting observation here is that the steady increase in tariffs for the non-poor starting 1994 has not dampened the rate of increase in the non-poor group's average electricity consumption.

Table 25 Average electricity expenditure as percent of total household expenditure (%)

	Pre-reform (1993)	Post-reform (1998)
Poor	1.08	3.0
Non-poor	4.55	9.0

Source 1993 Living standards survey quoted in World Bank, 1994; COWI et al, 1999

7.6 Summary of findings

The establishment of EVN in 1995 and the dedication of an office within EVN to aggressively pursue rural electrification has led to improvements in electrification levels and increase in electrification rates. Thus, the targeted rural electrification

efforts resulted in a very significant increase in electrification levels and much higher electrification rates for the poor.

The reform has had significant positive impact as well on electricity consumption per capita of the poor and the non-poor households. The rate of growth of tariff has slowed down after the EVN reform, and the slowdown is more pronounced for the poor. The steady increase in tariffs for the non-poor starting 1994 had not dampened the rate of increase in electricity consumption but led, however, to doubling of the share of electricity expenditure in the total household's expenditure during the post-reform period.

8 Summary of key findings and recommendations

The Accelerated Rural Electrification (ARE) approach of Provincial Electricity Authority (PEA) in Thailand, the creation of Rural Electrification Board (REB) in Bangladesh, and Electricity of Vietnam (EVN) in Vietnam that addressed rural electrification directly resulted in positive impact on electricity access of the poor. The EGAT Act, the second reform measure studied for Thailand, had no direct impact on electricity access, though it was observed that it contributed to marginal increase in the average electricity consumption of the poor households. The tariff reforms in Thailand resulted in the increase of average electricity tariffs for the poor as well as the non-poor. These results are summarized in Table 26.

Table 26 Impacts of institutional and structural reforms in Thailand, Bangladesh, and Vietnam on the poor households

	Thailand			Bangladesh	Vietnam
	PEA-ARE	EGAT Act 1992	Tariff Reform	REB	EVN
Electrification level	++	O	O	+	++
Electrification rates	++	O	O	++	++
Per capita kWh consumption	?	+	-	?	++
Average electricity tariffs	?	O	-/-	?	+
Electricity expenditure as % of total expenditure	?	O	-/-	?	++

- + : reform resulted in somewhat positive change in the indicator
- ++ : reform resulted in positive change in the indicator
- : reform resulted in somewhat negative change in the indicator
- /- : reform resulted in negative change in the indicator
- O : reform had no impact on the indicator
- ? : uncertain due to lack of data

The table above indicates the net impact of the reform measures on the poor:

Electrification level and electrification rates: The implementation of ARE by PEA in Thailand and the establishment of EVN have resulted in higher levels of electrification of the poor households. Approximately 99% (2000) of the poor households in Thailand and more than 77% (2001) in Vietnam enjoy electricity access. Although electrification rates in Thailand show a decreasing trend after PEA-ARE reform (during 1990s), this should still be viewed as a positive impact as it reflected high electrification levels of the poor households during the 1980s. In Vietnam, the fact that electrification rates for the poor increased after the EVN reform was initiated in Vietnam led to high electrification levels beginning late 1990s. Thus,

reform measures in these two countries were successful in improving electricity access of the poor households. In Bangladesh, the establishment of REB and PBS did not result in high electrification levels among the poor, but nonetheless, it did result in a significant number of electrified poor households. One factor that may have contributed to the poor's low electricity access is the high upfront cost of acquiring electricity access.

Per capita electricity consumption: The EVN reform improved the average or per capita electricity consumption of the poor households. Meanwhile, there was lack of data to ascertain the impact of PEA-ARE (before 1990s) and REB reforms on electricity consumption per capita of the poor households.

Moreover, in Thailand, after EGAT Act and tariff reforms, a slower increase in the per capita electricity consumption of the poor had been observed.

Electricity tariff: The net impact of electricity tariff reforms in Thailand, which aimed at removing cross-subsidies and reflecting economic costs, resulted in the increase of electricity tariff for the poor. The reforms resulted in lower amounts of subsidy for the poor household. However, despite the increase in tariffs, average electricity consumption per household continued to increase. The limited information available for Bangladesh indicates that the poor were paying a higher tariff and tariff reforms had increased the tariff for the non-poor. In the case of Vietnam, after the EVN reform, the electricity tariff for the poor increased at a slower rate. Moreover, tariffs were set so as to prevent increases in average tariffs of the poor at the expense of the non-poor.

Electricity expenditure: The tariff reforms in Thailand partially contributed to the growth of the ratio of electricity expenditures relative to the poor household's total expenditures. In fact, in 1998, the ratio had been at the highest level (3.4%), greater than the levels of the non-poor. In the case of Vietnam, with the steady increase in electricity tariffs subsequent to the reforms, higher electricity consumption of the poor was observed, but led, however to doubling of the share of electricity expenditure in the total household's expenditure.

The above findings essentially highlight that the PEA-ARE approach in Thailand and establishment of REB in Bangladesh and EVN in Vietnam was able to increase the electrification levels as well as consumption levels of the poor. Also, these reforms seem to focus on moderating tariff to enable the poor's access to electricity. On the other hand, the recent tariff reforms in Thailand, which were focussed more on economic efficiency did result in higher tariffs. However, it is difficult to say at this stage whether other recent reforms in Thailand have slowed down the electricity access of the poor.

Results of the study were subject to data constraints. The major data constraint was non-availability of electricity and expenditure data by income categories: The published sources do not report data by income group. Therefore, the study took rural households as a proxy for the poor and urban households as a proxy for the non-poor. The study thus ignores the fact that there are also poor people living in the urban areas and, similarly, that there are also the non-poor living in rural areas. To that extent, the

results of the study should be taken with care. A more rigorous analysis could be conducted if the disaggregated data were available. It is therefore recommended that efforts be made to establish such database.

9 Acknowledgement

The authors would like to thank Dr. Boonrod Sajjakulnukit, Dr. Bundit Limmeechokchai and Dr. Tran Minh Khoa for their helpful comments in an earlier version of the report. The assistance of Ms. Tania Urnee, Mr. Nhan Thanh Ngyuen and Mr. Nuttapol Limjeerajarus in compiling necessary data is also acknowledged. However, the authors only are responsible for any remaining errors.

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Annex I

The electricity consumers of PEA (including that of MEA) are divided into seven customer categories (or schedules) for the purpose of charging the appropriate retail tariff:

1. *Residential* - applicable to homes and other dwelling places, temples, and other places of worship.
2. *Small general service* - applicable to business, including home business, industrial and state enterprises with 15-minute maximum integrated demand of less than 30 kW.
3. *Medium general service* - applicable to business, industrial and state enterprises with a 15-minute maximum integrated demand of 30 - 1,999 kW and whose average energy consumption does not exceed 355,000 kWh per month for three consecutive months.
4. *Large general service* - applicable to business, industries, government institutions, and state enterprises with a 15-minute maximum integrated demand of 2,000 kW or more, or whose average energy consumption exceeds 355,000 kWh per month for three consecutive months.
5. *Specific business* - applicable to any hotel and other similar establishments providing lodging and accommodation with a 15-minute maximum integrated demand of 30 kW or more.
6. *Government institutions and non-profit organisations* - applicable to government institutions and to institutions and organisations established by the Local Administration Act with three-month average energy consumption of less than 250,000 kWh per month.
7. *Pumping of water for agricultural purposes* - applicable to electricity consumption for the use of water pumps for agricultural purposes of government agricultural agencies, officially-recognised farmer groups, agricultural co-operative, or individual farmers.



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