

A Report on Rural Electrification in India

## **Looming crisis of Indian Power sector**

**A sustainable delivery model for rural electricity through local entrepreneurship  
development**

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## **Executive Summary**

The research is a critical examination of the project, governance and other socio-economic issues related to rural electrification which has in the past adversely affected the success of such projects in India. The census of 2001 indicated that two large Indian states, namely Bihar and Jharkhand, have more than ninety percent of households which are un-electrified. Twelve percent of the electrified villages de-electrified due to various reasons. On a pan-India level, two thirds of the households in rural areas have no access to electricity. In short, the current state of rural electricity services can be said to be acute, as the lack of electricity in villages and households is impeding both economic and social development. The manifestations of this governance crisis are enormous and far reaching. Wastage of government development funds is not only resulting in non-access to electricity for the rural poor, pitiable maintenance of rural electricity network and reduced reliability of supply ultimately contributes to create an economic divide between urban development and rural poverty. This study is based on the three major analysis of the prevailing system to attempt to arrive at a conducive environment for change: Diagnostic Consumer Perception analysis, The Governance GAP analysis and Force Field analysis. This research addresses the rural supply organization framework, and proposes a restructured model based on international cases of success and failures in rural electricity delivery. The Study also looks at policy reforms which may be required to make a restructured model feasible, within the envelope of political, institutional and financial acceptability that would bring the benefits of electrification to India's rural population.

In this present research, based on a survey conducted with rural consumers and staff of the utility, governance emerged as the weakest link in the failure of the rural electricity supply in Bihar. Reports published by World Bank and consultants like Ernst and Young, has also indicated that AT&C losses or power theft is the single largest issue which has plagued the Indian power sector in general, and rural electricity supply in particular. The model proposed is designed to minimize the economic hazard of power theft as it would be a participative organization rather than a state-owned utility with more accountability.

The report recommends a reliable rural supply to reinforce a climate of confidence to be fostered in the rural electricity sector that reflects a sustained commitment to a long term plan, and stresses the importance of adherence to policies. The restructuring envisages a participatory organization dominated by stakeholders of the rural supply. There is a need to detach the proposed entity from the present SEBs (State Electricity Boards) or the disintegrated state-owned distribution companies. The model aims toward greater cost recovery accompanied by reliable service that meets the specific needs of agriculture, while concurrently curtailing waste of energy. The services would be made affordable with lesser establishment costs, and the use of Information Technology to lower costs of bill collection and for accurate metering. There is a need to develop supply chains for products and parts by working closely with industrial partners to fulfill the demand created by rural electrification schemes. The evolution of the power sector in India, the future role of SEBs, and the outcomes of key rural electrification schemes are detailed in the research.

The rural electricity retail organization model that is proposed for India is designed keeping the factors influencing the business environment in mind, such as the political, economic, social and technological scenario prevailing in the country, and the crucial field inputs collected from rural consumers and utility staff in Bihar. The report recommends two different models, one for grid-connected rural supply entity, and the other for remote integrated rural supply entity. These distinct models would serve the two divergent requirements of rural areas. These models are similar in objective but differ on approach from the other international rural supply models considering sustainability, the paying capacity of Indian rural consumers, incremental cost of connecting the remote villages, usage of electricity while keeping in view the strategic national development objectives of developing rural areas along with urban growth. The model has evolved by borrowing, analyzing, customizing and refining international best practices that can, because of similarity of conditions, act as successful models for local Indian conditions.

### **Key Recommendations**

1. The rural retail distribution in India must be segregated from the State owned SEBs or the Distribution companies formed by disintegration of SEBs. The smaller towns and

rural electricity distribution must be managed (operated and maintained) by consumer co-operatives. Rural distribution may be as a separate business based on the principle of rendering retail service and trading of energy.

2. Rural electrification projects under the RGGVY (Rajiv Gandhi Grameen Vidyutikaran Yojna) scheme, or other central scheme would still continue to be implemented by central Government and other central PSUs with active participation of States for infrastructure creation. The rural infrastructure once created would be transferred to Co-Operatives for a long term lease on nominal leasing charges. Any further local network expansion would be under the jurisdiction of co-ops.

3. In each administrative district there should be one consumer co-operative. The Consumer Co-Op Boards would be an elected board of the representatives from consumers. Qualified professionals may be deployed for management and technical functions, preferably from the local area to reduce administrative cost.

4. The Co-Op organizational structure must be of a lean organization, and only ten percent of the manpower requirement should be on permanent rolls. Seventy percent employees should be outsourced, and the balance of twenty may comprise of interns and trainees.

5. Local entrepreneurs, preferably the stakeholders, may be encouraged to take rural electricity retailing for villages. Village level entrepreneurs may be selected on a two-part bidding process. On fulfillment of capability required, the bids may be evaluated based on the quoted percentage of revenue as service charges on the regulated price. The contract may be for a period of 2yrs.

6. The franchisee area may be one large village, or a cluster of small villages, but not more than five under one franchisee. To make the business attractive for franchisees the minimum customers must not be less than two hundred households.

7. The estimated minimum profit one franchisee can earn through this model would be INR 4000, but through this innovative way of enhancing customer demand and promoting rural electricity retail business, the earnings could be expected to go up considerably.

8. There is a potential of creating one tenth of a million (a lakh) entrepreneurs in the rural retail supply business with the implementation of this model. The employment

potential of such a scheme can be the creation of four lakh new jobs for unemployed youth at the village level directly, and approximately equal numbers through associated business and opportunities due to availability of power.

9. There may be two models of Co-ops which can be deployed depending upon the accessibility of Grid supply. For remote areas where the possibility and economic viability of accessibility is difficult, the second model which includes integrated business including local generation may be more suitable.

10. The prices for the Co-Ops would be regulated for the first five years by SERCs(State Electricity Regulatory commission). However, there would be no direct subsidy by the Government in any form. The transfer of infrastructure at no cost, and on the ground that there is no mandatory ROI required to be returned to government, would make it a no-profit, no-loss organization, and would ease the financial burden on the new entity. Depending upon the growth and adaptation to the new reorganized model, a deregulated market may be achieved in ten years.

11. There would be one nominated SERC representative to keep a close regulatory watch on the activities of the Co-Op.

These recommendations are based on the present business scenario listed below:

Considering the high AT&C loss, the present rural electricity retailing model is unsustainable. To ensure the governance in the sector there is a need for serious re-engineering of the rural electricity supply organizations and structures. The rural electricity supply must be treated as a business unit with a proper accounting of the units purchased, and sold to the consumers but at what price?

To control the spread and exhaustive network management of the rural electricity supply, the role of local stakeholders is vital for success. Rural electrification can be classified functionally into three different sub-sections: new projects, operations, and upkeep of the network. The management of a company specifically meant for operation and maintenance is essentially required to be segregated from the existing SEB control.

## Acknowledgement

The research is based on a governance diagnostic survey of Indian villages in the state of Bihar, the study of globally failed and successful rural electricity delivery models, and deliberations with experts. These concept and research activities have been contributed to, and facilitated by several individuals. The recommended restructured rural delivery model was designed and concretized at IC<sup>2</sup> Institute of University of Texas, Austin under the mentorship of Dr. Bruce C Kellison, Chief of Bureau of Business Research IC<sup>2</sup> Institute of UTA. The vital guidance to formulate the organizational structure of proposed rural utility with potential entrepreneur development and support infrastructure by the local government, is based on the concept of “Creating the Technopolis in Austin” by Dr. David Gibson, Associate Director of IC<sup>2</sup> UTA. The direction of this research to evolve the concept of entrepreneurship development for rural development was inspired by him. Crucial advice regarding governance and retail delivery model by marketing legend, Dr. Robert A Peterson, Associate VP (Research), UTA is also worth mentioning.

The final recommendations are based on international based practices of successful rural models customized to the Indian business environment. To formulate the appropriate model, the opinion and guidance of other senior faculty and Business experts Dr. Vijay Mahajan of Red McCombs, Dr. David Eaton and Dr. Shama Gamhkar of LBJ Center for public policy, UTA, and Dr. William Cunningham are worth mentioning. The practicability of the proposed solution was deliberated and established in consultation with USA-based professional Managers from electricity Utilities such as LCRA and Austin Energy. The contribution of Dr. Jobaid Kabir and Bill Hatfield of LCRA, and Mr. Garza Juan of Austin Energy need special mention. Last, but not least, the contribution of Er. S.C.Mishra. Retd. Engineer in Chief of the BSEB has significantly influenced the study by offering his opinion on the problem of rural supply utilities in Bihar from a utility perspective, and coordinating the rural customer survey and data collection.

The support of many other individuals such as students, who have undertaken field surveys, engineers of BSEB who facilitated the survey, and the administrative team consisting of Coral Franke and Margaret at IC<sup>2</sup> deserve special mention.

## Report Organizer

The report on Rural Electrification in India has six sections. The section-wise content of the report is listed below:

**Section 1** narrates the scenario and current status of power sector in India with six sub-sections dealing with the basic introduction, historical evolution, regional concept of power planning and growth, power shortage – gap between demand and supply, financial status of SEBs, current status of per capita consumption vis-a-vis international consumption pattern, operational challenges and related issues in running an integrated grid. The last sub-section concentrates on reforms since 1991, and the Electricity Act 2003 which has brought in a paradigm shift in the Industry.

**Section 2** is about the Power Sector in Bihar and Jharkhand. This section will explore the alarming situation of rural distribution, with power not available to ninety-four percent of the households.

