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Rural Energy Services

Legal & Regulatory Review

 **Nexant**

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RURAL ENERGY SERVICES
LEGAL AND REGULATORY REVIEW

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List of Acronyms

ADB	Asian Development Bank
Danida	Danish International Development Assistance
FERC	Federal Energy Regulatory Commission
IFC	International Finance Corporation (World Bank Group)
IPP	Independent Power Producers
NRECA	US National Rural Electric Cooperative Association
NGO	Non-Governmental Organization
USAID	United States Agency for International Development
SARI/Energy	South Asia Regional Initiative/Energy
UNDP	United Nations Development Program
Micro-hydropower	Hydropower plant with an installed capacity below 100 kW
Mini-hydropower	Hydropower plant with an installed capacity between 100 - 1,000 kW
Small Hydropower kW	Hydropower plant with installed capacity between 1 and 10 MW 1,000 Watts
kWp	kilowatt peak (applied to SPV panels)
MW	1 million Watts
GW	1 billion Watts
TWh	1 trillion Watt-hours
SPV	Solar Photovoltaic
BREB	Bangladesh Rural Electrification Board
BPDB	Bangladesh Power Development Board
DESA	Dhaka Electricity Supply Authority
DESCO	Dhaka Electricity Supply Company
GOB	Government of Bangladesh
PBS	Palli Bidyut Samity
AP	Andhra Pradesh
APERC	Andhra Pradesh Electricity Regulatory Commission
APTRANSCO	Transmission Corporation of Andhra Pradesh Ltd.
BSES	Bombay Suburban Electricity Supply, Ltd.
GOI	Government of India
MNES	Ministry of Non-Conventional Energy Sources
REC	Rural Electrification Corporation, Ltd.
SEB	State Electricity Board
WBREDC	West Bengal Rural Energy Development Corporation, Ltd.
WBREDA	West Bengal Renewable Energy Resource Development Agency
WBSEB	West Bengal State Electricity Board
ADB/N	Agricultural Development Bank Nepal
AEPC	Alternative Energy Promotion Center
DDC	District Development Committee
DVC	District Village Committee
ESAP	Energy Sector Assistance Project
ETFC	Electricity Tariff Fixation Commission
HMG/N	His Majesty's Government of Nepal
ITDG	Intermediate Technology Development Group

MOWR	Ministry of Water Resources
MST	Ministry of Science and Technology
NEA	Nepal Electricity Authority
RED	Rural Energy Development
RESC	Rural Energy Service Centers
REDP	Rural Energy Development Project
CEB	Ceylon Electricity Board
ECS	Electricity Consumers Society
ESD	Energy Services Delivery
GOSL	Government of Sri Lanka
LECO	Lanka Electric Company, Ltd.

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Contents

Section	Page
Executive Summary	iii
1 Legal And Regulatory Review Objectives	1-1
2 Legal and Regulatory Review Approach	2-1
3 South Asia Rural Electricity Supply Regulation Definition	3-1
4 Basic Rural Electricity Supply Modalities	4-1
5 South Asia National Rural Electricity Supply Legal and Regulatory Status	5-1
5.1 Bangladesh.....	5-2
5.2 India.....	5-3
5.3 Nepal.....	5-15
5.4 Sri Lanka.....	5-23
6 Application of Rural Electricity Supply Legal Frameworks and Regulation to other Utility Services	6-1
7 Findings and Potential Actions for enhancing Rural Electricity Supply Regulation	7-1
8 Bibliography	8-1

Figure	Page
1-1 Estimated Urban And Rural Electricity Access.....	5-1

Table	Page
1-1 Projected National Plans Electrification Levels.....	1-2
4-1 Identified Rural Electricity Supply Legal Modalities.....	4-2
5-1 Rural Electric Co-operative Supply Societies Data.....	5-9
5-2 Sircilla and Singur Haripal Rural Electric Co-operative Societies Performance.....	5-11
5-3 India Rural Off-Grid Electricity Systems Summary.....	5-12
5-4 West Bengal Renewable Energy Resource Development Agency Rural Isolated-Grid Electricity Supply Schemes Summary.....	5-14
5-5 Nepal Rural Energy Development Program Micro-Hydropower Projects Summary.....	5-21

Executive Summary

Today in the rural areas of the South Asian nations poverty alleviation is a major economic development priority. It is increasingly recognized that the provision of reliable, sustainable, commercial energy, particularly electricity, to rural populations is critical to addressing this issue. Currently, in the rural areas of South Asia, it is estimated that less than 25 percent of the population has access to electricity. To address the provision of sustainable energy to South Asia's rural population, the SARI/Energy program includes a Rural Energy Services component. In designing this component, it became clear that an important aspect of implementing sustainable rural energy supply is sound governance and clear regulation. To better understand this dimension of sustainable rural energy supply and to help formulate programs that enhance the environment for improving rural energy supply, SARI/Energy has undertaken this Rural Energy - Legal and Regulatory Review.

Under the SARI/Energy Rural Energy Services component, supply of all forms of commercial energy required for sustained rural economic development is considered important. However, when considering the existing legal and regulatory aspects of rural energy supply in South Asia, in practical terms, this currently means rural electricity supply. Therefore, the Review undertaken for this task concentrated on rural electricity supply employing a six-step approach:

- Defining the major components of rural electricity supply regulation.
- Identifying and characterizing the basic rural electricity supply modalities.
- Meeting with selected participants in Bangladesh, India, Nepal, and Sri Lanka to understand the legal and regulatory procedures and practices associated with the rural electricity supply.
- Comparing existing South Asia rural electricity supply legal and regulatory procedures and practices in South Asia in order to characterize their effectiveness.
- Identifying potential actions that SARI/Energy could consider for improving rural electricity supply levels and efficiencies.
- Identifying potential approaches for expanding rural electricity supply modalities to include other energy forms and services.

RURAL ENERGY SERVICES

In South Asia it is convenient to divide rural electricity supply into two categories: grid-connected and off-grid rural electricity supply. These categories are primarily defined by the scale of associated electricity supply. Grid-connected supplies typically serve large numbers of rural consumers in comparison with individual off-grid supply systems.

Grid-Connected Rural Electricity Supply Regulation

In South Asia all electricity distribution, urban and rural, is dominated by parastatal utilities. Across the region, parastatal utilities distribute over 90 percent of all electricity consumed. In rural areas served by national electricity grids, the predominance of parastatal electricity distribution is even higher as most non-parastatal distribution is in urban areas. The predominate role-played by parastatal utilities in rural electricity supply means that what constitutes current regulation is largely derived from laws establishing and governing parastatal utility ownership and operation. This has resulted in the parastatal utilities being largely self-regulated. This applies to both their rural and urban operations. The main exception to self-regulation is tariff setting where senior government usually makes final decisions. However, the utilities have considerable power in the tariff setting process because they typically design the tariffs based on their intimate knowledge of their own cash flow and investment plans. Also, governmental decisions to disallow requested parastatal tariff request means, in simple terms, that any deficits have to be made up by the government from sources other than revenue from electricity sales. For political reasons, parastatal utilities cannot go out of business, cannot stop supplying electricity, and are not subject to employee layoffs.

In India as part of electric power sector reform initiatives in selected states, electricity regulatory commissions have recently been established. Under enabling legislation, the regulatory commissions have jurisdiction over all electricity suppliers. However, with the exception of the State of Orissa, the new state regulatory commissions regulate mainly parastatal utilities. It remains to be seen, particularly given the recent actions of the Maharashtra Electricity Regulatory Commission with regard to the Dabhol IPP and the Orissa Electricity Regulatory Commission with setting adequate retail electricity tariffs, how independent of state governments these new electricity regulatory commissions are or can be. Also, to date the India regulatory commissions have not been proactive in developing regulatory initiatives that could enhance rural electricity supply. They have been largely preoccupied with establishing themselves and dealing with the profound financial problems of their primary clients, the State Electricity Boards, or their successor parastatal entities.

The Bangladesh Rural Electricity Board (BREB) provides a progressive perspective on regulation involving a parastatal rural electricity supplier. BREB consists of the Board and Palli Bidyut Samities (PBSs), which are the rural electric suppliers. The PBSs are organized along the lines of cooperative societies. However, BREB is the owner of the PBSs and regulates them through annual Performance Target Agreement contracts. These contracts establish clear and quantifiable financial, operating, and service performance targets tailored to each PBS, depending on its maturity, size, and the characteristics of its service territory. Financial incentives and penalties are associated with a PBS's performance under its contract with the BREB. This is the only example of incentive-based rural electricity supply regulation found in South Asia.

An alternative in South Asia to a parastatal rural electricity supply entity is through rural electric cooperative societies. A registrar who is usually part of an agriculture cooperative ministry regulates cooperative societies. When electricity regulatory commissions exist,

there can be conflicts with such regulatory authorities. Such conflicts have yet to be resolved in the instances in which they appear to exist. Meetings were held with two Indian rural electric cooperative societies, one in Andhra Pradesh and one in West Bengal. Both are well run rural electricity distributors. Their performance compared with that of parastatal electricity distribution entities in the same regions in which they operate was enlightening, to say the least, and demonstrates the potential viability of cooperative societies as rural electricity suppliers.

Off-Grid Rural Electricity Supply Regulation

Off-grid rural electricity supply is minuscule in terms of energy supplied compared with grid-connected supply and, with the possible exception of Nepal, will likely always remain such. However, the legal basis and regulation of off-grid supplies is of growing importance in South Asia because of the relatively recent growth in the number of these systems. This growth is due in part to the decreasing ability of some governments to expand and maintain the rural portions of their national electricity grids and in part with major problems with electricity generation adequacy. To date, little regulatory attention has been paid to off-grid supply systems and this may impede the increase in the number of these systems and the growth of established systems.

Bangladesh is just starting to implement off-grid rural electricity supply in regions where grid-connection will not be implemented within at least five-years. As currently planned, this will primarily involve household SPV systems with major involvement of BREB. India, under the Ministry of Non-Conventional Energy Sources (MNES) and its associated State renewable energy development agencies has implemented one of the world's largest renewable energy supply programs based on off-grid supply systems. Nepal and Sri Lanka are aggressively implementing off-grid village micro-hydropower schemes and SPV household electricity supply.

In most cases, rural off-grid electricity supply is currently being realized through some form of: 1) Society (India and Nepal) or a Voluntary Social Services Organization (Sri Lanka), or 2) Cooperative Society (India). In all of the South Asian nations, specific laws and rules define the operation of these entities. Such entities are regulated through registrars who are usually part of some form of "cooperative" ministry other than that associated with parastatal electricity supply utilities. In most instances there appear to be conflicts between regulation of an off-grid electricity supplier by a registrar (Sri Lanka and possibly Bangladesh and proposed) or newly established electricity regulatory commissions (Indian States). For example, in Sri Lanka newly formed micro-hydropower, off-grid Electricity Consumers' Societies are technically illegal since there is an inadequate mechanism to obtain electricity supply licenses required under the existing national Electricity Act. The need for considerable improvements is indicated in order to achieve efficient regulation of off-grid rural electricity supply in South Asia.

Regional Rural Electricity Supply Regulatory and Legal Requirements

South Asia is moving to replace its traditional self-regulation of parastatal electricity supply utilities with more transparent and autonomous regulatory frameworks. To date in implementing such legal and regulatory changes, very limited attention has been given to the rural electricity supply dimension, both grid-connected and off-grid electricity supply. This could lead to a situation in which the desire to improve legal and regulatory frameworks as a prerequisite to tapping international private capital markets impairs the expansion and quality of rural electricity supply to better serve urban and near urban consumers in South Asia. Table below identifies some of the legal and regulatory requirements that need to be addressed if such a situation is to be avoided and that could promote solutions to rural electricity supply.

Important Rural Electricity Supply Regulatory and Legal Requirements

Grid-Connected Rural Electricity Supply	Off-Grid Connected Rural Electricity Supply
Clear legal recognition of not-for-profit rural electricity supply modalities as distinct from parastatal and commercial modalities	Establishment of clear and efficient legal bases for non-parastatal, grid isolated electricity supply entities
Clarification and streamlining of regulatory responsibilities for not-for-profit rural electricity supply modalities (The recent creation of electricity regulatory commissions has the potential to create regulatory conflicts.)	Development of a fair and efficient regulatory structure for micro and mini rural electricity supply entities
Development of processes to ensure adequate rural electricity supply under rural electricity distribution privatization	Development of more transparent and efficient processes for setting isolated grid rural electricity supply subsidy levels
Development of more transparent and efficient processes for setting rural electricity supply subsidy levels (Such subsidies are a major component of rural electricity tariffs)	Development and implementation of processes to ensure sustainable electricity supply for rural consumers, particularly single households

In addition to the Table requirements, there are also substantial financial and management requirements that will need to be addressed to enhance the environment for rural electricity supply in South Asia.

FINDINGS AND RECOMMENDATIONS

Major findings from this Review include:

- Efforts to reform and restructure the parastatal electricity utilities in South Asia have largely ignored the inherent differences between rural and urban electricity supply. This includes neglect in the design of new regulatory entities.
- In most cases, the major suppliers of rural electricity are the national parastatal utilities, which are also the owners, operators and regulators of electricity supply. This causes a conflict of interest, which needs to be addressed by policy makers.
- In South Asia, there are four main organizational structures used for rural electricity supply: Societies (in Nepal Associations); Cooperative Societies; private sector companies, and government-owned and operated utilities. The type of structure used will determine which regulatory mechanisms should be applied to rural service providers.
- Often rural suppliers organized as Societies or Cooperative Societies are subject to regulation both by a registrar and a regulatory commission. This creates regulatory conflicts, and needs to be addressed.
- The trend towards decentralization of government responsibility for electricity supply will affect the legal and regulatory frameworks applied to rural electricity providers. This trend appears to be the result of the inability of parastatal utilities to provide adequate service.
- The regulation of off-grid, non-parastatal electricity supply is not often well defined. This inhibits development of these resources and needs to be addressed.
- Most rural electricity suppliers are not considering expanding into other rural services (e.g., water or LNG) despite apparent synergies of supply. The reason for this lack of interest needs to be better understood.

Potential activities by the SARI/Energy program to help address these issues include:

- Help build appreciation and consensus on the need to provide for rural electricity supply within new and revised Electricity Acts and by newly formed regulatory commissions.
- Compare and communicate to regional policy makers and stakeholders the legal modalities for governance of rural electricity suppliers and help identify the advantages and disadvantages of each.
- Explore and communicate to policy makers and stakeholders the approaches, resource requirements and advantages of decentralizing rural electricity supply regulation.
- Develop and communicate approaches on implementing incentive-based tariffs for rural energy supply.
- Provide for information exchange and sharing of procedures for certifying private sector service technicians for household SPV and micro-hydropower systems in South Asia.
- Support coordination of rural electricity supply equipment certification and quality control for household SPV systems in South Asia.
- Identify options, clarify legal requirements, and assess the ability of rural electricity suppliers to undertake other related businesses and services.

- Consider the merits of a rural energy component under SAFIR.

SARI/Energy also may consider other types of assistance for rural energy services beyond those related to legal and regulatory issues. These include:

- Support regional networking of individual country rural energy supply programs through information exchange.
- Promote wider consideration of options such as cooperative societies and rural franchising as solutions to rural energy supply by policy makers and multilateral development banks.
- Promote, through information and peer exchanges, the concept of rural electricity suppliers forming apex organizations.
- Promote, through information exchange, the development and wider implementation of rural electricity financing mechanisms, such as commercial micro-finance and rural development banks.
- Review and develop a recommendation on improving the design of subsidies for rural energy programs and communicate different design approaches.
- Develop and make widely available a South Asia rural energy database.