**Section 3** is an overview of the observations on rural electricity supply status in India, with the background to undertake the consumer survey and the governance analysis carried out for the study.

**Section 4** covers the study of international experience of rural electrification in developing and developed nations. The five different nations from five continents representing developed and developing economies, and the countries of varied land areas have been selected for this survey. The study, and the implementation strategy of different nations such as Peoples Republic of China, United States of America, Costa Rica, Thailand and Mexico are covered in this section.

**Section 5** pertains to diagnostic analysis, field force analysis, governance gap analysis, including an endeavor to scan the issues related to the leaking revenue for existing state utilities, and the forces that would enable or act as a constraint in restructuring these organizations or implementing a new model for rural retailing.

**Section 6** includes the recommended model, and the approach for implementing the proposed rural electricity retailing organizational changes for encouraging governance and reduction in AT&C losses. This section also lists out the different sub-functions of a rural utility outfit being performed as on a specified date, and the proposed role of the new organization in the restructured model. Considering the diverse Indian requirement of rural utility, two different models are being proposed.

The collected data, methodology of research, survey results are attached in the report as annexure.

## **Power sector in India**

### **1. Introduction**

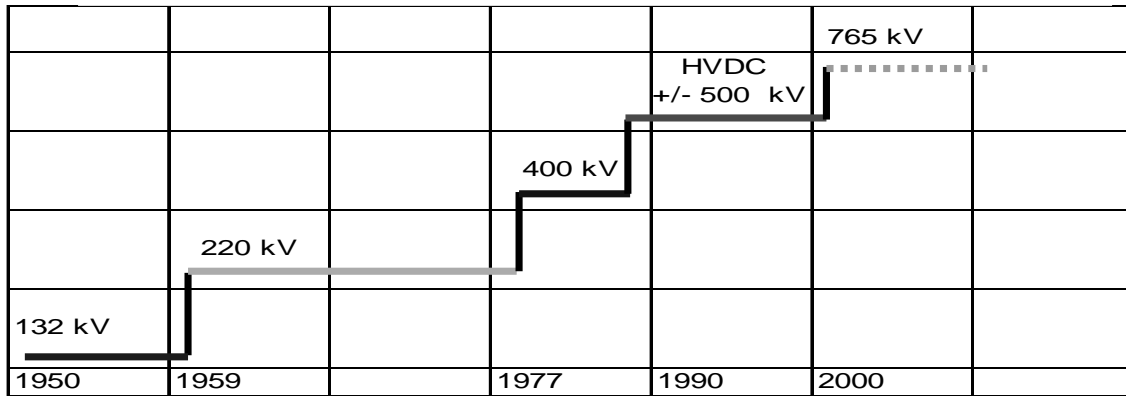
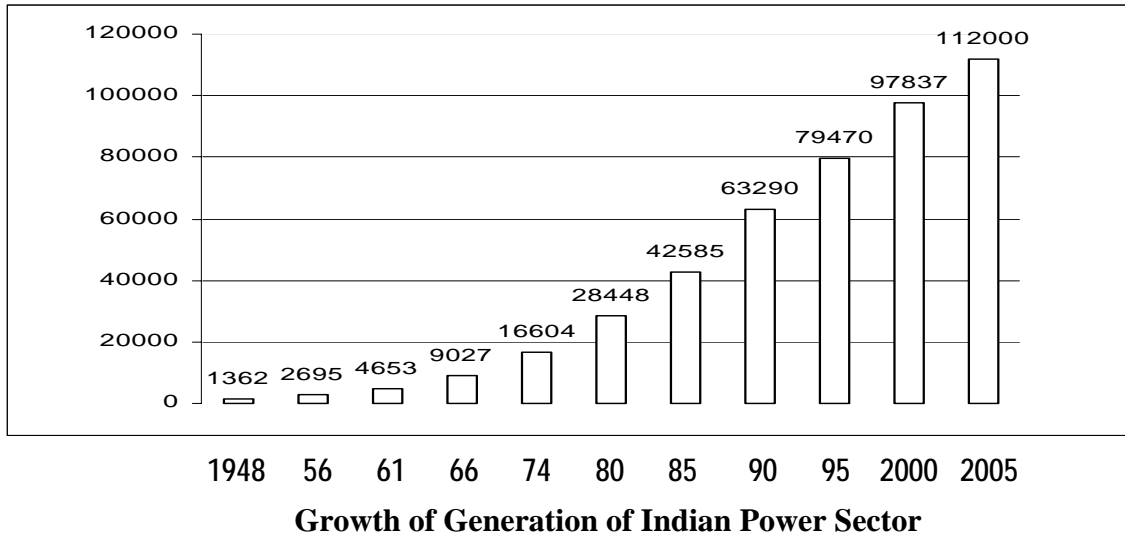
Electricity as a subject is in the concurrent list of the Constitution of India. It means that both the Union and State Governments can formulate policies and laws on the subject, but the responsibility of implementation rests with the States. Distribution of electricity in particular comes in the domain of the states. The average growth of the Indian economy was 8-9% in the last couple of years. However, the rural socio-economic development does not match this growth. India has a poor track record of rural electrification and other rural infrastructure development, including primary health care, education, drinking water and roads. In spite of sixty years of planned development and emphasis on the Power-Sector, including Rural Electrification Schemes by central Government, more than fifty-four percent of Indian households are without electricity.

The Power Sector in India is segregated into five autonomous regional grids namely: the northern, eastern, western, southern, and northeastern. The grids of the all four regions, excluding south have been connected with each other. The southern grid though connected with other regions on HVDC, functions autonomously with just a limited barter of power with the different regions. There are several problems which have retarded the growth of the Indian Power-sector; perhaps the most important confronted by the Indian Power Industry is the problem of stealing and larceny resulting in the current levels of AT&C losses which are as high as 40-45%.

To invite overseas involvement and investment in the energy sector, the Indian Government has adopted different strategic reform proposals to reduce the necessity of government restrictions in areas like production, power distribution, transmission and supply. The single largest fear for private producers is that they might not be compensated for the electricity they generate. The majority of the distribution companies are yet to emerge from the shadow of state control, either by the SEB or their unbundled substitutes, and all are fraught with economic troubles.

The total capacity of hydroelectricity hasn't been properly exploited. India is presently positioned fifth globally among consumable hydroelectricity capacity countries. While just 17% has been reined in hitherto, five percentage more is being further developed, allowing an astounding huge capacity of 78%, left unused.

India's Power sector was under government control until 1991 with all the major functions of generation, transmission and distribution to the consumers predominantly done by state-owned companies and boards. The government had a tight grip over the entire power business. Central electricity authority used to exercise control on new project clearance and approvals, finalization of tariff, load dispatch and operation of grid, commercial regulations and control, while states used to manage three areas of generation, transmission and distribution. The entire power sector was also owned, operated and regulated under the purview of government control. Power was a concurrent subject with the prime responsibility lying with states for supplying the power to the consumers. Central government was doing the national planning for the entire country until 1975. In 1976 central government established few central companies to look after the ever-increasing demand of generation. This efforts was not sufficient, and after 1990 this became further complicated since the financial conditions of the state boards were deteriorating every year and jeopardizing the financial health of the entire sector.



**Adoption of Transmission Voltage – Past trend**

**Figure – 1: Growth of Generation and Transmission voltage**

Source: CEA and Powergrid

The Indian Government has come out with a radical legislative approach with the Electricity Act 2003, which allows open access and free trading of power. The act was introduced to:

- Encourage competition and reform distribution.
- Reduction in entry barriers by de-licensing generation.
- Freedom to the captive generation and group captives.
- Recognition of trading as a separate activity.
- Introduction of transmission level open access, and
- Open access to consumers consuming more than 1 MW by January 2009,
- Multiple licenses in distribution, and

- Setting up of regulatory commission to fix tariff and develop the sector.

In the last fifty-seven years, growth and expansion of the network has brought in several complexities.

- The system is large and interconnected.
- All the states are connected and the regions are connected in the National grid.
- The financial viability of the present tariff structure is being questioned.
- Inefficient and huge number of manpower engaged by the SEBs.
- High AT&C / transmission and distribution losses.
- Low realization of revenue and
- Inefficient and unreliable supply

The Government has already taken the initiative in several areas to corporatise the Boards and privatize the Distribution areas. In a nutshell, the power sector is in a transition period.

A survey carried out by Powerline (August 2001), a trade journal for Indian power states: “78 percent of Indian households are not connected to any electricity”, India appears to be mired in a typical developing country conundrum. For every one percent rise in GDP, the government estimates, demand for electricity goes up by 1.6 percent. In effect this is the very effort to modernize as required in the global environment. Change in consumption patterns and consumption is oriented towards such things as installing more computer networks, illuminating chandeliers at convention centers, building more air-conditioned offices and hotels. Although India's manufacturing sector with over 6,500 registered companies is second only to that of the U.S., its per capita consumption of electricity at 600 kilowatt hours per year - is one of the lowest in the world: one sixtieth of Canada, a fifth of South Korea, less than half of China's. Most electricity production is concentrated in agricultural and industrial zones, as well as in the more exclusive neighborhoods of large cities. Over 90 percent of India's generating capacity is government-owned, 70 percent of that by state boards and 30 percent by the central government. About sixty-five percent of all power comes from thermal plants; mostly coal-powered, twenty-six percent is hydroelectric and three percent from nuclear power.