Improving the supply of commercial energy to the rural regions of South Asia is a critical requirement for addressing the high poverty levels currently prevailing in these regions. Initial planning for the Rural Energy Supply Training component for SARI/Energy indicated that one likely impediment to addressing this economic development problem was the lack of attention being given to the economic and operational differences between the supply of electricity to urban and near-urban consumers and rural consumers. Until recently, rural electricity supply has typically been viewed as primarily a grid extension issue. The goal of achieving sustainable electricity supply for rural areas generally was not a major consideration. This perception appears to be changing due to increased deterioration of rural electricity supply, the slow pace at which some governments have been able to provide electricity supply to rural areas, and increased local government appreciation of the political and economic benefits of electricity supply. It is also changing because of the dedicated work of a number of NGOs. The general failure to appreciate the differences between the requirements of urban, near urban and rural electricity supply systems has also largely hidden the unique aspects of rural off-grid electricity supply.

To promote understanding of the approaches for enhancing rural electricity supply in South Asia as a means of addressing rural economic development, SARI/Energy in the initial planning of its Technical Assistance component identified two rural energy activities: Rural Energy - Identify and Select Best Practices, and Rural Energy - Legal and Regulatory Review. This report addresses the latter Technical Assistance activity.

Objectives of the Rural Energy - Legal and Regulatory Review are to:

- Understand existing South Asia rural electricity supply legal frameworks and regulatory procedures and practices.
- Understand which institutions are the actual rural electricity supply regulators.
- Identify the features of current South Asia rural electricity supply regulation that appear to support the improving level and efficiency of South Asia rural electricity supply.
- Identify the features of current South Asia rural electricity supply regulation that appear to be impediments to improving the level and efficiency of South Asia rural electricity supply.
- Based on current experience with electric power sector reform and restructuring in both developed and developing nations, identify potential actions that the SARI/Energy project might undertake to contribute to improving the level and efficiency of rural electricity supply in South Asia.

- Extrapolate the understanding of South Asia rural electricity supply legal frameworks and regulation gained through this activity to other potential rural utility services, such as supply of petroleum fuels.

Under the SARI/Energy Rural Energy Services component, supply of all forms of commercial energy required for sustained rural economic development is considered important. However, in practical terms, when considering the existing legal and regulatory aspects of rural energy supply in South Asia, the focus must be on rural electricity supply. With the possible exception of special rural subsidies for petroleum fuels, particularly kerosene, and fraud investigations and prosecutions associated with adulterated petroleum fuels, electricity supply represents the only commercial energy form where any substantial energy regulation is currently practiced. Therefore, the review objectives have been framed in terms of rural electricity supply. A better understanding of rural electricity supply regulation, however, could facilitate the efficient design and implementation of regulation for other utility services when these are appropriate. Also, in conducting the review, legal and regulatory information was sought on all forms of commercial energy supply in rural areas, not just electricity.

Current rural electrification levels vary significantly between the four main South Asian nations (see table 1-1 below). While each nation has in-place programs to extend electricity supply to previously unserved rural consumers, it may take time to significantly raise their rural electrification levels. This is of particular relevance for Nepal and Bangladesh. Also, current national rural electrification plans in South Asia do not provide for complete national electrification. Most likely, significant numbers of rural consumers will need to depend on isolated and off-grid electricity supply for the foreseeable future or have no electricity supply. Any changes to existing or new laws or regulatory approaches that could increase the rate at which rural regions are electrified, both grid-connected and off-grid supply would facilitate rural economic development.

Table 1-1: Projected National Plans Electrification Levels

Nation	Projected Level Of National Electricity Grid - Percent	Projected Completion Date
Bangladesh	85	2020
India	97	2012
Nepal	Undetermined	Undetermined
Sri Lanka	90	2010

In the Legal and Regulatory Review objectives, efficiency refers to both the quality and cost of rural electricity supply; both improving efficiency when required or maintaining it at acceptable levels in newly electrified rural regions. In many rural areas throughout the region the efficiency of electricity supply is poor and may be declining. Electricity rationing is common and unscheduled, supply voltage is erratic, electricity losses are excessive, metering is non-existent or poor, repair service is poor or non-existent, and frequently there are long waiting periods for new connections. These problems may get worse before they get better because of the indicated physical condition of many rural

distribution systems. Many of these systems are over 30 years old and are suffering from long-term neglect due to lack of adequate maintenance and overloading. Without extensive investment to rebuild and strengthen many rural distribution systems, electricity availability might decline in the future. This is without consideration of the chronic electric generation deficit throughout most of the region, which results in very significant rural load shedding.

Electricity supply cost is at the crux of many issues limiting the availability and quality of rural electricity supply. Also, reforming electricity prices is a key regulatory issue and a prime reason why the multilateral and bilateral lending agencies and donors are pressurizing South Asian governments to establish autonomous and transparent regulatory commissions. Improving supply service quality is another major reason for this pressure.

The Rural Energy - Legal and Regulatory Review is being coordinated with the Rural Energy - Identify and Select Best Practices. The Legal and Regulatory Review will be used to identify the legal frameworks appropriate for the selected best practices and potential complimentary regulatory approaches.

A six-step approach has been used for this legal and regulatory review so that we may begin to understand, the complexities of regulating rural electricity supply in South Asia and what this implies for legal frameworks and regulatory improvements. The six steps are:

1. Defining what currently constitutes the major components of regulation of rural electricity supply in South Asia.
2. Identifying and characterizing the basic rural electricity supply modalities.
3. Based on 1 and 2, meeting with selected key participants in Bangladesh, India, Nepal and Sri Lanka to understand the legal and regulatory procedures and practices currently affecting rural electricity supply - policy makers, regulators, and regulated rural electricity supply entities.
4. Comparing existing rural electricity supply legal and regulatory procedures and practices in South Asia in order to characterize their effectiveness.
5. Identifying potential actions that SARI/Energy might support to improve rural electricity supply levels and efficiencies.
6. Identifying potential approaches for expanding rural electricity supply modalities to other energy forms and services.

Currently, electricity generation and supply in South Asia is almost exclusively provided by government owned and operated parastatal electric power utilities. Of the 367.8 TWh of electricity estimated consumed in Bangladesh, India, Nepal, and Sri Lanka in 1999, only about 31.7 TWh or 8.6 percent was distributed by non-parastatal utilities, including private sector companies. In rural areas served by national electricity grids, the predominance of parastatal utility electricity distribution is even higher as most South Asian non-parastatal distribution is in urban and near-urban areas. Unfortunately, hard statistics for actual rural electricity distribution by non-parastatal utilities does not appear to be available. For South Asia, 94 percent of the electricity associated with end use consumption in 1999 was generated by parastatal utilities.

In India, electricity distribution is provided mainly by the State Electricity Boards (SEBs) and electricity transmission and generation are almost exclusively provided by a combination of both national (Centre) and state parastatal generation utilities. In Sri Lanka, electricity distribution is the exclusive preserve of the Ceylon Electricity Board (CEB) and Lanka Electricity Company, Ltd. (LECO), both are government owned utilities. With the exception of several Independent Power Producers (IPPs), CEB is also the predominant electricity generator, accounting for 94 percent (1999) of installed generating capacity. In Bangladesh, electricity distribution is the legal responsibility of the Bangladesh Power Development Board (BPDB), Dhaka Electricity Supply Authority (DESA), Dhaka Electricity Supply Company (DESCO), and the Bangladesh Rural Electrification Board (BREB). All four distributors are government owned parastatal utilities. In 1999, BPDB accounted for 92 percent of electricity generation. By 2002, this generation level is estimated to decline to approximately 85 percent due to the realization of projects by Independent Power Producers (IPPs). In Nepal, the national grid and 70 percent of generation capacity is owned and operated by the National Electricity Authority (NEA), a parastatal utility.

The predominant role played to date in South Asia by parastatal utilities in electricity generation, transmission, and distribution means that what constitutes current electricity supply regulation is largely derived from laws establishing and governing parastatal utility ownership and operation, including the setting of electricity tariffs. This type of regulation has been subject to significant politicization over the years and suffers from lack of both transparency and governmental autonomy. This is particularly true in the setting of electricity tariffs based on commercial operating principles. Despite attempts to reform and restructure the electric power sectors in South Asia by the nations themselves, South Asia's parastatal electricity utilities are primarily self-regulated. Other than through the political electoral process, consumers, particularly rural consumers, have little direct input into determination of electricity tariffs and service quality. Because of this situation, it has been necessary to develop a working definition of what constitutes regulatory actions with regard to rural electricity supply in South Asia.

The self regulation currently practiced by South Asia's parastatal utilities differs significantly from regulation in most developed nations as well as in other developing nations where electricity distribution has recently been privatized. In these countries the purpose of electric power industry regulation is in the control of private sector utilities, not government owned and operated utilities even when these exist in parallel with private companies. Here the key regulatory issues are: 1) the establishment of retail tariffs for private sector utilities that are both "fair" to consumers and which allow for the financing of utility operations and expansion exclusively by the private sector; 2) the realization of high electricity supply reliability and quality; and 3) consumer protection. The private sector financing requirement means that tariffs need to be set at levels that allow private sector utilities to earn rates of return that allow them to compete with other private firms in the international capital markets. In many of the nations where the private sector is the provider of electricity supply, there has also been a growing trend to employee incentive based tariffs rather than cost-of-service based tariffs. In South Asia, the existing Electricity Acts all require some form of a cost-of-service pricing. However, in the tariff setting process, this requirement is frequently ignored or circumvented by creative accounting. Also, with one exception, no form of incentive based tariffs has yet to be introduced by South Asian regulators or governments.

In the developed and developing nations in which competitive markets are in operation, at both the wholesale and retail level, electric power industry regulation also includes activities to ensure that these markets are truly competitive and that the private sector participants are not able to exercise market power. In some nations, this is turning out to be a more complex task than envisioned at the time competitive markets were implemented - California being but one recent example. South Asia has yet to implement competitive electricity markets.

In the US, regulation is implemented at the retail level by state public utility commissions and at the wholesale level for interstate electricity issues by the Federal Energy Regulatory Commission (FERC). In England and Wales, where competitive wholesale and retail electricity markets are in operation, a single individual is designated as the industry regulator. An appropriately sized staff of specialist, technical, legal, and economics specialists, supports this regulator. The type of regulation represented by the commissions/boards operating in the US and other developed countries are referred to in this review as autonomous electric power sector regulation to contrast this form of regulation with the more fragmented, self-regulation approach currently used in most of South Asia.

The electricity regulatory commissions recently established in the India electric power sector reform states of Orissa, Haryana, Andhra Pradesh, Maharashtra, and Rajasthan and the new Central Electricity Regulatory Commission (CERC) at the central government level come closest to autonomous regulation. Besides issues related to more independent setting of electricity tariffs, a major reason for creating these electricity regulatory commissions is the ability to regulate privatized electricity power businesses, including electricity distribution companies. However, with the exception of Orissa, the relatively new state electricity regulatory commissions are regulating mainly parastatal utilities, particularly when the amount of energy supplied is the criteria for comparison. In the

reform states, new parastatal utilities have been formed by the unbundling of SEBs as an initial step in planned electric power sector privatization. It remains to be seen, particularly given the recent actions of the Maharashtra Electricity Regulatory Commission with regard to the Dabhol IPP and the Orissa Electricity Regulatory Commission with regard to regulation of private sector electricity distribution companies, how independent of state governments these new electricity regulatory commissions are or can become.

For the purpose of the Legal and Regulatory Review, the concept of regulation has been taken as embracing a wide range of activities that can affect how a particular rural electricity supply entity undertakes its business. This approach has been used in order to begin to understand the relationships between the "official" bodies controlling the actions of rural electricity supply entities and the functioning of these entities. It is through improvements in these relationships that it may be possible under SARI/Energy to enhance rural electricity supply.

Because of the broadness of the definition adopted for rural electricity supply regulation; it is not unusual for a supply entity to have multiple regulators. There are also situations where what has been considered to constitute regulation is not labeled as such. To indicate this, the term *de facto* regulator has been adopted. The powers of *de facto* regulators, while real, are not specifically provided for in any electricity laws or acts. The term regulatory commission is applied to legally constituted electric power sector regulators, such as those established in the India reform states and those being proposed at the national level in Bangladesh and Sri Lanka.

In the Review, the following activities are considered to be the primary activities that constitute electricity supply regulation:

1. Tariffs setting and enforcement.
2. Electricity supply regulations making revision, and enforcement.
3. Licenses issued, enforcement, and revocation for electric power generation, transmission, and distribution.
4. Electricity supply service quality, reliability, and safety standards setting and Enforcement.
5. Consumer protection.
6. Licensees uniform systems of accounts establishment and enforcement.
7. Control of rural electricity supply entities management structures.
8. Control of rural electricity supply entities operational and financial Performance.
9. Arbitration, adjudication, and settlement of disputes among licensees.
10. Ability to use legal means, including use of subpoena powers, to obtain information for tariff and regulations setting and enforcement actions.
11. Land use rights authority, such as the establishment of rights-of-way for electricity distribution systems.
12. Environmental regulation and permitting.
13. Electricity demand forecast preparation, including power to collect information from licensees.

14. Promotion of efficient, economic, and safe electricity supply and use.

In the Review, priority has been given to regulatory activities 1 through 8 because they are judged to be prime indicators of what currently constitutes South Asia rural electricity supply regulation and because of limited resources. Preference has also been given to trying to understand the viewpoints of non-parastatal, regulated rural electricity supply entities compared with regulatory entities. The reasons for this are:

- As result of previous USAID technical assistance, a considerable amount of information is available on the functioning of electric power sector regulatory commissions, established or proposed. This includes promulgated and proposed draft national electricity acts and for India the State Electricity Reform Acts.
- A considerable amount of information is available on the self-regulation of South Asia parastatal electric power utilities involved with rural electricity distribution.
- To date, only limited effort has been extended to understand the viewpoints of regulated rural electricity supply entities outside of the parastatal utilities. Part of the reason for this is the amount of effort required to communicate with what are frequently relatively small rural electricity supply entities located in rural areas. This can mean time consuming travel and the need for translators.

An important regulatory area that has not been explicitly addressed in this Review is the regulation of competition. Such regulation is extremely important where competitive electricity markets are in operation, such as in England and Wales and Norway. In most cases, including the US, issues of competition are regulated separately from electric power sector operation. In the US, the Antitrust Division of the Treasury Department monitors and prosecutes anti-competitive behavior and in England and Wales this function is part of the Ministry of Trade. In this Review, only very limited attention has been given to regulation of competition in the electric power sector because of its lack of existence and unlikely emergence for sometime in South Asia, particularly in the context of rural electricity supply.

Currently, a number of organizational approaches exist in South Asia for realizing rural electricity supply. These vary greatly in complexity and electricity supply capacity, ranging from the national level parastatal utilities having millions of rural consumers to individual households electrified by Solar Photovoltaic (SPV) panels. In order to comprehensively address the legal status and regulation of the different existing organizational approaches to rural electricity supply, an attempt has been made to associate these approaches with a series of organizational structures possessing definite legal status. These organizational structures are called legal modalities.

Table 4-1 presents the 15 rural electricity supply legal modalities identified in the course of the Review. In addition to helping to understand the legal and regulatory issues associated with rural energy supply, it is hoped that the modality definitions will be beneficial to other SARI/Energy rural electricity supply activities. In Table 4-1, the legal modalities have been divided into four groups: 1) Grid-Connected Rural Electricity Distribution Systems; 2) Grid-Connected Rural Electricity Generation; 3) Off-Grid Integrated Rural Electricity Supply Systems; and, 4) Off-Grid Rural Electricity Generation. The primary reason for this division is the profound differences between most grid-connected and off-grid rural electricity supply systems. These differences will become apparent in later parts of this Review.