### **1.1 Historical Evolution:**

Similar to other parts of the world, in India during the initial years, there was a period of technological rivalry between two incompatible systems i.e. AC (alternating current) and DC (direct current). In India until the 1940s, industry was confined to a few urban pockets where the total power generating capacity was about 1,350 MW. However after independence in 1947, a massive boost was given to the expansion of electricity through public investment. The installed capacity (of utilities) in 2006 was over 124,000 MW. The generation in billion units (BU) since independence has increased over a hundred-fold from 4 BU to over 420 BU.

### **1.2 Growth Profile of Indian Power-Sector**

The power sector in India has registered an average growth of 9% yearly during the last decade. The system had a total installed capacity of less than 1350MW before independence, reaching an installed capacity of 124,000MW by 2007. By a very rough estimate, using the present level of growth, power generation could touch a figure of 2,00,000 MW in the next five years. There are several agencies in India that are responsible for such studies, and the government has its data-base to forecast the load-growth in the Indian Power Industry.

The per unit power consumption (Total Power generation in KWH / population of the country) in any country is the indicator of the country's affluence, and the standard of living. Power consumption may be dependant on so many factors, and the load growth is dependant on the growth of industrialization. However, the focus is now on less concentrated loads with HV distribution such as computers and cyber cities. Through the Green Revolution, the modernization of cultivation and usage of pump sets in irrigation has also resulted in an increased electricity usage. City boundaries are extending, and the urbanization of areas near the cities has resulted in a greater demand for power. Seasonal parameters such as temperature, rainfall and snowfall are traditional factors, but burgeoning affluence and the rise in per capita income are equally important factors in load growth.

As electricity is one of the most vital infrastructure inputs for a country's economic development, demand of electricity is enormous and growing steadily. In recent times, the response to the public offer for investment in power companies in India is unprecedented. Currently, the vast Indian electricity market offers one of the highest growth opportunities for private developers.

S. No.	Country	Per Capital Electricity Consumption(kWh)
1.	Argentina	2185
2.	Brazil	1883
3.	PRC	1379
4.	India	613
5.	Japan	7818
6.	Mexico	1801
7.	Thailand	1752
8.	USA	13078
9.	World	2456

India is home to 16 per cent of the world's population, and although per capita energy consumption in India is 244 kg. of oil as compared to the world average of 1471 Kg of oil, its total commercial energy requirements are estimated to be of the order of 225 MT. Nearly 60 per cent of this is met by coal, which while being available in abundance, is of poor quality. According to ministry of power reports, thirty percent of Indian commercial energy requirements are met by petroleum products, nearly 7.5 per cent by natural gas and 3.5 per cent by primary electricity. It is believed, though perhaps not properly estimated, that non-commercial fuels like fuel wood, animal waste and agricultural residue meet a huge amount of energy requirements within the country. According to one estimate, traditional energy sources account for 40 per cent of the total energy consumption in the country. Both increasing pressure of population, and the intensified use of energy in agriculture, are major areas of concern. At the same time, the need to meet energy demand has created huge capital requirements needed for setting up

power plants, pipelines, ports, terminals and railway tracks to move fuel. In its quest for increasing the availability of electricity, the country has adopted a blend of thermal, hydro and nuclear sources. Out of these, coal-based thermal power plants and, in some regions, hydro-power plants have been the mainstay of electricity generation. Oil, natural gas and nuclear power accounts for a smaller proportion, i.e. less than 5% of the total installed capacity. Of late, increased emphasis is also being laid on non-conventional energy sources such as solar, wind and tidal.

### **1.3 Power Shortage – Gap between Demand and Supply**

The power sector has been characterized by shortage of supply vis-à-vis demand. In 1990-91, the country faced a declining shortage of around 16%, and an energy shortage of about 8%. The position worsened with a peaking shortage of 18% and energy shortage of about 12% at the end of the 8th Plan (1997) since capacity addition during the 8th Plan (1992-97) was much below the target. However the present level has relatively improved, with 12% peak shortage and 9% off-peak shortage.

In a resource-scarce country like India, there is a huge gap between energy demand and supply. For each megawatt of addition in power capacity generation, the investment required is fifty million Indian rupees, with matching funds for transmission and distribution. The additional resources needed for generation addition have not been sufficient to meet the power shortage. Therefore to manage the gap, “load shedding” has been resorted to throughout the country. Power outages have long been a fact of life in India, and candles, re-chargeable lamps, power converters and generators are as much a part of urban Indian homes as the vacuum cleaner in the U.S.

The focus in the past was more on power generation addition, and least on demand side management through conserving consumption and distribution. Delhi, India’s capital, is drawing far more than its allocated share of electricity from the national grid. Six-hour electricity cuts are an everyday occurrence in this megalopolis of 11 million. But the problem is not only confined to Delhi. In urban areas, consumers are used to cope with 18-20 hours of electricity per day. There are many rural areas and smaller towns that get four to five hours of regular supply a day, and sometimes they do not get power for

weeks. Bangalore, the ‘Silicon Valley of South Asia,’ suffers power outages of several hours per day. As a result, there are innumerable cases of industries forced to lay off workers, as well as riots with people threatening to burn electricity substations. Electricity cuts have sparked violent outbursts in small towns throughout the country. It is difficult to pinpoint any one single factor for the shortage of the power. Experts explain the crisis in a variety of ways, such as mismanagement, corruption, politicized distribution of state-controlled power, excessive subsidies for farmers, reluctance to privatize, and unworkable billing systems. The real cause for alarm is that in this developing country, supposedly rising from Third World mendicancy into the more respectable realm of free market consumership, the power situation has not improved to match the pace of progress.

#### **1.4 Per Capita Consumption**

In the NCEAR published data on power sector, the per capita consumption of electricity for the country as a whole is 592 KWh in 2007, as against 335.42 kWh during 1995-96 and 238.0 kWh during 1989-90. The growing economy calls for a matching rate of growth of the power infrastructure. In order to support a sustained high rate of growth of GDP of nearly 6 per cent per annum, demand for power is expected to grow at around 9% annually. Central Electricity Authority (CEA), with active participation of SEBs, has assessed the energy and peaking demand as identified in the table below:-

Table: Showing peak-demand and energy a per CEA National plan

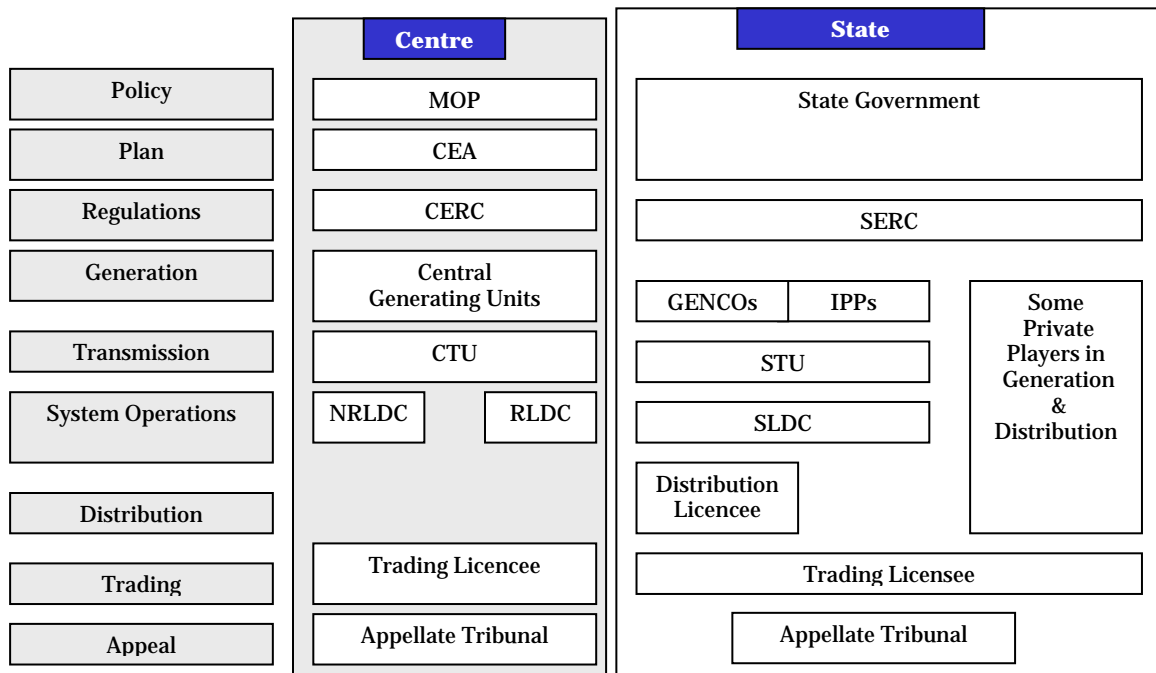
<b>Table – 2: Power projection</b>	2001-02	2006-07
Energy Demand (Billion kWh)	569.65	781.86
Peaking Demand (MW) Annual	95,757	130,944
Load factor (%)	67.91	68.16

The federal government has initiated plans to establish 71,000MWs of power in the next five years i.e. the 12<sup>th</sup> plan period. Based on additional capacity requirements, funds required for the generation component of the National Power Plan have been assessed

and estimated to be US\$ 120Billion. The requirement of funds for the transmission and distribution component would be about 60% of the budget requirement for generation. This includes funds for advance action on Plan Projects. Apart from generation, other components of the sector such as transmission and distribution, rural electrification and R&R projects would require an additional US\$120 billion. In conclusion, the funding requirement in the next five years of the sector is INR 10, 000,000 million (US \$ 240 billion).