Table 4-1: Identified Rural Electricity Supply Legal Modalities

Type of Electricity Distributor or Generator	Modality Description	Typical Size Range - Number of Consumers (Households & Other Load Points)	Typical Electricity Range	Annual Sales	Main Bulk Electricity Supply Sources	South Asia Examples	Notes
1.0 Grid-Connected Rural Electricity Distribution Systems							
1.1 Rural Electricity Supply (RES) Cooperative Societies	Consumer owned and managed rural electricity distribution cooperative societies. RES Cooperatives Societies are established under specific legislation /laws providing for and governing cooperatives and are not-for-profit societies.	25,000 to over 150,000	25 to 250 GWh		<ul style="list-style-type: none"> ▪ Grid purchase of electricity ▪ Electricity purchase from small private sector generators based on a range of technologies and fuels ▪ Self electricity generation 	1) India: Rural Electric Supply Co-operative Societies 2) Nepal: The recently established South Lalitpur Electric Cooperative Ltd. and likely the new Danida funded rural electrification projects in Kanchanpur and Kailali Districts	Cooperative societies may own some generation, but typically most are primarily electricity distributors that purchase electricity from government and/or private sector generators including small rural generators
1.2 Government Rural Electricity Supply Boards	Government controlled, central rural electricity board that functions through multiple local rural electricity supply societies involving rural consumer participation in local societies management and	25,000 to over 100,000 (individual consumer societies)	25 to 400 GWh (individual consumer societies)		<ul style="list-style-type: none"> ▪ Grid purchase of electricity ▪ Electricity purchase from small private sector generators based on a range of technologies and fuels ▪ Self electricity generation 	Bangladesh: Bangladesh Rural Electricity Board (BREB) and Palli Bidyut Samities (PBSs)	1) BREB is a central government entity specifically created to implement rural electricity supply. BREB currently owns and regulates 67 PBSs. It exercises

Type of Electricity Distributor or Generator	Modality Description	Typical Size Range - Number of Consumers (Households & Other Load Points)	Typical Electricity Range	Annual Sales	Main Bulk Electricity Supply Sources	South Asia Examples	Notes
	operation						considerable control over operation of the PBSs and provides financing. 2) Modality proposed by NRECA to the West Bengal Rural Energy Development Corp. for rural electricity supply.
1.3 Private Sector Distribution Companies	Rural load served by private sector electricity distribution companies that own or have a long-term lease or concession on a distribution system and manage the system	100,000 to over 1,000,000	70 to over 1,000 GWh		<ul style="list-style-type: none"> ▪ Grid purchase of electricity ▪ Self electricity generation based on a range of technologies and fuels ▪ Electricity purchase from small private sector generators based on a range of technologies and fuels 	<ol style="list-style-type: none"> 1) India: Bombay Suburban Electricity Supply's (BSES) three Orissa electricity distribution companies for village electricity supply 2) India: Rural electricity supply by private sector utilities (Noida Power Co., etc.) outside of Orissa 	<ol style="list-style-type: none"> 1) Typically the private sector distribution companies also supply urban and near-urban consumers along with rural load. 2) Rural load is frequently considered of secondary importance by private sector distribution companies

Type of Electricity Distributor or Generator	Modality Description	Typical Size Range - Number of Consumers (Households & Other Load Points)	Typical Electricity Range	Annual Sales	Main Bulk Electricity Supply Sources	South Asia Examples	Notes
						3) Nepal: Isolated grids built by NEA, but leased to private sector operators 4) Nepal: Butwal Power Company if successfully privatized	
1.4 Private Sector Distribution Companies Rural "Franchising" (Retailing?)	Most operations of rural electricity supply are managed and implemented by private sector franchisees of a private sector electricity distribution company	1,000 + consumers per franchise	0.5 to over 2 GWh		<ul style="list-style-type: none"> ▪ Grid purchased electricity 	India: Being considered by BSES for Orissa village electricity supply through their three distribution companies	1) A concept that BSES "appears" to be <u>developing</u> to deal with rural load as a result of its operating experience in Orissa 2) Concept may involve establishment of an electricity retailer 3) Considered a separate modality because the franchisee appears to function "mainly" as a retailer

Type of Electricity Distributor or Generator	Modality Description	Typical Size Range - Number of Consumers (Households & Other Load Points)	Typical Electricity Range	Annual Sales	Main Bulk Electricity Supply Sources	South Asia Examples	Notes
1.5 Consumer Owned Association/Society Providing Rural Electricity Supply Services to a Government Owned Utility	Consumer owned association operating rural electricity supply under a lease agreement with a government electricity distribution utility	5,000 to 25,000	0.5 to 3 GWh		<ul style="list-style-type: none"> ▪ Grid purchased electricity 	Nepal: Lamjung Electricity Association	<ol style="list-style-type: none"> 1) Lamjung Electricity Association operates part of NEA's rural electricity grid under a lease agreement 2) Establishment of the Association was a rural electrification project loan covenant
1.6 Government Owned and Operated Integrated or Distribution Electric Utilities	Rural electricity supply provided by a government owned integrated electric power utility or electricity distribution utility	100,000 to over 1,000,000	70 to over 1,000 GWh		<ul style="list-style-type: none"> ▪ Self electricity generation ▪ Purchase from other generators 	<ol style="list-style-type: none"> 1) India: Main rural electricity supply modality through the State Electricity Boards 2) Sri Lanka: Main rural electricity supply modality through Ceylon Electricity Board (CEB) 3) Nepal: Main 	<ol style="list-style-type: none"> 1) Rural consumers served by national or state government owned and operated electricity boards 2) Rural load frequently provides financial problems for electricity boards due to high

Type of Electricity Distributor or Generator	Modality Description	Typical Size Range - Number of Consumers (Households & Other Load Points)	Typical Electricity Range	Annual Sales	Main Bulk Electricity Supply Sources	South Asia Examples	Notes
						<p>rural electricity supply modality through Nepal Electricity Authority (NEA)</p> <p>4) Bangladesh: Limited rural electricity supply through the Power Development Board (BPDB) in parallel with BREB</p>	subsidies
2.0 Grid-Connected Rural Electricity Generation (Small Generators)							
1.1	Rural Electricity Generation Companies	Private sector generators primarily supplying electricity to rural distribution entities	N.A.	1 to 20 MW (installed capacity range)	<ul style="list-style-type: none"> ▪ Natural gas ▪ Mini-hydropower 	<p>1) Bangladesh: IPPs selling electricity to BREB</p> <p>2) Nepal: Private sector generators selling electricity to NEA isolated</p>	<p>1) Generator could be an IPP as in Bangladesh</p> <p>2) Generator could be partially owned by a Rural Electricity Supply Cooperative</p>

Type of Electricity Distributor or Generator	Modality Description	Typical Size Range - Number of Consumers (Households & Other Load Points)	Typical Electricity Range	Annual Sales	Main Bulk Electricity Supply Sources	South Asia Examples	Notes
						grids	Society
2.2 Rural Surplus Electricity Generators	Private or public sector rural companies that self-generate electricity and sell excess to the grid	N.A.	1 to 20 MW (installed capacity range)		<ul style="list-style-type: none"> ▪ Mini-hydropower ▪ Other renewable energy sources 	<ol style="list-style-type: none"> 1) Sri Lanka: Tea Plantations selling to local grid 2) India: sugar industry cogenerators 	Electricity supply is usually not the main business of the generator
3.0 Off-Grid Integrated Rural Electricity Supply Systems							
3.1 Individual Household Electricity Supply	Electricity generation and storage systems owned and operated by individual households	1	Up to 250 W (installed capacity range)		<ul style="list-style-type: none"> ▪ Solar photovoltaic ▪ Peltric hydropower sets 	<ol style="list-style-type: none"> 1) India, Nepal, Sri Lanka, Bangladesh: Household SPV systems 2) Nepal: Peltic sets 	This modality includes private sector service companies and/or individuals that provide maintenance services to household system owners
3.2 Individual Household Electricity Supply Utilities	Household electricity generation and storage systems owned and serviced by a utility	1	Up to 250 W (installed capacity range per household)		<ul style="list-style-type: none"> ▪ Solar photovoltaic 	Bangladesh: Proposed approach for BREB provision of SPV systems to off-grid households	Avoids need for household to initially purchase SPV system
3.3 Village Electricity Distribution Systems	Small generation and distribution systems owned and operated by villages	5 to 300	0.5 to 60 MWh		<ul style="list-style-type: none"> ▪ Micro-hydropower ▪ Solar photovoltaic 	<ol style="list-style-type: none"> 1) India: village hydropower schemes 2) Sri Lanka: village hydropower schemes 	Characterized by limited grid size and low voltage or dc electricity distribution

Type of Electricity Distributor or Generator	Modality Description	Typical Size Range - Number of Consumers (Households & Other Load Points)	Typical Electricity Range	Annual Sales	Main Bulk Electricity Supply Sources	South Asia Examples	Notes
						3) Nepal: Village hydropower schemes	
3.4 Consumer Owned Mini-Grid Electricity Distribution Systems	Generation and distribution systems owned and operated by villages	80 to 5,000	1 to 5 GWh		<ul style="list-style-type: none"> ▪ Solar photovoltaic ▪ Mini-hydropower ▪ Biomass Gasification ▪ Hybrid generation combining renewable and fossil fuels based generation 	1) India: Sargar Island Cooperative Society (West Bengal) 2) Nepal: Salleri Chialsa Electricity Co. and Khumbu Bijuli Co.	1) May overlap with 3.3 modality 2) Characterized by high voltage and three phase electricity supply compared with 3.3
3.5 Government Owned Mini-Grid Electricity Distribution Systems	Generation and distribution systems owned by government utilities and partially operated by villages	80 to 5,000	1 to 5 GWh		<ul style="list-style-type: none"> ▪ Solar photovoltaic ▪ Mini-hydropower ▪ Biomass Gasification ▪ Hybrid generation combining renewable and fossil fuels based 	1) India: Sunderbans SPV and biomass gasification schemes (West Bengal) 2) Nepal: NEA SPV and mini-hydropower	Characterized by high voltage and three phase electricity supply compared with 3.3

Type of Electricity Distributor or Generator	Modality Description	Typical Size Range - Number of Consumers (Households & Other Load Points)	Typical Electricity Range	Annual Sales	Main Bulk Electricity Supply Sources	South Asia Examples	Notes
					generation	schemes	
4.0 Off-Grid Rural Electricity Generation (Micro & Small Generators)							
4.1 Isolated Rural Private Sector Generation Companies	Small private sector owned generators that sell electricity to rural distribution systems	N.A.	50 kW to 1 MW (installed capacity range)		<ul style="list-style-type: none"> ▪ Mini-hydropower ▪ Wind 	Nepal: Off-grid mini-hydropower schemes	Ownership of generation and distribution system are separate
4.2 Local Government Owned Generation Stations	Small government owned generators that provide electricity to rural distribution systems	N.A.	50 kW to 1 MW (installed capacity range)		<ul style="list-style-type: none"> ▪ Mini-hydropower ▪ Wind 		Ownership of generation and distribution system are separate

N.A. = Not Applicable

In Table 4-1 each modality represents a structure under which a rural electricity generator, distributor, or integrated generation-distribution entity could be organized for purposes of operating an electricity supply business and be subject to rationale and enforceable regulation. To aid in understanding the different modalities, the table presents the current South Asia rural electricity supply examples on which the modalities are based. It also defines typical basic size parameters for each modality identified. It is believed that all of the modalities are equally applicable throughout South Asia.

An important feature of each modality and part of the rationale for their definition is that one or more well-defined legal structures can be associated with each modality. An exception is the off-grid Individual Household Electricity Supply modality. Here regulatory issues apply to the industry providing and maintaining the individual electricity supply systems, primarily SPV systems, to protect consumers, and ensure high levels of electricity supply reliability. In analyzing the ownership options for rural suppliers presented in Table 4-1, it was discovered that significant similarities were found between legal modalities in Bangladesh, India, Nepal, and Sri Lanka. This is not surprising given the common basis for the legal systems in these nations. The legal approaches that are believed to be available in all four nations and which are in use in at least one nation for electricity supply are:

1. Registration of a consumer owned, community based electricity supply entity as a Society (India) or a Voluntary Social Services Organization (Sri Lanka). This is the most uncomplicated, but also the most legally limited approach for organizing an electricity supply entity. Specific legislation (act or law) in each nation and for India in each state, defines the specific actions required to form a Society, how it must be registered with a specific government entity, who can be members and their voting powers, and rules and regulations the Society must adhere to. In all of the Society's laws reviewed, a Society is recognized as a not-for-profit entity and as such is exempt from income taxes. The activities of a Society are defined in a Memorandum of Association or similar document prepared by the Society in accordance with the Society's Law and filed with a Registrar. The Registrar can exercise considerable power, such as, force reorganization or termination, over a Society or Voluntary Organization if it does not meet its legal requirements.
2. Registration of a member owned electricity supply entity as a Co-operative Society. Co-operative societies have a long history in Europe, the US and South Asia, and encompass a wide range of activities. Such societies are characterized by a group of consumers or producers banding together to achieve a common business purpose through self-help and mutual aid. The legislation (acts or laws) providing for the registration of a Co-operative Society is more comprehensive than the analogous legislation governing a Society or Voluntary Social Services Organization. This legislation exists at the national level in Bangladesh, Sri Lanka, and Nepal and at the State level in India. A Co-operative Society is a not-for-profit entity and as such is exempt from income taxes. The activities of a Co-operative Society are defined in its bye-laws, which are prepared by the Co-operative Society in accordance with the Co-operative Society law and filed with a Registrar. As with a Society organizational approach, the Registrar can exercise considerable power

over a Co-operative Society if it contravenes the provisions of the Co-operatives Society Act and Rules and is usually part of a ministry that specifically deals with Co-operative Societies.

3. Registration of an electricity supply business as an incorporated entity under a Companies Act. This is the legal mechanism for establishing a company owned by shareholders with the voting rights of each shareholder dependent on the number of shares held and for limiting corporate liability. Electricity supply entities can be incorporated under Companies Acts by governments with the government owning all or part of the company's shares. Companies are subject to income tax. The regulation of a company under a Companies Act is more comprehensive than for Co-operative Societies and registration is also a more complex and expensive process.
4. Creation of a government owned and operated parastatal entity for purposes of electricity supply. Parastatal entities are created under Electricity Acts or Ordinances. As indicated previously, this is the predominate organizational structure for electricity supply entities in South Asia.

Each of the four basic approaches to establishing a legal body for purposes of rural electricity supply is suited to the specific requirements for which it was created. Under approaches 1 through 3, many of the regulatory actions identified for this Review are vested in the governmental body under which the entity is registered, usually a ministry or secretariat. In the absence of a specific electricity supply regulator, these bodies can be de-facto regulators for rural electricity supply. If an electricity regulator is created after registration of electricity supply entities, there could be a conflict between the governmental body responsible for some form of regulation and the electricity regulator. It could be beneficial to address any such conflicts in the enabling legislation for new electricity regulatory commissions.

In some cases, special laws to promote economic development of disadvantaged rural populations and/or development of special resources may exist for organizing a rural electricity supply business. These were not considered in detail in this Review.

The concept of the creation of a legal regulatory body for business purposes is important for effective and efficient operation of rural electricity supply entities. When properly applied and managed, the existence of a legal regulatory body may provide:

- A framework for clear tariff setting and enforcement.
- The ability to use tariffs to provide performance incentives.
- Legal ability of an electricity supplier to collect tariffs.
- Transparency of tariffs and applicability period.
- Transparency for regulation and for performance monitoring and reporting requirements.
- A legal body for construction and operations financing.
- A defined point for consumer claims and claims resolution, including obtaining electricity connection.
- Assets (investment) protection.
- Sound and transparent, service standards, safety standards and regulations.

- A legal body for environmental permitting and environmental regulations enforcement.
- Orderly legal actions when required.
- A defined time period to provide electricity generation and/or distribution services.
- Electricity price stability to consumers and generators.
- Limited liability to owners.

In Table 4-1 a distinction is made between rural electricity distribution and generation. There is a general feeling that generation may be a more attractive investment opportunity to private sector investor-operators than rural electricity distribution, particularly where a distributing entity is not financially strong. This would seem to be born out by the emergence of small, private sector generators in India, Nepal, and Sri Lanka. These generators are actively seeking new creditable consumers when they are allowed to sell electricity directly to such consumers. Several of the Indian States have been proactive in promoting such generators based on renewable energy sources in rural areas by allowing them to wheel electricity using the SEB transmission system and “bank” electricity with their SEBs. This may be a growing trend and one worth promoting through sound regulation, because of the general shortage of generating capacity in South Asia and the fact that generation is the most capital intensive component of electricity supply.

Today in the SARI/Energy South Asia nations of India, Sri Lanka, Bangladesh, and Nepal, 50 percent of the population is estimated to be without electricity. These amounts to approximately a half a billion people. In the rural areas of South Asia, the unavailability of electrification increases collectively to an estimated 75 percent. Figure 1 summarizes the disparity between urban and rural access to electricity in South Asia based on the number of households served by electricity. At current rates of rural electrification and population growth, it would take at least 35 years to achieve complete electrification in rural South Asia.

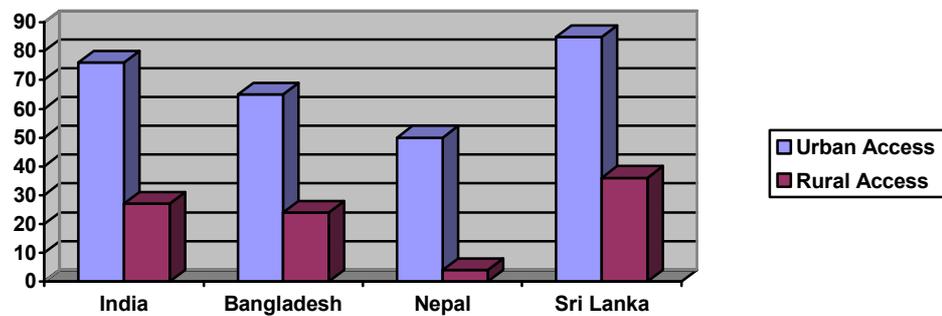


Figure 5-1: Estimated Urban And Rural Electricity Access Percent of Respective Households

The estimates presented in Figure 1 are very approximate and have been developed using a number of different sources in each nation, including census data. One complication is the different definition used in various nations to attempt to quantify the number of consumers actually being supplied electricity. In India for example, the main indicator of rural electrification is the number of villages connected to a regional electricity grid. However, the number of households in each connected village is only vaguely quantified. Also, with the exception of Bangladesh and limited service territories in India, specific measures of the amount and service quality of rural electricity supply are not maintained or are not consolidated at a level where they are readily available. The difficulty of making rural electricity supply estimates is only one indication of the problems associated with obtaining a sound understanding of the current rural electricity supply situation.

In addition to the four countries in Figure 1, SARI/Energy currently includes Bhutan and the Maldives. Eighty-three percent of Bhutan's population is rural with only approximately 15 percent of the rural population having access to electricity. Sixty-nine

percent of the Maldives population is located in small islands. Of the Maldives 200 inhabited islands, only 23 islands have regular and continuous electricity supply. The four main nations under SARI/Energy were examined to determine how rural electricity supply is currently regulated. In the cases of Bangladesh, Nepal, and Sri Lanka it was possible to be quite comprehensive. However, there remains a significant amount of information that is needed to more fully understand the case of Nepal. For India, it was only possible to sample the current situation. In India, virtually all rural electricity regulation is at the State level; an entirely reasonable situation. Therefore, the regulatory mechanisms in two states were reviewed: Andhra Pradesh because it is a reform state with a new Electricity Reform Act (1998), an established regulatory commission, has functioning rural electricity supply co-operative societies; and West Bengal, because of its consideration of changing the approach to rural electricity supply away from its Electricity Board and towards development of off-grid rural electricity supply systems.

5.1 Bangladesh

In Bangladesh the responsibility for rural electricity supply is straightforward and clear; it rests with the BREB. GOB established BREB under The Electrification Board Ordinance, 1977, to specifically implement rural electrification through national grid extension. It has become a model for sustainable development of rural electricity supply. Since its inception, BREB has brought grid supply electricity to 2.9 million rural consumers and is currently connecting new rural consumers at a rate of 1,000 per day.

Grid-Connected Rural Electricity Supply Regulation

With extremely minor exceptions, all rural electricity in Bangladesh is provided through the national grid. BREB is the owner, manager, and exclusive regulator of the rural electricity supply system - grid and off-grid. It also plans and manages rural grid construction. The operational structure of BREB is unique within South Asia. For this reason, in Table 4-1, it represents a specific legal modality.

BREB consists of the Board and Palli Bidyut Samities (PBSs). The PBSs are organized along the lines of cooperative societies with all electricity consumers within a PBS service territory required to be a member of the PBS. However, the PBSs are not registered as cooperatives under the Bangladesh Co-operatives Societies Act. Under The Electrification Board Ordinance, the PBSs are registered with BREB. The Electrification Board Ordinance specifically gives BREB the authority to "approve the rate of electricity to be levied by the Samities and any other groups for sale of electric power to their members and in doing so shall see that the rate enables the Samities and other groups to at least recover costs of financing, operation, and maintenance and depreciation of assets". GOB determines directly the price for bulk electricity purchased by BREB from BPDB and the price for sales of electricity to BPDB by BREB. BREB, jointly with the PBSs, owns the 140 MW Mymensingh Power Station and purchases electricity from small IPPs that specifically serve the PBSs. Bangladesh currently does not have an electricity regulatory authority, but its draft Electricity Act would establish one. Electricity tariff setting outside of the rural areas supplied by BREB and bulk electricity tariff setting authority rests with the Ministry of Power, Energy and Mineral Resources.

BREB currently has under its jurisdiction 67 PBSs and typically implements several new PBSs every year. The new PBSs are progressively moving into the more remote regions of the nation where load densities and the abilities of consumers to pay for electricity are low. A Board of Directors elected by its members manages each PBS and each is governed by a standard set of bye laws developed by BREB. Among other things, the bye laws establish: the conditions for PBS membership; the rights and liabilities of the members; the requirement for an annual members meeting and the conduct of this meeting; the powers of the PBS Board of Directors including specific provision for "Lady Advisors" to the Board; the PBS as a non-profit society; accounting standards; accounts audit requirements; and, the types of financial transactions a PBS can undertake.

In addition to the provisions of the PBS bye-laws and tariffs setting, BREB regulates the PBSs through annual Performance Target Agreement contracts signed with each PBS through and continuous PBS management and financial performance monitoring. The contracts establish clear and quantifiable financial, operating, and service performance targets. These targets are tailored to each PBS, depending on its maturity, size, and the characteristics of its service territory, which includes the ability of its consumers to pay for electricity. Performance targets are agreed jointly between the Board and the PBS Presidents and are worked out through meetings between the Board and PBS managers. Financial incentives and penalties are associated with a PBS's performance under its Performance Target Agreement contract with BREB. This is the only example of incentive-based rural electricity supply regulation found in South Asia.

As part of its regulatory authority, BREB also has the authority to replace the management of any PBS that it determines is not performing satisfactorily. Also, once a PBS Board of Directors has appointed a General Manager it cannot replace the General Manager without the prior approval of BREB.

BREB has designed an efficient, computerized management information system for monthly monitoring the performance of each PBS. This includes mandatory accounting and financial information reporting standards for the PBSs. BREB and the PBSs have perfected the PBS performance contracting and monitoring process over a number of years. This has resulted in one of the best managed utilities, particularly for rural electricity supply, in South Asia. Some of its accomplishments based on the 1999 - 2000 operating period include: metering of all consumers, prompt connection of new consumers (PBS members), prompt disconnection of non-paying consumers, issuance of printed bills monthly to each consumer, direct delivery of bills to consumers by messengers, an average bill collection rate of 96.93 percent, and electricity losses of 13.85 percent.

Another aspect of BREB regulation of rural electricity supply is the establishment of equipment, service, and safety standards. With technical assistance from the US National Rural Electric Cooperative Association (NRECA), these have been developed specifically for rural conditions in Bangladesh. Monitoring and enforcement of these standards is part of the PBS performance contracts.

BREB is responsible for all financing of the PBSs. In this regard, it represents a very creditworthy legal body for financing rural electricity supply. The repayment of loans made by BREB to the PBSs is a primary criterion for the tariffs established by BREB for each PBS. Loan repayments are used to finance new PBSs through a revolving loan fund.

BREB was established with considerable technical assistance from NRECA through funding provided by USAID over the past 20 years. Over this period, it has received approximately \$1.1 billion in grant aid from a wide range of donors and the GOB. A key question with regard to the BREB rural electricity supply modality, is could it be replicated in other South Asian nations without significant levels of foreign assistance; both financial and technical? This question might be answered if the West Bengal State Government implements a proposed plan to replace SEB rural electricity supply with some form of rural cooperatives.

Like elsewhere in South Asia, the Bangladesh electric power sector is being reformed and restructured to improve performance and provide for international private sector financing of urgently needed electricity supply projects. The reform and restructuring is being pushed by both ADB, the World Bank, and bilateral donors who are attempting to use their lending and donor leverage to entice GOB to move toward implementation. The proposed reform and restructuring includes all of the usual features of electric power sector reform and restructuring: establishment on an independent and autonomous regulatory commission with full tariff setting power; unbundling of the BPDB (this has been partially accomplished); establishment of wholesale electricity competition; asset revaluation; tariff increases to achieve the ADB's and World Bank's standard financial performance targets; and, privatization of at least some unbundled entities through transparent, competitive bidding involving international utility investor-operators.

One outcome to date of power sector reform and restructuring is the drafting of a new Electricity Act. Though the draft is GOB confidential, the Act reportedly does not specifically recognize the existence of BREB nor provides protection for its current mode of operation. If and when an electricity regulatory commission is established, it is understood that it would be responsible for setting BREB's bulk supply electricity tariff. However, it is not clear if BREB would retain tariff setting authority for the PBSs. These issues need to be resolved.

Off-Grid Rural Electricity Supply Regulation

To date, GOB has concentrated its resources on achieving rural electrification through grid extension. As a result, there has been little development on off-grid rural electricity supply systems despite the limited extent of the current rural grid. However, micro-grids operating on a totally unregulated basis exist to supply electricity to some rural bazaars. These systems are based on diesel and gasoline generation sets. Because they are unofficial, no data exists for these systems. However, reportedly they charge high prices for electricity; an indication of the value of electricity to rural consumers as well as an indication of their ability to pay for rural electricity service..

Recently, two developments have resulted in the opening up of off-grid rural electricity supply in Bangladesh. To date, the developments are confined to household SPV systems. This is consistent with Bangladesh's rural energy resource base where there is only limited development potential for hydropower and wind power. The two recent developments are 1) the emergence of a household SPV industry with NGO and bilateral donor support and 2) the BREB's adoption of a renewable energy policy and implementation strategy for off-grid electricity supply.

Grameen Shakti, a subsidiary of Grameen Bank, has been a leader in building a household SPV industry in Bangladesh by providing financing to rural consumers for such systems through its rural banking network consisting of 1,170 branch banks. Grameen Shakti is a non-profit company registered under the Company Act of 1994 of Bangladesh. Over the past four years, with assistance from the International Finance Corporation (IFC), it has financed nearly 5,800 household SPV systems.

BREB's, renewable energy policy has selected household SPV systems as it's preferred option for providing electricity supply to the regions of Bangladesh that will not be reached by the rural grid for at least five-years. Whereas the Grameen Shakti program involves the direct sales of household SPV systems to rural consumers using credit, the BREB program would provide similar systems on a monthly fee basis with the PBSs retaining ownership of the household SPV systems. The monthly use fee would be set by BREB and would be based on a measure of a consumer's ability to pay for a system. A PBS would also be responsible for maintaining the household SPV systems it owns.

So far the off-grid rural electricity supply in Bangladesh is confined to household SPV systems. Therefore, there are no major issues related to legal frameworks or regulation with the exception of "tariff setting" by BREB for the systems it supplies and quality assurance and quality control for the equipment supplying industry. As part of its financing of household systems, Grameen Shakti has attempted to act as a de-facto regulator of the SPV supply industry by attempting to impose and enforce quality standards on this industry. When BREB initiates its household SPV service, it will develop and implement quality assurance and quality control systems. These will likely become the standards for the SPV industry in Bangladesh. In establishing these quality assurance and quality control procedures, both BREB and Grameen Shakti could likely benefit from ongoing household SPV programs in India, Nepal, and Sri Lanka.

To support development of rural household SPV systems, the World Bank is currently developing a Rural Electrification and Renewable Energy Development Project. This projected \$188 million, five-year project would include: 1) the building of technical and management capacity for the household SPV industry; 2) the development of standards and testing programs; 3) financing to buy-down the capital cost of household SPV systems to improve affordability; and, 4) "identifying mechanisms to promote sustainability and replicability" of the program. The Project appears to incorporate many of the features being implemented very successfully under a similar World Bank Project in Sri Lanka - the Energy Services Delivery Project (see Section 7.4). This includes dealing with legal framework and regulatory issues related to rural household electricity supply and isolated micro-grids.

5.2 India

In India, 74 percent of the population lives in rural regions, where the main source of electricity supply is from the integrated electricity supply grids owned and operated by the parastatal SEBs. This is the result of a nationalization of the electric power industry following independence and a massive program of rural electrification initiated by GOI over 30 years ago. The SEBs currently have immense financial and operational problems, and the rural components are indicated to be the worst performing parts. This is usually attributed to the heavily subsidized tariffs in the rural regions, free electricity to agricultural consumers in two states, poor bill collection rates and high electricity losses, (both technical and commercial losses). However, it is difficult to make sweeping statements about the condition of rural electricity in India and some caution is in order. In the course of this review, no comprehensive analysis of the status of rural electricity supply across India was located. However, the World Bank is just completing a study on the condition of rural electricity supply that may contribute to a better understanding of the current situation.

When considering India's rural electricity supply, it is beneficial take into account both the enormity of the task and what has been accomplished to date. According to 1991 census data, India's has 587,258 villages. Of these, reportedly by March 1999, 504,823, or 86 percent, have been "electrified". Even if "electrified" does not mean that all households in a village have electricity, this represents a major accomplishment for South Asia. Further, at least nine States are considered 100 percent electrified. Of the 80,000 currently "unelectrified" villages, the GOI is currently implementing a program aimed at completing electrification by 2012. Under this program, all but 18,000 villages are planned to be grid connected. Electricity supply for the "difficult" villages, under the current electrification program is to be provided by off-grid electricity systems. The planned budget for electrifying the "difficult" villages is \$180 million spread over 10 years.

Grid-Connected Rural Electricity Supply Regulation

With two exceptions, regulation of grid-connected electricity means the regulation of the SEBs. In this Review only two states were sampled, Andhra Pradesh and West Bengal, because of resource constraints and a perceived need to better understand the alternatives available to rural supply by the SEBs. Considerable information is readily available on the operation and performance of the SEBs; much of it associated with recent World Bank and ADB loans to a number of SEBs to promote reform and restructuring. Much less information is readily available on alternative rural electricity approaches and how their performance relates to legal and regulatory issues. The exceptions to SEB grid-connected rural electricity supply are Co-operative Electric Supply Societies and private sector electricity distribution companies.

Andhra Pradesh is one of the reform states with a new electricity act, The Andhra Pradesh (AP) Electricity Reform Act, 1998, and an electricity regulatory commission established in March 1999, the Andhra Pradesh Electricity Regulatory Commission (APERC). AP has also unbundled its former SEB into two corporations under the Companies Act, 1956

to form the Generation Corporation of Andhra Pradesh, Ltd. and the Transmission Corporation of Andhra Pradesh, Ltd. (APTRANSCO). APTRANSCO is now responsible for electricity distribution throughout AP.