### 1.5 Regional Concept of Power Planning and Growth

The Indian power system is divided into five regions for the purpose of planning and operation: Northern, Northeastern, Eastern, Southern, and Western. Each region is directed by operating personnel using load dispatch and communication facilities located at regional and state load dispatch centers. These facilities are presently rather limited to serve the needs of India’s growing power system. The Indian power sector framework is summarized in figure 2 :



**Figure -2 The Organization Structure of the Indian Power Sector**

## 1.6 Operational Challenges and Issues

As per the reports submitted by CTU to the regulatory commission, regional operational problems stem primarily from the constituent's inability to satisfy the unrestricted load demand at 50Hz. This is a clear case of inadequate planning and forecasting of demand by the states. The trends available can be used to get the future load growth, and accordingly the needed capacity additions.

Although there is sufficient installed generating capacity, this capacity is not always available due to factors such as:

- Periodic and emergency maintenance.
- Quality of coal.
- Availability of water for hydro-generation.

These situations can lead to frequency, voltage, and network integrity problems – all of which are detrimental to system operation and can lead to equipment failure. Typically, low voltage occurs during peak load hours, and high voltage occurs during off-peak hours. Low voltages generally do not pose a serious threat to system operation and are correctable by: reactive power injection adjustment, transformer taps, generator over-excitation, and load shedding. However, these corrective strategies are not always feasible.

High voltages are more serious and are correctable by:

- Reactive power injection adjustment.
- Transformer taps, generator under-excitation.
- Line switching, and
- The creation of circulating currents.

Again, these corrective strategies are not always feasible. The reform process in this sector was initiated in the year 1991 with the Govt. willingness to allow few private generators to establish their own generating plants in India. But in the last sixteen years, in spite of several new proposals from the private sector, less than 5% of the added generating capacity came into the private sector. However, the fresh initiative of large

size UMPP (Ultra Mega Power Plants) awarded through competitive bidding to the private producers is bringing good results. There existed a failure to attract potential investors to invest in this area. It was recognized that the electricity supply industry in India was in a state of emergency, and reforms were urgently needed. The direction in which the power sector reform should proceed is not universally accepted.

Such actions as restructuring, unbundling and privatization of large inefficient SEBs was recommended as the solutions. Accordingly the government has started to separate the two functions of “Regulator” and “Business Operator”. Government has decided to play the role of regulator through independent CERC / SERCs, and leave the function of providing services and involvement in the power business to the private operators and some of the corporations who are doing this efficiently.

A concern frequently expressed by the new investors and power companies in India is about the capacity and willingness of consumers / people to pay for electricity. Anil Upadhyay, Secretary Power, Bihar Government (1996) has highlighted some revealing facts about willingness of urban consumers to pay for power at peak time. In most of the small towns of Bihar, load shedding in the evening peak hours is almost a regular phenomenon. This is the time when the urban middle class needs electricity most. To fill this need, an unorganized, unregulated and unlicensed market has emerged. Every town has a large number of entrepreneurs, each owning very small diesel generating sets of 10-20 KVA capacity, each connected to about 100 households to give power to one or two points (say, two lights or one light and one fan). This supplies power between 6 and 10 pm, in case SEB power fails. The consumers pay a fixed price per point per day regardless of hours of actual supply. This price corresponds to energy charges of Rs. 8-10 per unit (which has since increased by about 50 per cent with the recent hike in diesel prices). The point is that the urban supplier has valued the price of electricity at evening peak hours at this level, and the consumer is willing to pay the price. In rural areas, it is well known that the farmers pay economic rates for water taken from a nearby farmer's pump-set. As Upadhyay, energy secretary to the government of Bihar states in his published findings: “In electricity, Rajasthan SEB introduced a novel ‘nursery’ scheme to provide ‘out of turn’ connection to the farmers willing to pay the actual cost of connection (which is about 10 times the normal charge), and a tariff of Rs. 1.20/-unit

instead of Re 0.50/- unit under normal connections. This attracted tremendous response—about 60 per cent of new connections were given under this scheme. In another variant of the same approach, the Punjab SEB has introduced a scheme to give power connection to private tube wells on priority to those farmers who install their own transformer. This scheme has also become extremely popular. These examples show that political populism has created an environment of uneconomic tariffs and non-payment. Several instances show that consumers are more concerned with reliability and quality of supply, and if they are assured of this they are willing to pay the price. Unfortunately, the Indian power sector has become trapped in a vicious circle of low tariffs, poor recovery and erratic quality of supply and service.”

### **1.7 Challenges of Reforms and Radical Change:**

Government funding has not kept pace with the projected investment for the critical power infrastructure because the investors have not found it prudent to invest in any portfolio which is prone to poor rate of revenue, high commercial loss and under-performance. Transmission and distribution losses are to the tune of 40-45%. A reduction of 20% could have given Rs.500crores or more to each SEB as additional annual revenue. This in itself could sustain investment of 6 times as much.

AT&C losses comprise technical losses arising mainly out of long low voltage distribution lines, a large number of registered un-metered consumption points, and un-metered consumers. Meter reading and billing does not encompass all the registered consumers, the quality of meter, in addition, being suspect. Apart from the theft and pilferages of power, there is substantial loss of revenue due to collusion of consumers and employees of utility supplies.

The Ahluwalia committee appointed by GOI (Government of India) to look into the losses of revenue in power sector stated: *“The losses include pilferage of electricity, which is estimated to be at least 15% of the energy delivered. The reform process in this sector particularly with the privatization this percentage is expected to fall below a certain acceptable level. Subsidized tariff and cross subsidies did wonders to help the economy in the villages. The leapfrog in the agriculture sector was contributed in no*

*small measure by the availability of cheap / free electricity. However we have to remember that 54 years have passed since we became independent. Sustained subsidized/cross subsidized electricity to agriculture and other sectors has resulted in the beneficiaries taking electricity for granted and has made them oblivious of the real cost of energy. The result has been wastage of electricity and lack of initiative to conserve. How long such subsidized sectors need a crunch to stand on should be reviewed. State regulated tariff crippled the utilities. Just the opposite was the case in advanced countries where the monopoly enjoyed by the state regulated utilities was seen to be the high tariff and windfall profit.”*

The ASCI report on tariff fixation and power sector reforms submitted to SERC West-Bengal stated, *“Private participation in generation was proposed to supplement budgetary support for increase in generation. With SEBs in the red, it didn’t work. Private participation in generation in the West was introduced to do away with state monopoly, introduce corporatisation and competition to reduce cost of electricity.”* When privatization of generation failed to attract investors, it was presumed that the solution lay in restructuring of SEBs to segregate generation, transmission, distribution and sale of electricity and to privatize them. It was hoped that it would increase efficiency and improve accountability. We failed to identify that unless pilferage of electricity was reduced/eliminated, other areas of improvement will only have a cosmetic effect. Restructuring in the West was ushered in to segregate the naturally monopolistic part of the business from that which could be brought under competitive environment and freed from regulation.”

## **1.8 Financial Status of State Electricity Boards**

State Electricity Boards have been the main components of the ESI in India for the last 50 years, and have rendered a commendable service in electrification of the country. In the working paper submitted to GOI by a committee of experts, salient issues brought out are::

- Consumer tariffs having been fixed at levels much below the average cost of supply, for large consumer segments.
- The power in India since independence in 1947 has always been treated as a facility to be provided by the government, and the companies providing such services were government owned boards with a few private players.
- The consumers of electricity have always been pampered by the government by offering them a tariff, which is even lower than the cost of production.
- The fixing of power tariff was more an exercise to please all sections of consumers, and hardly any effort was exerted to link price with cost of electricity production and transmission.

As recently as 1998, the responsibility of fixing the tariff for power was handed over to an independent commission. The consumption of power was never considered either as a service to the community, or a commodity. The financial mess in the power sector is largely due to the concept of running the utility companies as government departments and not as a business. Many of the international consultants appointed by GOI (Government of India) to identify areas of reforms have clearly recommended that professional managers rather than political appointees or bureaucrats manage these companies.

The SERCs have recorded in the tariff notifications that there is inefficiency in energy metering, billing and revenue collection by SEBs. Most of the state electricity boards are losing almost half of the energy sold due to improper measurement through metering, faulty billing and non-efficient means of revenue collection. Accordingly, in the complete commercial cycle the company is losing half of the revenue due to commercial and technical losses. This loss is especially prominent in far-flung rural areas. KPMG in its report to West Bengal State Electricity Board has submitted a time-bound action plan and has identified five major areas of concern:

- Lack of commercial orientation.
- Technical & Commercial loss, Cumulative losses,
- Adversely affecting the Net worth of the company.
- Ageing workforce and

- Lack of training importance.

The report decries the business environment of the company and mentioned that the technical & commercial losses of 36% in Nov'2005, are high compared to any acceptable business model. The revenue losses need to be reduced considerably. In the report it is mentioned that the company is losing Re 1 per unit of energy purchased from other agencies, generated and sold. This is almost 40% of per unit cost of the power sold in west Bengal. In the case of West Bengal, the positive aspect of revenue collection is the increase of 63 paise per unit of revenue realization in the current financial year, but simultaneously this is being eroded by an increase in cost of supply by 68 paise per unit. Thereby the loss is further widened by a gap of 5 paise per unit. The rate of return on investment is on the negative side, with the company suffering a deficit, and performing much below the prescribed statutory return of 3%.