The AP Electricity Reform Act, 1998 was reviewed from the standpoint of specific provisions related to the regulation of rural electricity supply, including any incentives for improving such supply. The Reform Act and the APERC created under it:

1. Is based on the concept of regulation through the issuance of licenses for electricity supply. A Distribution and Retail Supply License defines the service territory in which a licensee can sell electricity and requires compliance with regulations and service standards established by APERC.
2. Is indifferent to the legal modality of an entity requesting a license from APERC. As long as the applicant can meet the requirements of the Act, it is eligible to be considered by APERC for issue of a license.
3. At the time of enactment, provisional licenses were provided for both APTRANSCO and the Rural Electric Co-operative Societies then operating in AP. These appear to be a pass-through of previous operating regulations, i.e., operating regulations under the former SEB.
4. In reviewing a request for a supply license, APERC is not constrained to grant exclusive licenses for a specific service territory.
5. Does not define a specific license period under which a licensee may operate subject to revocation by APERC for just cause.
6. Does not distinguish between grid connected and off-grid electricity supply. This is likely a moot point since AP is considered to be completely electrified.
7. The same regulations and performance and safety standards apply to all supply licensees. While there are no special provisions for rural electricity, such as standards tailored to rural conditions to reduce construction cost, it appears that the APERC could grant these if so requested in a license application if it deemed such to be in the best interest of AP.
8. Does not appear to guarantee open access to the transmission network or provide for electricity “banking”.
9. Tariff setting is based on the cost of service including a statutory rate of return. However, it appears that APERC may have the prerogative to implement incentive based tariffs if and when it deems such is in the best interest of AP.
10. There are no specific incentives for investment in rural electricity supply.

An attempt was made to meet with APERC, but scheduling conflicts prevented such a meeting. This is considered a deficiency of the Review that should be addressed in follow up activities. It is important to obtain the specific views of the APERC on rural electricity supply issues and raise the regulatory issues identified in this Review.

APTRANSCO is the main AP rural electricity supplier. Through incorporated under the Companies Act, APTRANSCO is 100 percent AP government owned and functions in a manner similar to the transmission and distribution component of the AP SEB. As such, it represents the Government Owned and Operated Distribution Electric Utility legal modality. APTRANSCO is a licensee of APERC, which is its exclusive regulator. This

includes the setting of APTRANSCO's rural retail electricity and bulk supply tariffs. The license also establishes service and financial reporting requirements for APTRANSCO. However, it is unlikely that APERC could revoke APTRANSCO's license or penalize it for not complying with provisions of the Electricity Reform Act.

The other grid connected rural electricity supply modality in AP is The Co-operative Electric Supply Society. Nine such Co-operative Societies are currently in operation. . All of these are registered under The AP Co-operative Societies Act, 1964 and are subject to regulation by the Registrar of Co-operative Societies and must conform to AP's Co-operative Societies Rules. These define the bye-laws, membership requirements, and financial reporting and auditing requirements for a Co-operative Society. The Co-operative Societies Registrar is part of the AP Ministry of Co-operative Societies. Technical advice is provided to the Registrar by the technical staff of the AP Secretary for Energy.

In addition to the Registrar of Co-operative Societies, the Rural Electric Co-operative Societies must be licensed by APERC. The provisions of the current licenses issued to AP Rural Electric Co-operative Societies appear to place considerable new requirements on the Societies and do not recognize any differences between a private sector electricity supplier and a co-operative society supplier. The new requirements include: 1) compliance with the Distribution Code and Construction Practices that apply to APTRANSCO; 2) an obligation to connect consumers, apparently without such consumers complying with a Society's bye-laws; and, 3) having to obtain approval from APERC for current billing practices, consumer disconnection procedures, and the handling of consumer complaints. At this time it is unclear how the new requirements of the APERC will impact the operation of the AP Rural Electric Co-operative Societies and how conflicts between the Electricity Reform Act and the Co-operatives Society Act will be resolved. Licenses were only issued to the Co-operative Societies in 2000. However, some Societies have begun to petition for changes such as the granting of licenses for a more reasonable period than one year.

Concerning retail electricity tariffs, APERC licenses issued to the Co-operative Societies require that "tariffs applicable to consumers shall be the same as are applicable to the similarly placed consumers of the Distribution & Retail Supply Licensee in the surrounding area". The "surrounding area" means APTRANSCO. The bulk supply tariff that APTRANSCO is allowed to charge to a co-operative society is also determined by APERC. The bulk supply tariff for the co-operative societies is based on APERC's understanding of a society's cost of supply, including a return on its assets. The currently allowed rate of return is the prevailing bank rate plus 5 percentage points. This means that the AP subsidy to co-operative society members (consumers) is "built into" the APTRANSCO bulk supply tariff.

AP is not the only State with operating Electric Supply Co-operative Societies. Currently, according to the Rural Electrification Corporation, Ltd. (REC), there are 33 operating rural electric co-operative societies in India. These are registered under their respective State Co-operative Societies Acts. As such, at minimum they are subject to

regulation under these Acts. Table 5-1 presents general data obtained to date for India's operating rural electric supply societies.

Table 5-1: Rural Electric Co-operative Supply Societies Data

Rural Electric Co-operative Society (RECS)	Date Of Operation	Number of Consumers	Annual Electricity Sales - GWh	Connected Electricity Load - kWh
Andhra Pradesh				
1. Anakapally	1976	73,641	26.78	
2. Athmakur	1984	33,534	4.74	
3. Cheepurupally	1982	28,433	14.42	
4. Jogipet	1982	45,722	71.58	
5. Kadiri - East	1984	27,766	36.19	
6. Kadiri - West	1983	31,242	20.79	
7. Kuppam	1982	59,830	62.90	
8. Rayachoty	1976	46,004	46.69	
9. Sircilla	1970	157,833	173.00	
Gujarat				
Kodinar				
Karnataka				
10. Hukeri	1970	65,688	111.5	65,688
Maharashtra				
11. Mula Parvara	1971	132,608	529.4	200,191
Madhya Pradesh				
12. Charama	1989	17,697	23.5	8,665
Uttar Pradesh				
Lucknow				
West Bengal				
Singur Haripal	1980	74,458	55.3	

Source: Rural Electrification Corporation, Ltd. and Sircilla and Singur Haripal Rural Electric Co-operative Societies

Many of the Indian co-operative societies are of the same approximate size as the BREB PBSs. A typical PBS serves approximately 50,000 consumers. However, several of the PBSs located close to Dhaka are considerably larger.

Knowledge of the existence of rural electric supply co-operative societies is not new. However, in discussions with the SEBs and others involved in designing new electricity distribution companies as part of state electric power sector reform and restructuring, the co-operative societies are usually considered to be ineffective electricity suppliers. Little consideration has been given to using this rural electricity supply modality as part of reform and restructuring in India. However, this may be changing. The success of the BREB and the wider appreciation in South Asia of its accomplishments may be contributing to this change.

One potential sign of such change is occurring in West Bengal. The Government of West Bengal in response to the deterioration of rural electricity supply in the State, in 1998 established the West Bengal Rural Energy Development Corporation, Ltd. (WBREDC). One of the main objectives of WBREDC is "to acquire and take over from WBSEB, DPL and other agencies and cooperatives the transmission and distribution system in rural areas". According to the former WBREDC Director, the State Government accepts the fact that subsidies will be required for rural consumers. What it is seeking is a rural electricity supply modality that minimizes this subsidy. Reportedly, the WBSEB is currently unable to collect sufficient revenue from its rural consumers to cover the salaries of its rural staff, let alone to cover the cost of electricity supplied. Under USAID funding, NRECA has been supporting the Government of West Bengal and WBREDC in assessing the merits of implementing rural electricity supply based on the BREB modality. Reportedly, the Government of West Bengal and WBREDC are planning to announce the approach they plan to use to resolve their rural electricity supply "problem" in 2002.

Another sign of potential change is unfolding in Orissa, the first State to privatize electricity distribution. In 1999, Bombay Suburban Electricity Supply, Ltd. (BSES) purchased a controlling share in three of the four distribution companies created as part of Orissa electric power sector restructuring. One of the major problems they have encountered in converting these distribution companies into commercial operations is collection of billings from their village consumers. To address this problem, BSES undertook a pilot project covering 100 villages involving the formation of Bidyut Sanghas (Village Electricity Committees). A Bidyut Sanghas functions as a central point within a village for matters concerning electricity supply. These include service complaints, meter reading, billing, handling new connection requests, disconnection, and credit control. The pilot project was sufficiently successful that BSES is considering replicating it in all three of its Orissa distribution companies and turn franchising of the operation of the Bidyut Sanghas over to "local grass root entrepreneurs". This development is reflected in the Table 3 Private Sector Distribution Companies Rural "Franchising" legal modality. A more complete understanding of BSES's franchising approach needs to be obtained. This could not be accomplished under this Review due to time constraints.

To obtain the perspective of the existing rural electric co-operative societies on regulation and to better understand their methods of operation, meetings were held with two societies: 1) The Co-operative Electric Supply Society Ltd., Sircilla in AP and, 2) Singur Haripal Rural Electric Co-operative Society, Ltd., in West Bengal. It was also judged that such information might be beneficial in refining the modality for implementation of BSES's proposed village franchising approach to grid connected rural electricity supply.

Both of these rural electric cooperative societies are well run rural electricity distributors. Their performance compare favorably with that of APTRANSCO and WBSEB, and in some cases exceeded it. Both cooperative societies meter most of their consumers (cooperative members), maintain and keep meters calibrated, have computerized billing systems that provide printed bills to each consumer, collect on-time better than 80 percent of the amounts billed, disconnect members for failure to pay for electricity, have progressively expanded the number of members served, have negligible illegal

connections and theft, and provide new connections with short waiting periods. Singur Haripal even operates call centers for notification of system failures and service problems. It also uses state-of-the-art computerized billing software to bill all of its consumers. Collection of bills from domestic consumers is "subcontracted" to local co-operatives licensed as rural banks. This system has proved to be very effective since the rural banks are close to the consumers.

As an indication of the difference between the performances of the Sircilla Co-operative Electric Supply Society and APTRANSCO is the number of consumers per utility employees. Sircilla currently has 443 consumers per employee while APTANSCO has 136. It also is able to clear faults and replace shorted transformers within days rather than the weeks currently required by APTANSCO. Sircilla has also made extensive use of the REC to finance the expansion of its distribution grid to cover 100 percent of the households in its service territory. Since its inception, Sircilla has received five REC loans. All of these have been repaid as scheduled.

Financially, both societies run positive margins; revenues exceed expenses including debt servicing. Even if many of India's other 31 rural electric cooperatives do not reach the performance levels of Sircilla and Singur Haripal, these two indicate what it is possible to accomplish through the cooperative societies legal modality. It also indicates that the success of the BREB could be transferable to India where this makes economic sense for rural electricity supply.

Table 5-2 presents basic information for the Sircilla and Singur Haripal Rural Electric Co-operative Societies.

Table 5-2: Sircilla and Singur Haripal Rural Electric Co-operative Societies Performance

Activity	Sircilla Society - Andhra Pradesh (2000-01 Data)	Singur Haripal Society - West Bengal (1997-98 Data)
Number of Consumers	157,833	74,458
Electricity Purchased -GWh	392.4	74.5
Electricity Sold - GWh	319.8	55.3
Electricity Losses - Percent	18.5 %	25.8 %
Mean Electricity Purchase Price - Rs	0.23	Rs 0.60
Mean Electricity Retail Sale Price -Rs	0.59	Rs 1.35
Typical Billing Collection Performance	85 - 90 Percent of Billed Amount	Over 95 Percent of Billed Amount
Connections Metered - Percent	70.0	80
Margin - Rs	2,227,632	282,000
Length of 11 kV and Distribution (LT) Lines - km	7,979	1,360

Sources: Direct communication with Sircilla and Singur Haripal Rural Electric Co-operative Societies

As indicated above, both the Sircilla and Singur Haripal Rural Electric Co-operative Societies are registered under the Co-operative Societies Acts of their respective States. Sircilla also holds an APERC Distribution and Retail Supply License. Singur Haripal does not require a license under the existing West Bengal Electricity Act. Both societies are overseen by a Board of Directors elected by their members in accordance with their bye laws and the provisions of their respective Co-operative Societies Acts. For Sircilla regulation of administrative matters, including financial reporting and auditing, are currently regulated by the Registrar who is part of the State Co-operatives Ministry. It is unclear whether or not APERC will impose additional reporting requirements on Sircilla as a result of the New Electricity Supply Act. As stated above, APERC sets both the bulk electricity supply tariff under which Sircilla purchases electricity and its retail tariff. Sircilla has found it to be beneficial to have access to the AP Government through the Co-operatives Ministry in dealing with both APERC and APTRANSCO. A concern expressed by Sircilla with their license was its one-year length. Given their past period of operation and financial performance, this seems to be a counterproductive license provision.

For the Singur Haripal Co-operative Society, the West Bengal Electricity Regulatory Commission (WBERC) sets the bulk electricity supply tariff that can be charged by WBSEB to the Society. However, unlike in AP, the Society sets its own retail tariffs. Further, the current regulatory capability of WBERC appears to be relatively weak. This means that, outside of the bulk electricity supply tariff, the Registrar is a de-facto regulator. If WBREDC is able to implement co-operative society based rural electricity supply, a new regulator for these cooperatives would likely be established.

Off-Grid Rural Electricity Supply Regulation

India under the Ministry of Non-Conventional Energy Sources (MNES) and its associated State renewable energy development agencies has implemented one of the world's largest renewable energy supply programs. Also, MNES is believed to be the World's only renewable energy research, development, and implementation institution with national ministerial status. Part of MNES's responsibility includes leadership in the design, funding, and implementation of off-grid electricity supply schemes in rural areas currently not electrified. Table 5-3 summarizes the magnitude of the MNES directed program for off-grid electricity supply across India. MNES is also implementing major programs on institutional capacity building with regard to renewable energy, biogas systems, advanced cook stoves (chulhas), and decentralized rural energy planning.

Table 5-3: India Rural Off-Grid Electricity Systems Summary

Type of Off-Grid Electricity Supply	Number of Systems Operating	Estimated Total Installed System Capacity - MW
Household SPV	137,212	4.8
Rural Water Pumping SPV	3,575	6.4
Micro-Grid SPV Schemes	13	0.2
Biomass Gasification Based Isolated Grid Schemes	1,719	35.5
Hydropower Generation 0 to 3 MW	NA	226
Hydropower Generation 0 to 25 MW	387	1,341
Micro-Windmills	45	0.09
Windpower Generation	2,507	1,267

NA – Not Available

Source: MNES Annual Report 2000-2001 and Direct Communications with MNES

To gain appreciation of off-grid legal frameworks and regulation in India, meetings were held with the West Bengal Renewable Energy Resource Development Agency (WBREDA). WBREDA, with support from MNES, GOI, and the Government of West Bengal, is financing and directing an aggressive program to electrify regions within the State for which connection with the integrated India-West Bengal electricity grid is not economically feasible; at least for the foreseeable future. By 2011, WBREDA plans to have installed 20 MW of decentralized electricity supply systems. The main area where this program is being implemented is the Sunderban region. This is large group of islands, waterways, and mangrove swamps that form the vast delta of the Ganga at the upper part of the Bay of Bengal. The population of this region is 2.9 million and its deltaic geography extends into the southwestern part of Bangladesh.

Table 5-4 summarizes the WBREDA isolated grid rural electrification programs. These are primarily based on WBREDA's concept of providing "hard" electricity to grid isolated rural villages. Hard electricity is defined as a supply that can operate reasonable size, three-phase motors and is efficient to distribute over moderate distances. The modalities that represent this form of hard electricity supply for isolated grid schemes appear to be applicable to other parts of South Asia. Such hard electricity supply is currently also used in Nepal.

Table 5-4: West Bengal Renewable Energy Resource Development Agency (WBREDA) Rural Isolated-Grid Electricity Supply Schemes Summary

Isolated Mini-Grid Scheme	Technology	Supply Entity	Installed Generation Capacity	Typical Generation	Distribution Grid Characteristics
Gosaba Island (Commissioned June 1997)	Biomass Gasification & Combustion Engine Driven Generator	Gosaba Rural Energy Co-operative Society	5 x 100 kW	90 MWh (August 1997 to April 1998)	3 km 11 kV line 5 km LT distribution line
Chotomullakhali (Under Construction)	Biomass Gasification & Combustion Engine Driven Generator	WBREDA Utility	5 x 100 kW	N. A.	N. A.
Sagar Island (Commissioned February 1996)	SPV Grid System	Sagardweep Rural Energy Development Co-operative Society	26 kW (peak)	N.A.	4.5 km LT line
Sagar Island Mritunjaynagar (Commissioned April 1999)	SPV Grid System	WBREDA "Utility"	26 kW (peak)	N.A.	6 km LT line
Bangopalpur Village (Commissioned November 1994)	SPV Grid System	Bankura Institute (Society)	12.5 kW (peak)	N.A.	N.A.
Gayen Bazar (Commissioned March 1999)	SPV Grid System		25 kW (peak)	N.A.	5.5 km LT line
Mahendraganj (Commissioned April 1999)	SPV Grid System		25 kW (peak)	N.A.	6 km LT line
Manasadweep Khasmahal (Commissioned March 1999)	SPV Grid System		25 kW (peak)	N.A.	5 km LT line
Household SPV Systems	SPV	House Owner	771 Systems	N.A.	N.A.
Notes: LT - low tension distribution N.Av. - Not Available N.A. - Not Applicable					

Source: WBREDA Annual Report 1996-1998 and Direct Communications with WBREDA

In implementing its isolated grid schemes WBREDA is experimenting with two legal organizational approaches: co-operative societies registered under the West Bengal Co-operative Societies Act, 1973; and, Societies registered under the West Bengal Societies Registration Act, 1961. For the smaller schemes and the new Chotomullakhali scheme, WBREDA is also currently the direct system owner-operator. In all cases, WBREDA exercises considerable control over the electricity supply entities it has created through its

role as the capital supplier and as the sole provider of technical support and training for both the implementation and operation of specific schemes. In return for grants to cover the capital cost of the schemes it has implemented, WBREDA obtains an "implied contract" with the actual scheme operating entities that gives it approval authority over all-important decisions. It also retains ownership of the assets for all of the off-grid schemes that it funds.

WBREDA is careful not to use the term "tariff" or "electricity sales" in any of its off-grid supply schemes to avoid regulation by the WBERC. Rather it works with the actual operating entities, to establish contributions to be "donated" by electricity consumers as payment for electricity. Unless the level of contribution is acceptable to WBREDA, it will not implement a scheme. WBREDA's basic approach to establishing contribution levels for electricity consumers is that such contributions should at minimum cover the cost of operating all facilities associated with a specific scheme. As a result of the way in which electricity prices are set and its "implied contract" with the operating entity for each scheme, WBREDA is the main de-facto regulator for off-grid electricity supply in West Bengal. It shares this regulatory responsibility with the registrar for either a co-operative society or a society depending on the type of legal entity involved. As indicated previously, the registrar as a regulator is primarily concerned with the organizational structure of the registered entity, financial reporting, and the rights of members and adherence to co-operative society or society rules.

The Gosaba Rural Energy Co-operative Society is an example of an off-grid co-operative society implemented by WBREDA. This Co-operative Society is currently supplying electricity to 1,000 households and small businesses by means of an 11 kV distribution system in the Sunderban region. WBREDA provided most of the capital for the project, managed construction, and provided operator training for the bio-mass gasification plant and the electricity distribution micro-grid. The co-operative members provided some capital from co-operative society membership fees and some construction labor. Since the project was commissioned, WBREDA has continuously provided technical assistance with plant operation and maintenance. It also closely monitors the 71-hectare fast growing tree plantation that is the gasification plant's fuel source. The Co-operative Society is responsible for operation and maintenance of both the bio-mass generation plant and the distribution micro-grid. It also is responsible for consumer billing, collections, and new connections and, when required, disconnection for lack of payment. The present revenue collected by the Co-operative Society is sufficient to pay all fuel (diesel is a supplemental fuel) and operating costs, including operator salaries.

Since commissioning, the Gosaba Rural Energy Co-operative Society has experienced steady growth in the number of customers connected and in the amount of electricity consumed by customers. Load grow building is a significant feature of isolated grids in the Sunderban region. Once electricity is available, it takes time for the consumers to purchase electrical appliances in order to recognize the full benefits of electricity service. Electricity demand at commissioning was 60 kW. Within one-year it grew to 200 kW. An interesting aspect of the Gosaba electricity supply scheme is that while the plant typically operates only six hours per day, due to demand a significant number of connected consumers use SPV systems in the down period for fans and lighting.

WBREDA is experimenting with both the co-operative society and society approaches to organizing off-grid electricity supply entities because it is concerned with potential politicization of the co-operative society legal modality. This concern has been expressed by others in India with regard to rural electricity supply co-operative societies and was an issue in the design of the Board of Directors structure for the PBSs in Bangladesh. Whether or not the society approach can overcome this problem remains to be demonstrated. An optional approach may be to change the co-operative society rules to tighten the requirements for Board of Directors membership.

5.3 Nepal

In Nepal the national grid currently serves only approximately 4 percent of rural households with 88 percent of the population living in rural areas. It is estimated that by 2020 only 30 percent of the total population will be connected to the national grid and an additional tiny percentage to isolated grid systems. Nepal, like Bangladesh and Sri Lanka, does not have a comprehensive electric power sector regulatory framework. NEA, the parastatal national electric utility, has the sole responsibility for construction and operation of the Nepal national grid and public sector electricity generation. It is also responsible for the operation of a number of isolated grids.

Grid-Connected Rural Electricity Supply Regulation

The actual regulators for grid-connected rural electricity supply are a combination of Ministry of Water Resources (MOWR), the Electricity Tariff Fixation Commission (ETFC), the World Bank, the ADB through power loan covenants, and NEA. NEA is the owner and operator of virtually all grid-connected rural electricity supply. NEA also functions as the primary regulator of grid-connected rural electricity supply since it establishes and controls the main functions constituting regulation as defined for this Review. In theory, tariffs are set and administered by ETFC. However, NEA prepares its required retail tariffs, with these being established by the ADB and/or the World Bank when loans are in effect or being offered. This has almost always been the case over the past 10 years. Nepal is almost totally dependent on such soft loans for transmission and distribution expansion and augmentation.

The Ministry of Finance has some regulatory oversight through the Agriculture Development Bank of Nepal (ADB/N), which administers loans and grants for rural electricity supply development. It is also the owner of the Butwal Power Company. Currently, HMGN is in the process, for a third time, of trying to privatize this company through sale of controlling interests to a strategic investor.

Rural grid expansion has recently slowed because of HMGN's inability to comply with the effectiveness conditions of a new ADB Rural Electrification Loan. This loan has been delayed for over a year and it is unclear when it will become effective. The main issues delaying ADB loan effectiveness are:

- NEA's inability to achieve a sufficient self-financing ratio of 23 percent

- and reduce its accounts receivable to an acceptable level.
- The need for passage by the Nepal Parliament of an Electricity Theft Control Act that would give NEA legal authority to disconnect and prosecute non-paying customers.
- The need for government institutes to clear significant past due amounts to NEA for consumed electricity and for future prompt payments for electricity by government entities.
- The need for the Government to implement a semi-automatic electricity tariff adjustment scheme to meet a loan retail electricity tariff covenant.
- NEA reduction of electricity losses to an acceptable level.

NEA, with encouragement and support from both multilateral and bilateral donors, has been experimenting with approaches to improve the quality of grid-connected and off-grid electricity supply through decentralization. Two approaches applied to date for grid-connected rural electricity supply are the Lamjung Electricity Association and the South Lalitpur Electric Cooperative Ltd. The Lamjung Electricity Association was formed in 1994 and is registered under the Nepal Association Registration Act, 1977. In Nepal the designation Association is equivalent to that of a Society in India and Sri Lanka. Its establishment was a condition for a Nordic Development Fund rural electrification loan.

The Lamjung Electricity Association leases a 11 kV distribution line from NEA, but does not have a distribution license. It initially provided service to 26 villages (3,500 consumers), but has been able to expand its service to 40 villages (6,100 consumers). By comparison with the Indian co-operative societies and the Bangladesh PBSs, this is quite small and may not be near the optimum size for rural distribution entities in Nepal. All of the Association's consumers (members) are metered.

The Lamjung Electricity Association primarily operates the business side of rural electricity distribution and is heavily dependent on NEA for technical support for maintenance and extension of its distribution system. It has proved to be an effective approach for meter reading, consumer billing and collections, and promoting new connections. It currently collects 99 percent of its billings, which is considerably higher than NEA in its rural service areas. The Association has organized its members into sub-units based on Transformer Committees. It currently has in-place 46 such committees. This has provided a local level of transparency as to who is paying their electricity bills and who is not. The Transformer Committees and sound billing practices are significant parts of the Association's success in billing collection.

The Association is free to set the tariffs it charges to its customers subject to the constraint that these cannot exceed the national retail tariffs charged by NEA to its customers. The bulk electricity supply tariff that NEA charges the association is set by the ETFC and is currently Nepal Rs 2.69/kWh. The Association's current weighted average electricity retail tariff is Nepal Rs 5.77/kWh. This allows the Association to operate with a positive operating margin - total revenues exceeding total costs including lease payments to NEA - and it has accumulated significant cash reserves. Lease payments to NEA are structured to act as a subsidy to the Lamjung Electricity Association, the payment being lower than is indicated by the underlying assets. An important advantage

of the Lamjung Electricity Association approach to managing rural electricity supply is that the Association's consumers do not have to bear NEA's considerable overhead charges.

Through the lease agreement and the dependence of the Lamjung Electricity Association on NEA for technical support, NEA is the primary regulator for the Association. The exact role of the registrar with regard to Associations was not determined. To clarify this, and to better understand the role of the Registrar, meetings with the Lamjung Electricity Association are recommended.

The South Lalitpur Electric Cooperative Ltd was registered in 1999 under the Nepal Cooperative Societies Act. This is the first co-operative society for electricity supply in Nepal. The registrar is part of the Department of Cooperatives that is under the Ministry of Agriculture and Cooperatives. NEA is currently constructing the distribution system for the cooperative and will hand this over in mid 2002. This will likely take the form of a lease similar to that used for the Lamjung Electricity Association. Because of this and the Cooperative's dependence on NEA for technical services, NEA will be the main regulator of the Cooperative.

Initially, the South Lalitpur Electric Cooperative plans to serve 10,000 households plus about 800 other consumers located in 200 villages. All customers will be metered. The Cooperative managers are currently working on its tariff schedule. However, this will be subject to the same cap applied to the Lamjung Electricity Association.

Through implementing both the Lamjung Electricity Association and the South Lalitpur Electric Cooperative, NEA has demonstrated its willingness to consider approaches to rural electricity supply in addition to direct operation. It is also considering similar approaches for the isolated small electricity grids it currently owns. Support for such alternative approaches to rural electricity is being provided by Danida, which, is planning to fund a series of rural cooperatives or associations for grid-connected electricity supply in two districts in southwest Nepal.

Off-Grid Rural Electricity Supply Regulation

Hydropower is the primary source for all electricity supply in Nepal. Currently, off-grid hydropower is provided both by isolated electricity grids based on mini-hydropower and by village micro-hydropower. This is a consequence of Nepal's mountainous geography with its abundance of hydropower resources and dispersed rural population. Nepal's mountainous geography and population dispersion also constrain the wide spread use of petroleum based fuels for rural electricity generation, because of high initial cost and high transportation cost. All petroleum fuels consumed in Nepal are imported and require hard currency.

For rural areas in which hydropower resources are not adequate, like other South Asian countries, Nepal is turning to SPV electricity supply systems. It currently has an estimated operational SPV capacity of approximately 1,000 systems with an estimated capacity of 700 kWp. These systems are used to power both community centers and

individual households. The community SPV systems provide a local service that would otherwise be met by diesel generation sets, or would not exist.

Governmentally, Nepal is divided into 75 Districts. A District Government governs each District. Included in the district local government structure is a District Development Committee (DDC). The DDCs are responsible for, among other activities, district energy planning. Each District is further divided into a number of District Village Committees (DVCs). Each DVC consists of up to seven wards.

Regulation of off-grid electricity supply is different for the mini-hydropower-based grids and for village micro-hydropower schemes. NEA owns the main isolated electricity mini-grids. These 39 grids with a reported generation capacity of 17 MW are regulated in a manner similar to national grid-based electricity supply. Construction of the NEA-owned isolated grids was initiated in the early 1970's when HMGN issued an edict for all District Headquarters to be electrified. In addition, there are several independently operated isolated grids.

Where development of mini-hydropower grids is not economically feasible, due to demand and/or resource availability, Nepal is aggressively pursuing village based micro-hydropower schemes. In this endeavor, it receives significant technical assistance and financial support from NGOs and official donors and lenders. Micro-hydropower has a long history in Nepal and many institutions have been involved with its development. Only a brief overview is presented here to help put into context the current regulatory environment for this source of off-grid rural electricity supply. The experience of Nepal with development of micro-hydropower may also be relevant to future micro-hydropower development in Sri Lanka and India. References 30, 42, and 48 in the Bibliography provide additional information on micro-hydropower development in Nepal and other mountainous areas in South Asia.

For generations, Nepal has made extensive use of its abundant water resources through wooden mechanical water wheels—ghattas. Ghattas, of which over 25,000 are in use, traditionally provided mechanical energy for agro-processing, such as grain hulling, grinding, and oil extraction. Beginning in the 1960s and largely with support from NGOs, low cost, locally manufactured turbines were introduced as an improvement over wooden water wheels as sources of mechanical energy. It is estimated that 660 mechanical energy turbines are currently in operation in Nepal. Electric generators were occasionally connected to these turbines and to a very limited number of ghattas in order to provide lighting to a mill house and nearby households. These applications led in a relative short time to experimentation with dedicated micro-hydropower electricity supply. Implementation of such electricity supply schemes was aided by significant technical and funding support from NGOs and HMGN's provision of micro-hydropower subsidies and loans beginning in fiscal year 1981/82. HMGN subsidies and loans are provided through ADB/N. The initial micro-hydropower subsidy amounted to 50 percent of the cost of the scheme's electrical components. Without this level of capital subsidy, it was judged by the NGOs and HMGN that most micro-hydropower schemes would not be profitable for their developers.

During the 1980's and early 1990's, it is estimated that approximately 950 micro-hydropower schemes were implemented in Nepal. Approximately, 170 of these were add-on electric generators to primarily mechanical energy turbines. The peak year for such schemes was fiscal 1989/90 in which 25 schemes with a design capacity of 314 kW were installed. Over the same period, approximately 250 peltric sets, with an average electricity output of 1 kW, were also installed in 25 hill districts. Many of these schemes, however, failed to achieve sustained operation due to siting, mechanical, and/or financial reasons. Analysis of the schemes that continued to operate also indicated that many were operating with extremely low load factors, even for rural micro-hydropower projects.

To attempt to address the deficiencies of the rural micro-hydropower schemes and to expand the application of micro-hydropower in rural areas, in August 1996, HMG and the UNDP jointly launched the Rural Energy Development Program (REDP). The REDP is a carefully designed development program based on examination of the root causes of previous problems in sustaining and expanding micro-hydropower projects in Nepal. The initial budget for the REDP was \$5.5 million and its projected lifetime was 5 years.

The REDP is based on a decentralized administration and management approach involving the DDCs through the establishment, under each participating DDC, of a Rural Energy Development Section (RED) and the DVCs. The REDs are the authorized local body for energy planning, information dissemination, provision of technical assistance, and creating linkages between the DDC, NGOs, and private sector organizations. In each district in which it is active, the REDP has also established a District Energy Fund (DEF). The DEF is made up of financial contributions from the DDC, donor's assistance including UNDP assistance, grants, and the returns from investments in rural energy schemes. The REDP promotes a "holistic" approach to rural electricity supply. The "holistic" approach emphasis community mobilization, human resources development, institutional development, natural resources management, and sustainable rural energy development. Each micro-hydropower scheme is owned and operated by village level Community Organizations. There are separate Community Organizations for males and females.