Consumer tariff has always been a matter of debate, deliberations and issue of public interest. Fixing of tariff for the power companies based on sound economic policy is a treacherous journey towards reform. Varied pragmatic criteria would have to be applied by SERCs in the fixation of consumer tariffs for different categories, balancing between social needs/compulsions, cost of supply etc. It would also be prudent to relate tariffs with the quality of power supply, so consumers could expect load-shedding-free supply at a proper voltage when they are required to pay higher tariffs. The dichotomy is that this is possible only after a corresponding enhancement in generating capacity and T&D augmentation, which is not possible unless the ESI's revenue improves substantially (through tariff increase and /or efficient metering, billing and collection).

In a World Bank Report (1999), it has been estimated that only about 50-60% of the electricity generated in India is actually metered at the consumers' end. The rest goes as T&D losses, un-metered supplies and theft (by unauthorized tapping and tampering of meters). The SEBs bills for only a part of the metered energy, and only a part of the latter is actually paid for by the consumers. The overall result is that the SEBs get only a fraction of the revenue they could, even with the present, un-remunerative tariffs, if

metering, billing and collection were to be done more efficiently. Past experience has generally shown that metering, billing and collection efficiency can be improved only marginally in the present SEB setup, due to various factors. It appears that the only pragmatic approach for tackling this problem is some sort of privatization of distribution, wherein the private entrepreneur or company, and the employees have a personal financial stake in ultimate revenue collection. Privatization of distribution systems, besides enhancing revenue collection (towards restoring the financial viability of ESI) would also provide an immediate and direct path for non-governmental funds to be applied for distribution system augmentation. This is a very important aspect, particularly when the Central and State governments are not in a position to provide the required funding. Efficiency improvement in the management of the distribution business would be a side benefit of privatization, and the ultimate customer of the ESI, i.e. the consumer, would gain in the long run on all the above counts.

### **1.9 Power Sector Reforms in India**

The power sector in India has undergone radical changes since 1991. The policies and framework have been overhauled, as also the approach and organizational structure of the SEBs. The results are far more positive, but it is still a transition period. However the reason for the slow progress of reforms is the fact that power is a concurrent subject for central and state governments. The execution is predominantly in the state sector and ninety-five percent of Indian consumers get their power supply from the state electricity boards, or the state government owned companies carved out from erstwhile State Electricity Boards. These utilities are owned, operated and regulated by state governments. Utilities are not in a good financial health. Companies are having operational losses to the tune of 40,000Cr (US\$ 1billion), and the cumulative loss has reached to figures which have eroded the net worth of the company's asset. Since 1991 the central policy makers were compelled to draw plans to revive the sector by introducing the power sector reform programs. The companies are bogged down due to heavy transmission and distribution losses, which also include power theft. As per the reports of World Bank, only forty-five percent of the power sold is recovered through

revenue collection. This has led to a situation where the paying Industrial customers have to suffer and subsidize the non-paying rural and politically sensitive consumers. The service rendered to the paying customers is generally much below the desired level. The qualities of service rendered are not quantified and it is expected that the mere availability of power supply is the assurance of quality service, which a power customer expects.

The Federal Government took the initiative in 1991 to bring about reforms in this sector, and to institute both financial as well as operational efficiency. As a policy decision, the Government recommended a trifurcation of Boards and propels an initiative to form smaller, more manageable entities. Orissa was the first state in the country which started the process of reforms. Financial institutions such as the World Bank and DFID ( please identify the acronym) assisted in transforming the ailing power industry from a loss making entity to self sustainability, and bringing efficiency, financial viability and effectiveness in the services rendered. The erstwhile SEB was trifurcated into three companies. The government retained the transmission company, the rest of the two companies in generation and distribution were privatized. The aim was to run the power industry in a more professional manner based on sound commercial principles. The objective was clearly to transform the power business which was run as a social obligation of Government, to a company which is oriented towards business plans and its long-term strategy. The state regulatory authorities were placed to look after the interest of the common consumers as the power industry is a natural monopoly. There have been different experiments in organizational structure as well as the owner-ship model in the last eight years.

### **1.10 Electricity Act 2003 – a paradigm shift**

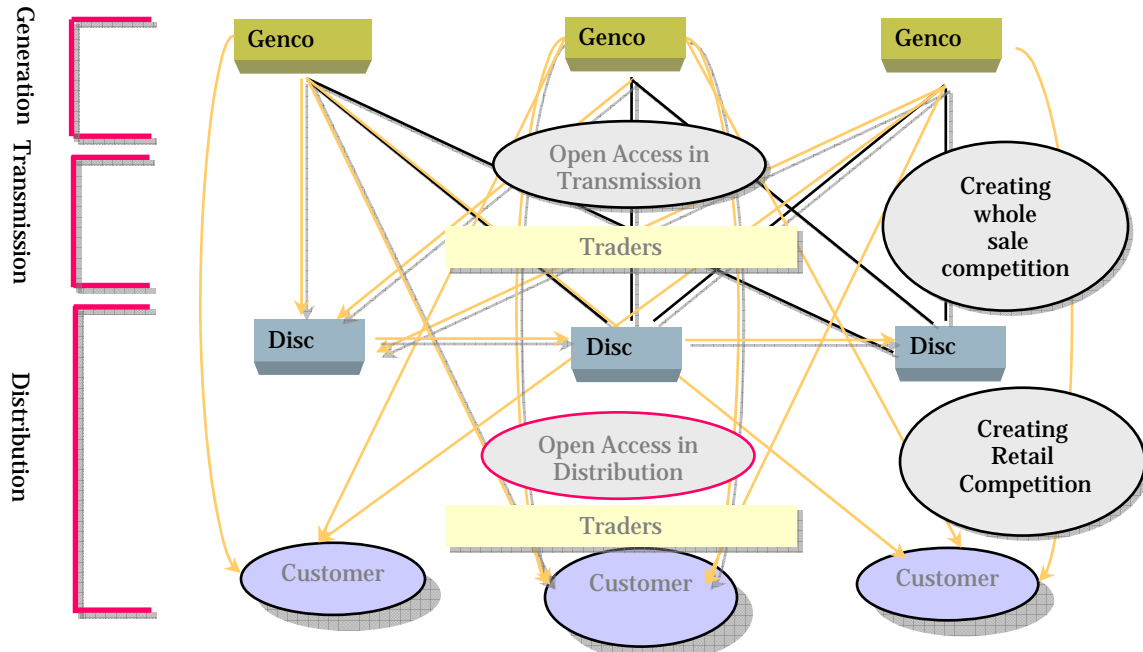
The Electricity Act 2003 was promulgated to bring in market dynamism and improvement in efficiency in the sector. The Act would help to bring in Independent Regulatory Commissions in the States as well as in the Center. The Act has provisions to release thermal generation from the requirement of any prior clearances/licenses. It also allows no restriction for setting up captive power plants, including group captive power

plants. This would also facilitate open access in transmission resulting in a creation of an all-India market. The Act has allowed private investment in transmission through licensing by Regulatory Commission. This is in addition to fuel freedom for building dedicated transmission lines. Moreover the real big change would be with the open access in distribution, which would be through a phased introduction with consumers above 1 MW getting the right to open access latest by January, 2009. This would enable provision for more than one distribution license in the same area. There has been a clearly laid out prescription of performance standards for distribution licensees and its enforcement by Regulatory Commissions in the Act.

The generation pricing has gone beyond cost-plus-pricing being followed earlier. As per the Act, competitively bid generation tariffs are to be accepted by Regulatory Commissions. As a result of this, bids were invited for Ultra Mega Power Projects (UMPP) and three of them have been awarded by PFC to the lowest bidders. This should bring in increased efficiency and market dynamism in the generation of electricity. Power purchase costs for customers availing open access will be market determined. The central government has appointed an Appellate Tribunal for quick disposal of appeals against decisions of the State Regulatory Commission/Central Commission.

Power tariff (pricing) is fixed by the regulators based on the total expenditure of the company, loss component and the total energy sold. In the reform process, policy makers are endeavouring to encourage competition and applicability of service marketing. The market forces do not determine the pricing of the power in India, rather the commission regulates the fixing of tariff and that too is subject to challenges in the judicial system. The power pricing in the sector which still is mostly run by the government-owned Utility, the concepts of TODP (time of the day pricing), flexi-pricing, premium-Pricing for uninterrupted and quality power may be a welcome change. A recent research indicated that the Utilities have failed to implement the customer focus approach and applicability of CRM (customer relationship management) in Indian power sector due to several factors such as lack of motivation of workforce, lack of internal marketing, attitude of employees toward the customer, non-availability of meters, poor billing process, organizational structure of the utility companies, lack of information and no

additional benefit in providing uninterrupted service of high quality. The researcher has proposed two solutions: one based on the IT (information technology), and the second the radical changes in the organization and the shift of behavioral changes.



**Fig – 3 Proposed Market model – post Electricity act 2003**

The power sector market may emerge as shown in Fig -3 with open access in both Transmission and Distribution sector by the year 2009.

### 1.11 Power theft – A Governance concern

AT&C losses, T&D Losses, Theft of power are different nomenclature and concepts of explaining the breach between power sold and revenue accrued in the Indian Power Sector. It has been statistically proven in the past that private enterprises are doing better than the state owned utilities as far as curbing theft, or reducing losses. At the same time control on theft is better managed in urban, rather than rural areas. It is also accepted by all stakeholders including the planners and policy makers that by and large there is an unethical collusion between the employees of these Utilities and the consumers for such high AT&C losses to the tune of 40-45%.