Initially, the REDP was implemented in the five districts of Baitadi, Dadeldhura, Baglung, Tanahun, and Kavre. The program has now been extended to 15 districts. Table 5-5, taken from the REDP Annual Report 2000, summarizes REDP's accomplishments in the implementation of micro-hydropower projects. It has also implemented 869 household SPV systems and 505 bio-gas generators in the districts in which it is active. Another accomplishment of REDP is the establishment of Rural Energy Service Centers (RESC) at the district level. In the past, the distance from villages to competent technicians and replacement parts has been a major problem for micro-hydropower schemes. The establishment of the RESCs has led to a significant reduction in the downtime of electricity supply schemes through provision of technicians and spare parts at the district level. The services of the RESC are not limited to the REDP districts. They also provide technical services to adjoining districts.

Table 5-5: Nepal Rural Energy Development Program (REDP) Micro-Hydropower Projects Summary For 10 Districts Associated With REDP Phases 1 and 2

District	Micro-hydropower Schemes Completed	Micro-hydropower Schemes In Construction	Electricity Capacity of All Schemes KW	Benefiting Households	Total Cost All District Schemes \$ Thousands
Achham	2	5	100	1,037	189
Baitadi	3	4	96	805	142
Dadeldhura	4	5	75	580	149
Baglung	4	6	263	2,582	305
Myagdi	3	4	188	1,641	261
Parbat	3	4	99	952	173
Tanahun	5	4	159	1,160	286
Dolakha	4	3	120	1,179	144
Kavrepalanchok	5	3	155	1,410	281
Sindhupalchok	3	4	139	1,332	248
Total	36	42	1,394	12,678	2,178

Source: REDP Annual Report 2000

The REDP has matured to the point where it is looking to ways to further ensure the sustainability of micro-hydropower and address potential load growth. In this regard it is supporting formation of rural cooperative societies under the Nepal Cooperative Societies Act.

At approximately the same time as the initiation of REDP, HMGN took a step to improve overall coordination of renewable energy projects in Nepal by establishment, in late 1996, of the Alternative Energy Promotion Centre (AEPCC). AEPCC is overseen by the Ministry of Science and Technology (MST) and is legally the national institution responsible for the promotion of renewable energy sources in Nepal. Since most existing and planned off-grid rural electricity supply is based on either micro- or mini-hydropower or SPV systems, rural electricity and renewable electricity supply are synonymous in Nepal.

AEPCC's stated main role in expanding and sustaining rural electricity supply is to prepare rural energy support programs for financing by HMGN and international donors, including NGOs, and to monitor and evaluate the execution of actual electricity supply projects. AEPCC is not designed to be involved in direct implementation of projects, but rather to work through local government entities, particularly, DDCs and DVCs, official donors (including REDP), and NGOs. It has the responsibility for design, monitoring, and evaluation of rural micro- and mini hydropower, solar, biogas, and wind schemes and improved cooking stove projects. Though created in 1996, AEPCC has only been active since 1999 because of institutional capacity constraints.

AEPCC is receiving major managerial and technical support from Danida through its Energy Sector Assistance Programme (ESAP). The ESAP is visualized as a long-term support effort of 10 to 15 years on Danida's part. The ESAP consists of six components:

1. Assistance to AEPC with the objective "to create a strong national capacity for supporting and coordinating public, NGO, and commercial initiatives for making high performance and environmentally friendly sources of energy supply accessible to the rural population". The 1998-2002 budget for this component is \$1.2 million (DKK 8 million) plus the provision of a full-time, resident ESAP Coordinator.
2. General Programme Support budgeted at \$0.9 million (DKK 6 million) and comprising the ESAP Programme Office and provision of general consultancy services.
3. Financial Assistance to Rural Energy Investments with the development objective "to reinforce the mobilisation of finance for rural energy investments and programmes" with initial emphasis on financing household SPV systems, micro-hydro projects, and rural grid extension. Danida would like to see the associated Intermediate Rural Energy Development Fund become the main funding source for all official and NGO financing of rural energy projects. The 1998-2002 budget for this component is \$15 million (DKK 101.3 million).
4. Micro-Hydro Component with the development objective: "to define a coherent framework and suitable concepts for a cost-effective, technically and socially appropriate development of isolated rural electrification schemes that makes use of micro-hydro plants". This component is to build on the decentralized, local involvement approach developed by REDP. The 1998-2002 component budget is \$1.7 million (DKK 11.7 million).
5. Solar Energy Component with the development objective "to bring the service of electricity to off-grid households and to community and other public buildings by means of environmentally benign SHS (Solar Household Systems) and to develop a commercial sustainable situation for SHS dissemination in Nepal within five years". The 1998-2002 component budget is \$2 million (DKK 14 million). The target installation of SPV systems under the component is 27,000 systems over a four-year period.
6. Improved Cooking Stoves Component with a 1998-2002 budget of \$1.1 million (DKK 7.5 million).

Thirty-three micro hydropower projects have been approved for the subsidy provided by ESAP's provision of micro-hydropower capital cost subsidies. None of these have become operational. They are located in districts in which REDP is not working.

In an effort to promote off-grid micro- and mini-hydropower, HMGN in its 1994 *Nepalese Legal Provisions on Hydro-Power Development*, established the following legal provisions for hydropower facilities with a capacity of less than 1,000 kW:

1. License Requirement: No license shall be required for conducting surveys or for building and operating such plants. For plants between 100 kW and 1,000 kW, notice shall be given to the concerned agency before commencing work on the project.
2. Royalty: No royalty shall be imposed on the electric power generated.
3. Income Tax: Exemption from income tax is granted.

4. **Tariff Setting:** The producer may fix the selling price of electricity.
5. **Compensation:** In case a licensee is going to distribute electricity in an area where a plant smaller than 1,000 kW is already generating and distributing electricity, the licensee shall be obliged to purchase the existing plant and distribution system, if the owner so wishes.

The micro- and mini-hydropower legal provisions appear to be silent on the creation of a legal body for either a micro- or mini-hydropower project other than mini-hydropower schemes implemented by NEA. This raises the same legal and regulatory issues that are discussed in the next section on Sri Lanka.

The micro- and mini-hydropower legal provisions have resulted in three types of de facto regulatory agencies:

1. The hydropower scheme developer, is usually a Community Organization (CO)
2. Either the AEPC or REDP, depending on which organization is providing a scheme subsidy and/or financing.
3. ADB/N for schemes in which it provides financing.

Currently, both the REDP and AEPC are the de facto regulators for village micro-hydropower in Nepal. Significant subsidies are provided by HMGN for micro- and mini-hydropower. These subsidies apply to the cost of electrical equipment at the following rates:

- 75 percent for Districts defined as being very remote
- 50 percent for other Districts.

Turbines, penstocks (an exception is made for peltric sets by allowing a subsidy for the polyethylene pipe which functions as a penstock), waterways, and related items are not normally subsidized by HMGN. Currently, there exists no uniform subsidy policy in practice. This is apparently negatively affecting investment incentives.

5.4 Sri Lanka

Until recently, Sri Lanka employed a single-track approach for supplying electricity to its rural areas. The only significant mode for new rural supply, providing electricity to unserved consumers, was by extension of the national, integrated electricity supply grid. As far as could be determined, there has been no development of isolated mini-grids for electricity distribution other than possibly some isolated grids developed by tea plantations or other estates for their exclusive use.

Grid extension and operation, including grid augmentation, is the sole responsibility of CEB in rural areas. This is the classic Government Owned and Operated Electric Utility legal modality. Until recently, Sri Lanka has depended mainly on large hydropower schemes for electricity generation. These were primarily built with concessional finance and are located in rural areas. However, most large hydropower potential has now been

developed and the CEB has had to turn to fossil fuel based IPPs for new generating capacity. In 1999, hydropower's share of total installed capacity was 68 percent.

In rural areas outside of the area of insurrection it is estimated that 36 percent of rural households have electricity service connections. This contrasts with an estimated urban electricity supply level of 85 percent of households. To achieve CEB's targeted 90 percent grid supplied electrification level by 2010, the nation's generating capacity will need to approximately double. Current reported annual electricity demand growth is 6 to 9 percent.

Grid-Connected Rural Electricity Supply Regulation

Of the two electricity distribution utilities in Sri Lanka, CEB and LECO, the rural load is served primarily by CEB. As the national, parastatal, electric power utility created in 1969 under the Electricity Board Act, CEB is largely self-regulated. Two exceptions are tariffs and major procurements. Also, as a government owned body under the Ministry of Irrigation and Power, it must conform generally to GOSL operating norms, directions, budgeting constraints, and performance and financial reporting requirements. CEB is not regulated by any form of regulatory commission, as no such commission currently exists. CEB's Chairman and Board of Directors are appointed by GOSL.

Electricity tariffs are politicized in Sri Lanka. CEB designs and proposes tariff changes to the GOSL. The actual tariffs are, however, set by the Cabinet. In recent years, the increases allowed by the Cabinet have been less than the increase in the cost of electricity supply. As a result, CEB is encountering severe financial difficulties. Contributing factors are the increasing dependence on IPPs for electricity generation and a current drought that is constraining available hydropower capacity. The cost of electricity obtained from the IPPs under hard currency power purchase agreements is considerably higher than CEB's traditional supply from its hydropower stations. The GOSL has been reticent to allow the considerably increased cost of electricity generation to flow through to consumers. However, CEB has continued to meet its commitments under the IPP power purchase agreements.

Like many other South Asian parastatal utilities, CEB suffers from numerous management and operational problems in addition to its current financial difficulties and is unable to finance system growth with internally generated funds. To address these problems, as in Bangladesh and the India reform states, both ADB and the World Bank have used their lending leverage to entice GOSL to reform and restructure the electric power sector. This includes all of the usual features of electric power sector reform and restructuring: establishment on an independent and autonomous regulatory commission with full tariff setting power; unbundling of CEB; establishment of wholesale electricity competition; asset revaluation; tariff increases to achieve the multilateral bank's standard financial performance targets; and, privatization of at least some unbundled entities through transparent, competitive bidding involving international utility investor-operators. The CEB reform and restructuring planning and design process, funded by ADB and the World Bank, has been ongoing for 6 years and it is unclear when restructuring may occur and what form it will take.

From the perspective of rural electricity supply and its specific regulation, the slowness of the reform and restructuring process with its suspension of borrowing from both the ADB and the World Bank has had at least two impacts. First, it has significantly reduced CEB's ability to expand the national grid in rural areas. In the past, ADB and World Bank loans have been an important source for CEB financing of rural electricity supply. Currently, CEB is receiving some funding for rural electricity supply expansion from Kuwait. Second, the slow growth in electricity supply, including increased rationing in rural areas, is resulting in the Provincial Councils becoming more proactive with regard to rural electricity supply. The Councils may be aided in becoming more proactive under the 13th Amendment to the Constitution. In this Amendment "extension of electrification within a Province and the promotion and regulation of the use of electricity within the Province" is a concurrent subject.

Provincial Council interest in rural electricity supply is a recent occurrence and it remains to be seen how large and what roles the provincial governments can assume. The Sabaragamuwa Provincial Council has recently issued a *Provincial Policy on Small Scale Hydro Electric Power Stations*. This appears to pave the way for the Provincial Council to "provide the technology, finance, and organizational strength" to construct both micro- and mini-hydropower schemes if it so desires. Part of the national funds for rural electrification is channeled through the provincial governments. In the past, these have been transferred to CEB for actual project's implementation. However, the Sabaragamuwa Provincial Council stated that it is now planning to use its rural electrification funds directly for village hydropower projects building on the ongoing World Bank Energy Services Delivery (EDS) Project. The Council also appears to have a bias against small hydropower development in the province because it results in the "export" of an indigenous resource needed in the province "to Colombo". The Uva and Southern Provincial Councils have also been proactive with regard to rural electricity. Based on experience gained under the EDS Project, the Uva Council has launched a grant scheme for promoting household SPV systems in Uva.

A further indication of a potential shift to a more decentralized approach to rural electricity supply is the decision of a number of the Provincial Councils to establish a rural energy information network within Sri Lanka. This should allow for more efficient use of provincial government resources and facilitate coordination of specific rural energy supply initiatives. To support this endeavor, the Provincial Councils have engaged The Energy Forum, a local energy information NGO. The movement toward decentralized rural electricity supply could be a potentially important development for improving rural electricity supply in Sri Lanka and should be considered for monitored by the SARI/Energy Rural Electricity Supply component.

At the national level, it appears that the preferred approach to rural electricity supply will not change as a result of electric power sector reform and restructuring. A discussion with the Power Sector Reforms Committee that is directing the ADB and World Bank consultants in design of the restructured industry raised several concerns related to regulation of rural electricity supply. First, while the current version of the new electricity supply act is still GOSL confidential and a draft was not available for review, the act is

reportedly totally silent on rural electrification. This includes recognition of what is currently occurring with World Bank funding regarding off-grid village electricity supply (discussed in the following subsection). It appears that in design of the future electricity distribution business, negligible consideration has been given to any other grid-connected supply modality, other than the Private Sector Distribution Companies. The selection of the Private Sector Distribution Companies modality might be the best solution, but it is difficult to support this conclusion without having given serious consideration to the other grid-connected modalities, particularly those that have demonstrated successes in other parts of South Asia.

The second concern that emerged from a discussion with the Power Sector Reforms Committee is that in making provision for a national regulatory commission, there is apparently no specific distinction between rural electricity supply entities, particularly small and off-grid entities, and the proposed private sector distribution and generation companies. Since off-grid rural electricity suppliers currently exist and may well expand before any regulatory commission is effective, this seems counterproductive. The regulatory requirements for many of the grid-connected and all of the off-grid rural electricity supply legal modalities identified in Table 4-1 are believed to be different and simpler than for a distribution company with millions of customers and generation companies with 100's of MWs of installed capacity.

For example, it may be beneficial to the efforts to expand rural electricity supply, particularly off-grid supply, if a rural distribution license was specifically provided for. It may well be a sound policy to recognize this at the outset of electric power sector reform and restructuring and include ways to encourage development of alternative approaches for supply of rural electricity when they are viable. For rural consumers, the adoption of community-based approaches to rural electricity supply can result in supply options that are less costly, more sustainable, and more environmentally benign than national grids connected to modern power stations. This is not to say that the nation's electricity supply and reliability needs could be accomplished by the same approach. Consideration of alternative approaches to meeting rural electricity supply requirements could be particularly important for Sri Lanka's rural economic development. It is a nation with a significant unserved rural electricity demand and where for political and economic reasons the accomplishment of the current rural electrification target is unlikely to be met. The potential reunification of the nation would only exacerbate this economic development issue.

The third concern with the proposed reform and restructuring related to rural electricity supply is the apparent lack of provision for open access to the transmission system. This could facilitate the development of small rural electricity generators by allowing them to sell electricity to rural electricity suppliers.

An additional issue related to grid-connected rural electricity supply is the apparent reticence of CEB (or really GOSL) to make known its specific expansion plans for the national grid and to identify the regions that will ultimately not be connected to the national grid. This is perhaps understandable for short-term political reasons; however, it

complicates planning for off-grid electricity supply. This appears to be of concern to the Provincial Councils.

Off-Grid Rural Electricity Supply Regulation

For off-grid rural electricity supply, at least seven of Sri Lanka's provinces have appreciable micro-and mini-hydropower potential. There is also significant potential for small hydropower. And, solar insolation is appreciable throughout much of the island. Beginning in 1992 with significant support from knowledgeable renewable energy NGOs and a range of donors, Sri Lanka began development of village, off-grid and micro-hydropower. In 1999, these schemes started to accelerate. This is attributed to financing and technical assistance provided by the World Bank's \$55.3 million ESD Project. Unserved rural consumer frustration with the rate of grid extension and financial and technical support provided by three Provincial Council's were also likely contributing factors. Between 1992 and the end of 1998, 57 village micro-hydropower schemes serving an estimated 1,481 households with a total rated capacity of 266 kW were installed. Starting in 1999, an additional 57 village micro-hydropower schemes were installed or are being installed. These schemes serve an estimated 2,358 households and have a total rated capacity of 353 kW. (Appreciation is given to the International Technology Development Group (ITDG), a leading rural energy NGO in both Sri Lanka and Nepal, for access to their micro-hydropower project database).

For areas where micro-hydropower is not feasible, Sri Lanka has been aggressively implementing household SPV systems; again with NGO and EDS Project support. Prior to effectiveness of the EDS Project about 5,000 household SPV systems had been installed. This resulted in a nascent local SPV supply industry. Under the household SPV part of the EDS Project, an additional 37,000 systems are target for installation by 2003. As of March 2001, the EDS Project had provided financing for over 3,200 new household SPV systems spread across seven Provinces.

The EDS Project appears to be developing into an exemplary project for realization of off-grid rural electricity supply. It consists of three components:

- EDS Credit Component.
- Pilot Wind Farm with CEB.
- Capacity building to support CEB's Pre-electrification Unit and its Demand Side Management Unit.

The EDS Project concentrates on creating and sustaining the conditions for the local private sector to implement micro-, mini-, and small hydropower schemes and sell household SPV systems. Other than quality assurance and quality control activity, it does not deal with technology issues; these are left to consumers and the private sector equipment and services providers. A major feature of the EDS Credit Component (\$49 million) is the disbursement of financing for village micro-hydropower schemes and SPV systems through participating credit institutions (PCIs). At present, five commercial banks and Sarvodaya Economic Enterprises Development Services (SEEDS) are PCIs.

They are the actual lenders for financing of village micro-hydropower and household SPV schemes. In addition to financing, the EDS Project includes a grant component to support off-grid project development and technical assistance for project feasibility studies.

A major concern of the World Bank in designing the EDS Project was to ensure its sustainability. Particularly how to sustain financing on commercial terms from local banks after Project completion and maintenance of the implementation organizations created under the Project? This concern appears to have moved further into the future as the Bank is considering implementing EDS Phase 2 upon completion of the current project at an increased funding level. However, to address the concern over sustainability, the Bank has been undertaking an assessment of how to strengthen the legal basis for off-grid rural electricity supply in Sri Lanka. This assessment was undertaken by INFOTECHS I/D/E/A/S - *Energy Services Project: Policy Development on Village Hydro Schemes*. This study is directly relevant to this Review. It demonstrates the potential importance of establishing sound and practical legal frameworks and regulatory practices and procedures as a pre-requisite for sustainable rural electricity supply.

Two issues that demonstrate the importance of legal basis and clear regulation are the licensing of off-grid supply schemes and establishment of a legal body to facilitate financing. Under the Electricity Act, 1950 an electricity supplier is required to have a license issued under Section 2 of the Act. This is interpreted to apply to both grid-connected and off-grid generation and distribution. With the creation of the CEB under the Ceylon Electricity Board Act, 1969, no license can be granted under the Electricity Act without CEB approval. In effect CEB regulates all electricity supply licenses. "A person who acts in contravention of the licensing requirement under the Electricity Act and establishes or maintains any installation for the generation of electrical energy or supplies energy for a fee or reward without a license for such purpose, is guilty of an offence and on conviction may be ordered to dismantle and remove the installation." However, because CEB does not have a mechanism in place for issuance of the required licenses, none of the existing village hydropower schemes are in compliance with the Electricity Act licensing requirement.

To date, CEB has not enforced licensing for village micro-hydropower schemes. According to INFOTECHS I/D/E/A/S, CEB "grudgingly" considers these schemes to be important, "albeit temporary sources of rural electrification". Non-enforcement of licensing raises at least three concerns. One is that the current village schemes are technically illegal and unprotected from future closure by CEB or a future regulatory commission without financial recourse. Second, there is no legally constituted body for enforcing safety standards, although the EDS Project has been attempting to address safety through development of a set of village micro-hydropower safety standards. These are less stringent than CEB's rural distribution standards. Third, the lack of a license could jeopardize a village hydropower scheme's access to water supply. The issuance of a license confers certain rights. In the case of village micro-hydropower, this includes the right to use natural water supplies and to build the structures required for electricity supply. Without a license a scheme is not guaranteed such rights. If the developer of a larger hydropower project usurps or interferes with the water supply of a village scheme,

it appears that the village has no legal protection. However, this has apparently yet to happen in Sri Lanka.

To address licensing concerns, the INFOTECHS I/D/E/A/S report recommends that a method of licensing village hydropower schemes be developed that recognizes the technical and business requirements of these schemes or that the CEB specifically sanction each scheme. Under the CEB Act, CEB is empowered to join with "any body approved by the Minister" for electricity generation. This power might be applied to the village hydropower schemes.

In Sri Lanka, village micro-hydropower schemes are owned, managed, operated, and maintained by an Electricity Consumers' Society (ECS) organized by villagers usually with help from NGOs. The EDS Project Credit Component is specifically designed to provide financing to ECSs. However, banks will not normally lend to a community group. This raises the issue of how to constitute an ECS as a legal body to provide comfort to the lending PCIs. Two of the approaches identified in Section 6 have reportedly been used to date for ECSs: 1) The Voluntary Social Services Organizations Act, No. 31 of 1980, and (2) creation of a limited liability company. A third option identified in the INFOTECHS I/D/E/A/S report is to register an ECS as a co-operative society under the Co-operative Society Law, No. 5 of 1972. Only one ECS has been incorporated to date and this was only possible with the financial intervention of an NGO. This demonstrated the senselessness of imposing the expense of registering as a corporation and the statutory reporting requirements of a company on an ECS. The other ECS receiving financing from the EDS Project are believed to have taken the society route to attempt form a legal body. However, this route is, questionable because of the exclusion of Voluntary Social Services Organizations as legal bodies in Sri Lanka.

With the formation of Voluntary Social Services Organizations and the non-existence of a regulatory commission, the de- facto regulator of village micro-hydropower is effectively the Ministry of Social Services. This covers monitoring for corruption, financial reporting, and the powers of the Organization members. It does not apply to tariffs that are set by the ECSs.

Overall, the current legal framework and regulatory mechanisms for rural electricity supply in Sri Lanka is the weakest in South Asia. This is a consequence of CEB's dominance in providing rural electricity supply to date and its self-regulation. It is also a consequence of the relative newness of off-grid rural electricity systems in Sri Lanka. However, it is clear that the World Bank, NGOs, and Provincial Councils are seriously developing methods to address the legal framework and regulation of village off-grid electricity supply.

The issue of rural distribution of commercial energy forms in addition to electricity is relatively recent in South Asia. It is primarily the result of growing concerns over the adverse health impacts on rural populations, particularly women and girl children, being forced to rely on polluting fuels, such as dung and field wastes, for cooking and heating. While in some areas, particularly in the Himalayas, this was initially perceived as a deforestation problem it is now recognized as both a health and deforestation problem. In mountain areas, the use of dung for cooking and heating has an additional detrimental dimension; it is reducing agricultural productivity because of lack of compost. Undoubtedly, increasing attention will be directed to these issues in the future, and legal and regulatory issues may need to be addressed. These may be particularly important if commercial petroleum fuels and/or other utility services are linked to the management and operating structures currently used to provide rural electricity distribution. If a rural infrastructure is in place and functioning for electricity, why not use it to meet other needs? Several developing countries have begun to consider using a multiple utility services approach to meeting the full suite of rural commercial energy and other utility needs.

In the course of this Review, no instances of combining rural electricity with the distribution of other forms of commercial energy were found. However, the potential for combining rural electricity distribution with the distribution of fuels, such as LPG, for cooking and heating were discussed with all parties. One issue raised by the combined operation of energy with other rural services, is the incompatibility of the local transport modes required. For example, liquid fuels or LPG containers, unlike electricity, require some form of vehicle transport. Most of the rural electricity distributors do not have available such vehicles. Unlike utilities in developed nations, they do not have major fleets of vehicles to support their operations.

There may be some potential for combining rural electricity supply with water supply. In discussions at the Provincial level in Sri Lanka, it was determined that theft has been a problem with some rural water supply schemes. Since, this has not been a problem with rural electricity supply, applying its metering, billing, and collections approach might help address this problem. One potential issue with combining water and electricity supply is the general lack of water meters. In many instances water is supplied on a communal basis and not as a purchased commodity.

Of the new regulatory entities created in India and proposed for Sri Lanka and Bangladesh, all are designed to regulate only electricity. The concept of multi-utility regulators does not exist in South Asia. This may be attributable to the ways in which utility privatization is being implemented in these nations.

The most striking feature of rural electricity supply in South Asia is the poor quality of rural electricity supply that currently exists. In some rural locations in each nation where electricity supply is available, it functions quite well. However, in many rural areas throughout the region electricity supply service is inadequate at best. In rural Bangladesh, the rural connected portions of Sri Lanka, selected rural cooperative societies in India, and very limited rural service territories in Nepal, electricity supply is accurately metered, consumers are regularly billed for consumed electricity and pay their bills in a timely manner, technical losses are acceptable by international standards, and electricity theft is a negligible problem. Also, the inability of the majority of most rural consumers to pay for electricity may be overstated. The successful rural supply operations that exist utilize a range of different organizational structures clearly demonstrating that rural electricity supply is a solvable problem when the will exists to implement it.

Improvements in the legal frameworks and regulation of rural supply are part of the successes, but the most important factor is the realization of sound rural electricity supply entities management. Financing is also extremely important, but as indicated by the experience in Bangladesh, is probably manageable where sound management practices including staff training are in place.

A growing problem across that region impacting electricity delivery is the adequacy of generating capacity. In Bangladesh and just starting in Sri Lanka, this is driving the development of rural, decentralized electricity generation dedicated to supplying rural consumers. Decentralized generation for rural supply is also for geographic reasons essential for Nepal.

In reviewing the various approaches to structuring the governance of rural electricity, a basic message that emerges is not to underestimate the ability of rural populations to appreciate the value of electricity and to unite to seek to obtain it. Given the correct incentives and limited assistance, they will usually find ways to acquire access to electricity. People in rural areas walking and carrying storage batteries for significant distances several times per month to a recharging point in order to have light and watch television is a testament to this conclusion.

Well-designed legal frameworks for structuring rural entities that provide generation and distribution of electricity and appropriate levels of regulation form part of the incentives needed in rural areas. They also appear essential for sustaining and growing rural electricity supply projects once implemented. The availability of subsidies combined with financing to rural populations are other important incentives. While these incentives may be more important for rural off-grid electricity supply, they are also relevant to grid connected electricity supply. Current problems in many parts of South Asia with deterioration in the quality of rural grids and the challenges of expanding centrally connected grids into regions with poorer and sparser populations are a direct result of not providing such incentives.

Major findings of the Rural Energy - Legal and Regulatory Review are:

- The drive to reform and restructure many South Asia national and State level parastatal electric power utilities has largely neglected the inherent differences between rural and urban and near urban electricity supply, particularly differences in the rates of return that might be realizable on assets. This includes neglect in the design of new regulatory commissions.
- In Nepal and Sri Lanka the major suppliers of rural electricity, the national parastatal utilities, are also the owners, operators, and regulators of electricity supply. This creates an inherent conflict that needs to be addressed.
- Regulation works when the regulating entity has some real recourse over supplier finances and/or can offer financial incentives for the business behavior of the regulated entity. The only rural supply situation in South Asia where this has existed for sufficient time to draw any conclusions is the Bangladesh Rural Electricity Board's "regulation" of the Palli Bidyut Samities. Since BREB owns the PBSs, one needs to consider whether this really represents sound regulation.
- In India, discussions were held with two Rural Electric Co-operative Societies, one in Andhra Pradesh and one in West Bengal. Both of these were well-managed rural electricity supply societies (comparable to the PBSs in Bangladesh), particularly when compared with the rural operating performance of their companion State Electricity Boards. Their performance incentive seems to stem more from dedication to electricity supply and their members (consumers) needs, than to effective regulation. A contributing factor may be the co-operative society modality for rural electricity supply.
- In South Asia, there are four main organizational structures with legal standing that are currently used for rural electricity supply: Societies (in Nepal Associations), Cooperative Societies, private sector companies, and government owned and operated utilities. Which structure is used will determine the effectiveness of regulatory mechanisms that an electricity supply entity must comply with.
- For rural electricity supply entities organized as Societies or Cooperative Societies and when regulatory commissions exist, regulatory actions are usually divided between a registrar and the commission. This can create regulatory conflicts.
- An increasing phenomenon that may shape the legal framework and regulation of electricity supply in rural areas is an apparent trend toward decentralization of governmental responsibility for electricity supply. This is primarily the result of a growing perception at the local government level of the inability of parastatal utilities to deliver both adequate supply infrastructure and electricity as indicated by widespread electricity rationing.
- In general, the regulation of off-grid, non-parastatal rural electricity supply is not well defined. Frequently, there can be multiple entities without explicit electricity supply experience implementing regulatory actions. While this is not surprising, given the predominance of parastatal utilities in South Asia, this may be hindering the growth of off-grid electricity supply.
- Most rural electricity suppliers are not considering expanding into other service areas. Water supply appears to be the area where there may be the most synergism, but metering and treating water as a commodity appear to be issues. The reasons for

the lack of development of multi-service rural utilities need to be more fully understood.

Potential SARI/Energy actions to enhance the extent and viability of South Asia rural electricity supply:

- Help build appreciation and consensus on the benefits of providing for rural electricity supply within new and revised Electricity Acts and the establishment of Regulatory Commissions. Such provisions could strengthen current South Asia rural electricity supply developments by:
 - Acknowledging the legal rights of non-parastatal, off-grid electricity suppliers and their consumers (This may be particularly important in instances of electricity distribution privatization and rural grid expansion)
 - Providing for rural electricity supply licensing tailored to the needs and capabilities of rural suppliers. This could facilitate financing of such suppliers.
 - Providing for reasonable and fair tariffs for rural consumers that internalize the differences between rural and urban/near urban electricity supply.
 - Recognizing and providing for the different service requirements of rural suppliers, including allowances for rural safety and supply service standards.
 - Providing enhanced incentives for rural electricity generation, particularly generation based on renewable energy sources.
- Compare and communicate to policy makers, regulators, local governments and rural electricity supply entities the legal modalities for governance of rural electricity suppliers and help identify the advantages and disadvantages of each.
- Help identify and develop provisions to enhance existing laws that will facilitate establishment and operation of rural electricity supply entities, such as:
 - Tailoring financial audit requirements to the scale of a rural electricity supply operation.
 - Establishing special provisions in Co-operative Societies Acts for rural electricity supply co-operatives, particularly the appointment of and qualifications for senior management experienced in electricity supply.
 - Facilitating the formation and operation of apex organizations for rural electricity supply entities to strengthen and improve the efficiency of these entities.
- Explore and communicate to policy makers and other stakeholders the approaches, resource requirements, and advantages of decentralizing rural electricity supply regulation, particularly with regard to new suppliers (licensing, permitting, etc.)
- Develop and communicate approaches to implementing incentive-based tariffs for rural electricity supply.
- Provide for information exchange and sharing of procedures for certifying private sector service technicians for household SPV and micro-hydropower systems in South Asia.

- Support coordination of rural electricity supply equipment certification and quality control for household SPV systems in South Asia.
- Identify viable options, clarify legal requirements, and assess the ability of rural electricity suppliers to undertake other related businesses and services.
- Consider the merits of a rural energy component under SAFIR.
Rural electricity supply considerations beyond legal and regulatory matters for SARI/ Energy consideration resulting from the Review are:
 - Support regional networking of individual country rural energy supply networks through information exchange.
 - Promote wider consideration of options such as cooperative societies and rural franchising mechanisms as solutions to rural energy supply by policy makers and multilateral development banks. .
 - Promote, through information and peer exchanges, the concept of rural electricity suppliers forming apex organizations.
 - Promote, through information exchange, the development and wider implementation of rural electricity supply financing mechanisms (commercial, micro-finance, rural development banks, etc.) (Need an in-country financing institution to sustain financing currently provided under World Bank and ADB rural electrification loans).
 - Review and develop a recommendation on improving the design of subsidies for rural energy services and communicating different design approaches.
 - Develop and make widely available a South Asia rural energy supply database to facilitate inter-country comparisons including subsidy levels (primarily a consolidation of existing country data, not new data development).

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