However keeping these facts in mind, it is equally important to analyse the social and political pressure for such theft or losses. There are numerous examples of assault,

humiliation and obstruction to Utility Board engineers by any influential persons in society when they are taken to task by upright and honest engineers in cases of detection of theft of Energy by these anti- social elements. Power companies have to empower its agencies to prevent theft of energy. Many-a-time all efforts including police cases against erring consumers are given political colour with wide coverage in the media with an ulterior motive to defame the genuine efforts of the Company. There are laws to curb theft of energy. The Indian Electric Act 2003 empowers the Utilities with sufficient power to deal with anybody engaged in theft in any way.

Electricity Act 2003 – is a sincere effort to reduce the T&D losses and punish the infringement. There are provisions to control theft of power with harsh punitive actions. Theft is a term for whoever dishonestly abstracts, consumes or uses any energy, and if it is proved that any artificial mean or means not authorized by the licensee exist for the abstraction, consumption or use of energy by the consumer, it shall be presumed, until the contrary is proved, that any abstraction, consumption or use of energy has been dishonestly caused by some consumer.

For realizing the outstanding dues, the Act 2003 has provisions for disconnecting the line after a notice of 15 days.

“To defaulting customers without prejudice to his rights to recover such charge or other sum by suit, cut off the supply of electricity and for that purpose cut or disconnect any electric supply line or other works being the property of such licensee or the generating company through which electricity may have been supplied, transmitted, distributed or wheeled and may discontinue the supply until such charge or other sum, together with any expenses incurred by him in cutting off and reconnecting the supply, are paid, but no longer:

Provided that the supply of electricity shall not be cut off if such person deposits , under protest, - (a) an amount equal to the sum claimed from him, or (b) the electricity charges due from him for each month calculated on the basis of average charge for electricity paid by him during the preceding six months

- (1) Whoever, dishonestly,(a) taps, makes or causes to be made any connection with overhead, underground or under water lines or cables, or service wires, or service facilities of a licensee; or (b) tampers a meter, installs or uses a tampered meter,

current reversing transformer, loop connection or any other device or method which interferes with accurate or proper registration, calibration or metering of electric current or otherwise results in a manner whereby electricity is stolen or wasted; or (c) damages or destroys an electric meter, apparatus, equipment, or wire or causes or allows any of them to be so damaged or destroyed as to interfere with the proper or accurate metering of electricity, so as to abstract or consume or use electricity shall be punishable with imprisonment for a term which may extend to three years or with fine or with both: Provided that in a case where the load abstracted, consumed, or used or attempted abstraction or attempted consumption or attempted use - (i) does not exceed 10 kilowatt, the fine imposed on first conviction shall not be less than three times the financial gain on account of such theft of electricity and in the event of second or subsequent conviction the fine imposed shall not be less than three times the financial gain on account of such theft of electricity and in the event of second or subsequent conviction the fine imposed shall not be less than three times the financial gain on account of such theft of electricity. Provided further that if it is proved that any artificial means or means not authorized by the Board or licensee exist for the abstraction, consumption or use of electricity by the consumer, it shall be presumed, until the contrary is proved, that any abstraction, consumption or use of electricity has been dishonestly caused by such consumer. Any officer authorized in this behalf by the State Government may - (a) enter, inspect, break open and search any place or premises in which he has reason to believe that electricity has been, is being, or is likely to be, used unauthorisedly; (b) search, seize and remove all such devices, instruments, wires and any other facilitator or article which has been, is being, or is likely to be, used for unauthorized use of electricity; (c) examine or seize any books of account or documents which in his opinion shall be useful for or relevant to, any proceedings in respect of the offence under sub-section (1) and allow the person from whose custody such books of account or documents are seized to make copies thereof or take extracts there from in his presence.”

- (2) The provisions of the Code of Criminal Procedure, 1973, relating to search and seizure shall apply, as far as may be, to searches and seizure under this Act. If a person, having been convicted of an offence punishable under sub-section (1) is again guilty of an offence punishable under that subsection, he shall be

punishable for the second or subsequent offence for a term of imprisonment which shall not be less than six months, but which may extend to five years and shall also be liable to a fine which shall not be less than ten thousand rupees.

- (3) There are provisions for punitive action for theft of material under section 137 of Act 2003. Whoever dishonestly receives any stolen electric lines or materials knowing or having reasons to believe the same to be stolen property, shall be punishable with imprisonment of either description for a term which may extend to three years, or with an imposed fine or both.
- (4) There are provisions in clause 138 of the act 2003 which stipulates interference with meters or works of licensee. The clause stipulates that whoever (a) unauthorisedly connects any meter, indicator or apparatus with any electric line through which electricity is supplied by a licensee or disconnects the same from any such electric line; or (b) unauthorisedly reconnects any meter, indicator or apparatus with any electric line or other works being the property of a licensee when the said electric line or other works has or have been cut or disconnected; or (c) lays or causes to be laid, or connects up any works for the purpose of communicating with any other works belonging to a licensee; or (d) maliciously injures any meter, indicator, or apparatus belonging to a licensee or willfully or fraudulently alters the index of any such meter, indicator or apparatus or prevents any such meter, indicator or apparatus from duly registering, shall be punishable with imprisonment for a term which may extend to three years, or with fine which may extend to ten thousand rupees(US\$ 250), or with both, and , in the case of a continuing offence, with a daily fine which may extend to five hundred rupees; and if it is proved that any means exist for making such connection as is referred to in clause (a) or such re-connection as is referred to in clause (b), or such communication as is referred to in clause (c), for causing such alteration or prevention as is referred to in clause (d), and that the meter, indicator or apparatus is under the custody or control of the consumer, whether it is his property or not, it shall be presumed, until the contrary is proved, that such connection, reconnection, communication, alteration, prevention or improper use, as the case may be, has been knowingly and willfully caused by such consumer.

The Act also has provisions for severe punitive action for theft of electric lines and materials under clause 136 of Act 2003.

“ Whoever, dishonestly (a) cuts or removes or takes away or transfers any electric line, material or meter from a tower, pole, any other installation or place of installation or any other place, or site where it may be rightfully or lawfully stored, deposited, kept, stocked, situated or located including during transportation, without the consent of the licensee or the owner, as the case may be, whether or not the act is done for profit or gain; or (b) stores, possesses or otherwise keeps in his premises, custody or control, any electric line, material or meter without the consent of the owner, whether or not the act is committed for profit or gain; or (c) loads, carries, or moves from one place to another any electric line, material or meter without the consent of its owner, whether or not the act is done for profit or gain.”

## 2. Power Sector in Bihar and Jharkhand

Bihar is a state in India located in the eastern part of the country. The state has a rich traditional and historical background. Bihar of recent times is known as one of the most problem-ridden regions of the country, and the popular view is that the situation is due mainly to failures of public policy. In a recent survey it was declared the most backward state. The eastern state has a population of 82.8 million as per 2001 Census, which has crossed a figure of 100million in the year 2007 as per current statistical assessment considering the population growth. The state being in the highly-populated Gangetic plain, it has a dense population of 880 per sq. Km. (2001 Census)



Figure – 4: District Map of Bihar

The entire land area of Bihar consists largely of plains formed due to sediments deposited by the River Ganga, Gandak and Sone. This area is divided into thirty-seven districts. A power starved state, Bihar is the only state in the country with practically no operating generation of its own. The existing plants at Baruni and Muzzafarpur are old and in the

process of renovation. It has always been a conundrum for the planners in the Bihar power sector whether to buy power from the central sector generating stations or to plan for new plants themselves. Bihar is one of the few states in the country which is dependant on the central sector power generating company for more than eighty percentage of its total power consumption. As a thumb rule for planners, each MW of capacity adds an additional cost to the state exchequer of more than 5crores. The shortfall in the next ten years if taken as a meager 1000MW would need additional investment to the tune of 5000Crs. To date it is quite economical to draw power from the central grid as the cost of generation in these plants is reasonable, and it is even economical compared to the generation cost of the plants at Barauni and Kanti, the thermal plants of Bihar. Since the bifurcation of the state, Bihar has lost all the major generating plants to its small brother Jharkhand. In the family feud of distribution of the assets, the ownership of Tenughat power station was a bone of contention for many years until recently it was decided to allocate it in favor of the Jharkhand.

The GOI has taken several initiatives in this direction and most significant is the RGGVY (Rajiv Gandhi Gramin Vidyut Yojna) which is giving a grant of 90% of the project cost to the state power utility. The funding issue is being addressed through this scheme and implementation issues are also being taken with advisors-cum-consultants appointed by the Government. In recent times, the Bihar Government has taken the task of rural electrification through major initiatives such as Accelerated Power development and reform programs in the major load centers of Patna, Muzzafarpur, Gaya and Rohtas. The project of upgrading the existing power equipment in the sub-stations, along with the augmentation of transformation capacity, changing the old low capacity conductors is being executed by the central power agencies under Sub-Transmission project. The success of these projects depends largely on the completion of the project within the stipulated time frame of the project completion period, within the estimated and approved project cost, and in the context of Bihar maintaining the system at desired quality beyond the project.

The rural initiative in Bihar is trying to catch up with the national initiative for electrification of all villages by 2009. In the State of Bihar schemes for villages,

electrification is being carried out under different programmes. Electrification of 2,600 villages in the districts of Vaishali and Muzaffarpur under the Minimum Needs Programme on the occasion of the 2,600 Birth Anniversary of Lord Mahavir is one such program which is nearing completion. Under the Pradhan Mantri Gramodaya Yojana 340 virgin villages are being electrified, and the rehabilitation of the existing electricity system is being done in 210 villages. In each of these villages one Dalit Basti is to be provided by electricity connections. To take up cent percent of the electrification in the State, the State Govt. has entered into a quadripartite agreement with Rural Electrification Corporation (REC), BSEB and the GOI power sector undertakings of Power Grid Corporation of India Ltd. (PGCIL) and National Hydroelectric Power Corporation (NHPC). This programme is being implemented under the RGGVY scheme for 'Electrification of one lakh villages and one crore households'. The funding for this scheme is being made by REC as grant and loan components. The central undertakings are implementing the rural electrification works in the 36 districts, with NHPC taking up works in West Champaran, East Champaran, Sitamarhi, Sheohar, Darbhanga, Samastipur and Madhubani. The remaining districts are being taken up by PGCIL

The major problems of the State Electricity Utility company, the erstwhile BSEB (recently it has been divided in to seven state-owned companies under a holding company) are: Un-remunerative consumer tariffs, which should have been revised over the years but was pushed under the carpet for political expediency. SERC in the state needs to be proactive and push forward and thus should be able to proceed quickly with rationalization of retail tariffs for different consumer categories, such that the BSEB within the State has a chance of becoming financially viable. Consumer-tariffs need not provide for SEB's present inefficiency, it has since been restructured to come out of the present political stranglehold and become more efficient. Pragmatic criteria would have to be applied by SERCs in fixation of consumer tariffs for different categories, balancing between social needs/compulsions, cost of supply etc. It would also be prudent to relate the tariffs with quality of power supply to consumers who could then expect load-shedding-free supply at a proper voltage when they are required to pay higher tariffs. The vicious loop is that this is possible only after a corresponding enhancement in generating capacity and T&D augmentation, which is not possible unless the Utility's

revenue improves substantially (through tariff increase and /or efficient metering, billing and collection).

It has been reported that only about 50-60% of the electricity generated and procured from regional grid in Bihar is actually sold and billed at the consumers' end. The rest goes as T&D losses, unmetered supplies and theft (by unauthorized tapping and tampering of meters). Only the SEBs bills for a part of the metered energy, and only a part of the latter is actually paid for by the consumers. The overall result is that the SEB get only a fraction of the revenue that they could get, even with the present, unremunerative tariffs, if metering, billing and collection were to be done more efficiently. The past experience has generally shown that metering, billing and collection efficiency could be improved only marginally in the earlier SEB setup, due to various factors.

The state government has initiated the process of restructuring the state owned BSEB in to seven entities under the holding company. The generation would be under the new company Bihar Rajya Vidyut Utpadan Company Limited with its office at Patna. The transmission of the state would be under Bihar Rajya Vidyut Sancharan Company Limited, and there would be five distribution companies, namely Bihar Rajya Patna Vidyut Aapurti Company Limited with head-quarters at Patna, Bihar Rajya Dakshin Vidyut Aapurti Company Limited with head-quarters at Gaya, Bihar Rajya Uttar Vidyut Aapurti Company Limited with head-quarters at Muzzafarpur, Bihar Rajya Purvotar Vidyut Aapurti Company Limited with head-quarters at Bhagalpur, Bihar Rajya Koshi Prakhanda Vidyut Aapurti Company Limited with head-quarters at Saharsha.

However, theft of power even by industrial and commercial consumers and influential sections of society, not to speak of others, is not only a big challenge but also strikes at the very root of the state's progress and prosperity. Unauthorised hooking for availing electricity, unauthorized connection without meters, tampering of the seals of the meters, utilizing unauthorized loads beyond the sanctioned limit, extension of connections to other premises or unauthorized places, and other similar bad practices are not only illegal but a criminal offence too, because of being dangerous to human and animal life. Placing a metal hook on a live conductor renders the latter weak, and there is always the fear of

electrocution of human and animals alike due to the fall of live wire on the earth. Also, chances of burning of transformer due to overloading resulting from unauthorized hooking etc. cannot be ruled out. The need for subsidy for agriculture and to small poor consumers is well recognized. But where it is supplied publicly or privately, there is an urgent need to make it more targeted and limited.

## **2.1 Rural Electrification and supply**

Rural Electrification scheme is a vital program for the socio-economic development of a country. The program has the objective to trigger economic development and generate employment by providing electricity as an input for productive uses in agriculture and rural industries and improve the quality of life of the rural people by supplying electricity for lighting homes. Rural Electricity involves supply of energy for two types of programmes; Production-oriented activities like minor irrigation, rural industries etc., and Electrification of villages including rural households.

While the emphasis is laid on exploration of ground water potential and energisation of pump sets / tube wells which have a bearing on agricultural production, the accent in respect of areas covered under the Revised Minimum Needs Programme (RMNP), is on village electrification. According to the earlier definition -A village is classified as electrified if electricity is being used within its revenue area for any purpose whatsoever. This definition of village electrification was reviewed in consultation with the State Governments and State Electricity Boards and the following new definition was adopted: 'A village will be deemed to be electrified if electricity is used in the inhabited locality within the revenue boundary of the village for any purpose whatsoever'. It has been decided to revise the definition of village electrification and a new proposed definition of village electrification is as under – 'The basic infrastructure such as distribution transformer, and or distribution lines, is made available in the inhabited locality within the revenue boundary of the village including at least one hamlet/ Dalit Basti(colonies for person in the lower strata of society) as applicable and any of the public places like Schools, Panchayat Office, Health Centers, Dispensaries, Community centers etc. avail power supply on demand. The ratings of distribution transformer and LT lines to be provided in the village would be finalized as per the anticipated number of connections decided in consultation with the Panchayat / Zila Parishad / District Administration who will also issue the necessary certificate of village electrification on completion of the works. The number of household electrified should be minimum 10% for villages which are un-electrified, before the village is declared electrified'. The revision of definition

would be prospective. In the state of Bihar, in spite of best efforts, the electrification of villages is only 71% of the total villages as per official records.

Rajiv Gandhi Grameen Vidhyutikaran Yojana (RGGVY) – the new initiative by the Indian Government for Village Electrification Scheme: Indian Government has introduced the scheme Rajiv Gandhi Grameen Vidhyutikaran Yojana (RGGVY) in April 2005, which aims at providing electricity in all villages and habitations in four years and provides access to electricity to all rural households. This programme has been brought under the ambit of Bharat Nirman (Build the nation). The scheme is to bridge the development of urban and rural India. The new scheme for electricity distribution infrastructure is envisaged to establish Rural Electricity Distribution Backbone (REDB) with at least a 33/11KV sub-station, Village Electrification Infrastructure (VEI) with at least a Distribution Transformer in a village or hamlet, and stand alone grids with generation where grid supply is not feasible. This infrastructure would cater to the requirements of agriculture and other activities in rural areas including irrigation pump-sets, small and medium industries, khadi (handlooms) and village industries, cold chains, healthcare, education and IT. This would facilitate overall rural development, employment generation and poverty alleviation.

One problem in rural supply, even at a heavily subsidized tariff, is billing and collection in far-flung areas. The SEBs have almost given up on this. A private enterprise will do better, but problems will remain. Some kind of consolidated supply and collection at one point will have to be worked out. Panchayats and rural co-operatives can be important institutions in this area. West Bengal has involved some panchayats in distribution. Rural cooperatives have been tapped in several states, but their experience has not been very successful. These institutions need to be strengthened and involved in electricity supply and distribution.

## **2.2 Paying capacity of rural India**

A concern frequently expressed in India is about the capacity and willingness of the rural consumers to pay for electricity. There is a perception among the investors and planners that they have been spoiled too much in the SEB system and are habitual defaulters.

Upadhyay (1996) highlighted some startling facts about the willingness of urban consumers to pay for power at peak time. In most of the small towns of Bihar, load shedding in the evening peak hours is almost a regular phenomenon. This is the time when the urban middle class needs electricity most. To fill this need, an unorganized, unregulated and unlicensed market has emerged. Every town has a large number of entrepreneurs, each owning very small diesel generating sets of 10-20 KVA capacity, each connected to about 100 households to give power to one or two points (say, two lights or one light and one fan). This supplies power between 6 and 10 pm, in case the BSEB power fails. The consumers pay a fixed price per point per day regardless of hours of actual supply. This price corresponds to energy charges of Rs. 8-10 per unit (which has since increased by about 50 per cent with the recent hike in diesel prices). The point is that the urbanite has valued the price of electricity in evening peak hour at this level, and is willing to pay the price. Coming to rural areas, it is well known that the farmers pay for water taken from a nearby farmer's pump-set at economic rates. In electricity, Rajasthan SEB introduced a novel 'nursery' scheme to provide 'out of turn' connection to the farmers willing to pay the actual cost of connection (which is about 10 times the normal charge) and a tariff of Rs. 1.20/-unit instead of Re 0.50/- unit under normal connections. This attracted a tremendous response—about 60 percent of new connections were given under this scheme. In another variant of the same approach, the Punjab SEB has introduced a scheme to give power connection to private tube wells on priority to those farmers who install their own transformer.

Moreover it is interesting to look at the transformation of rural economy in some of the states like Punjab, Haryana, Gujarat and Maharashtra. The success of ITC sponsored Village Chaupal are a few of the indicators of rural economy change. Nevertheless the rural customers are paying for an alternative source of fuel i.e. kerosene and candles for lighting. Therefore the fair pricing of the rural electricity would help it to grow in a sustainable way. It is furthermore true that the electrification would spur the growth of villages and rural area and therefore the paying capacity would boost with time.

### **3.0 Research Observation**

The rural electrification and rural electricity supply in India is one of the several integrated functions State Electricity Boards are performing. Those include state level Generation, Transmission, urban Distribution and rural Distribution. Even in the states which have gone for restructuring, the rural electrification is still remains with the state-owned companies. The monolithic and large SEBs is marred by mis-governance. The cross subsidy in agriculture and rural supply has drained the resources of the state power companies, with highly damaging effects on their overall performance and quality of service. Rural Electrification in India is highly subsidized. But benefits of such high subsidy have not reached the customers. It is clearly seen that in last sixty years, subsidies could not improve the quality of life of rural poor.

Rural electrification programs are inherently difficult for any country due to fewer customers and larger areas to cover. It has been experienced in the past that the low population densities in rural areas results in high capital and operating costs for electricity companies. Moreover in the rural Indian context, consumers are extremely poor and have limited usage of electricity mainly for lighting.

The World Bank funded developmental projects including health programmes have come under scrutiny in recent time. The US\$ 2billion health sector aid has been kept on hold on the basis of a CAG (Comptroller and Auditor General of India) report detailing alleged rigging of bids, bribery, fraud, fake NGOs, and tempered documents. It reveals rampant corruption in implementation of projects. The SEBs being a state-owned utility, it has been a fiefdom of politicians. Right from political interference in the orderly planning and running of programs, insisting on favored constituents being connected first and preventing the disconnection of people not paying their bills. Local communities and individual farmers may cause difficulties over rights of way for the construction and maintenance of electricity lines.

India has transformed from a Local to State, State to Regional and Regional to National Grid in the last sixty years. In spite of this national integration, grid pockets in rural areas have been left without electrical connections. Either they can be connected by grid sources or it can be supplied through localized generation. Large scale grid-based rural electrification is a relatively complex business. It appears that the only pragmatic approach for tackling this problem is some sort of privatisation of distribution, wherein the private entrepreneur or company, and the employees have a personal financial stake in ultimate revenue collection.

Cost recovery is probably the single most important factor determining the long-term effectiveness of rural electrification programs. When cost recovery is pursued, most of the other program elements fall easily into place. All the successful programs reviewed in the case studies placed a strong emphasis on covering their costs, though there is a wide variation in how it was approached.

In contrast, electricity supply organizations depending on operational subsidies are critically vulnerable to any downturn in their availability. When the subsidy is reduced, as inevitably happens, the virtue of increased sales turns into the vice of greater losses, creating a significant disincentive to extend electricity to new customers, especially poor people. The contradictory signals to management make proper running of the organization impossible.

Rural electrification only makes commercial sense in areas where there is already a demand for electricity-using services such as lighting, television, refrigeration and motive power. In the absence of a grid supply, these services are obtained by spending money on kerosene, LPG, dry-cell batteries, car battery recharging and small power units, all of which are highly expensive per unit of electricity supplied. The remote rural area may not fit in to the first category of the demand, and the rural households demand initially would be limited only to lighting and basic requirements. However the increase of household demand would also take place consequent upon economic growth of the area after the electrification.

Project of this magnitude which is for the overhauling of the entire system requires a strong will, project management of highest order and comprehensive scheme in totality

taking into account the entire gamut of the power system in the state. People in the state need to understand that the very basic aspect of human behavior is that a person can improve only if he admits that he has scope of improvement. If they continue to live in a fool's paradise that whatever they have is the best, and whatever system they are following is perfect, than only god can save them.

The improvement in the system also requires strong support from consumers in the development initiatives. For any public utility project to succeed three parameters, namely the investment, a feasible project plans for execution and the acceptability of the project by the customers with a strong will to maintain it are essential to succeed. The state power planners must not only focus on building the new facilities, but creating sufficient awareness among the consumers to help in preventing damage and theft, maintaining the electrical installations such as power transformers, poles and conductors specially in rural areas beyond the premises of the utility company and paying the dues in time for the electricity they have consumed. For a poor state like Bihar creating infrastructure is not sufficient, it is equally important to have proper maintenance of the equipments and installations.

The restructuring may yield good results only if the revenue collection and theft can be controlled by the newly formed five distribution companies in Bihar. If there are no changes in the staff and the officials, it would be an intriguing subject to observe in the days ahead. Perhaps smaller district level customer Co-Operatives could have been a better choice for distributing power to district towns and villages. Autonomy and accountability for reducing AT&T losses can be best attained with privatization of distribution systems in some form, besides enhancing revenue collection (towards restoring the financial viability of Power Company) would also provide an immediate and direct path for no-governmental funds to be applied for distribution system augmentation. This is a very important aspect, particularly when the State governments are not in a position to provide the required funding, Efficiency improvement in the management of the distribution business would be the side benefit of privatization, and the ultimate customer of the power company i.e. the consumer, would gain in the long run on all the above counts. In other words, we do not seem to have any option but to privatize the distribution.

#### 4.0 International RE Case Studies – Successes and Failures

The situation in which the Indian states are today was the same for US in the 1930s, and the same for China in the 1970s. However, several countries have implemented rural electrification in ways which are different from one another. Some of the countries have quietly and successfully been providing electricity to their rural areas. As per a World Bank report published in 2005-06, China has achieved 98% rural electrification; in Thailand, over 80 percent of rural people have a supply. In Costa Rica, cooperatives and the government electricity utility provide electricity to almost 95 percent of the rural population.

The present report has undertaken several case studies from all around the world to identify the crucial factors determining the success of such programs. The cases are both old and new, but there are few common factors which have emerged. However, in the success story of countries like Costa-Rica, the role of co-operatives reinforced what is already well-known. With the passage of time and changing technology some of the concepts used earlier have challenged much of the conventional wisdom. There would be an attempt to affect these lessons to future RE programs to significantly increase the success rate of rural electrification, and the provision of significant and sustainable benefits to increasing numbers of rural people.

#### **4.1 Rural Electrification in the People's Republic of China**

The model adopted for rural electrification and supply in PRC has been a great success considering the fact that China is one of the largest countries in the globe and the program to electrify rural household was enormous. China, a large nation with a population of more than 1200 million could successfully electrify more than 98% of households who now have access to electricity. The Rural Electrification program in China is a success story over the last six decades since 1949. In PRC, rural electrification project financing is generally a blend of central government, provincial government, banks, county governments, and individual villagers. The achievement of reducing losses below 12%, and with reliability as high as 99% these achievements are worth considering especially because of the fact that the RE progress at 1949 was as low as less than 50%.

### The Quality of Rural Electricity Supply - China

Year	Electricity supply reliability rate	Losses
2001	99.12%	<12%
2000	97%	<12%
1999	95%	<12%
1998	93%	<12%
1997	92%	>20%
1996	85%	>20%
1995	80%	>20%
1994	75%	>20%
1993		>20%

**Table – 7 : Showing the Progress of Quality of Rural supply and losses**

Initially the majority of the financing came from the state, but over time the financing from the state became a small proportion of the total financing and a large share comes from commercial banks. Some informal subsidies were given in the form of low cost construction materials. Rates of 3.6 percent interest were given for small hydro system developments. Rural tariff is almost twice the urban tariff. Recent initiatives are working towards trying to reduce the difference between urban and rural tariffs. The decentralized power companies are allowed to maintain a 10 percent profit.

Outside of the large cities and metropolitan areas, the program is centered on decentralized power companies (DCPs) at the township, county or prefecture level. DCPs own and operate sub-transmission and in most cases small generation plants. With assistance from the center, the local companies were responsible for the expansion, under the guidance of Bureaus of Power, which assisted with the planning. Communities organized and built civil infrastructure. Decentralized rural distribution and small scale generation companies serve rural populations. DCPs are supported in terms of technical assistance by central government, and especially in the case of micro hydro generation by

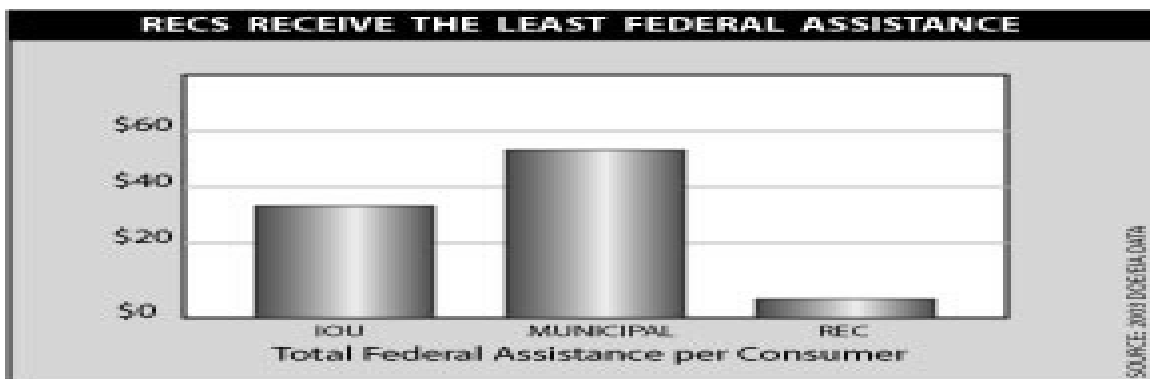
the Ministry of Water Resources and Small Power. In the later stages of the program, the NPRECP played an important role.

#### **4.2 Rural Electrification in the United States of America**

Mostly rural supplies in the United States are being fed and serviced by Electric cooperatives. The Co-Ops are private, independent electric utilities, owned by the members they serve. Democratically governed businesses, electric cooperatives are organized under the Cooperative or Rochdale Principles, anchoring them firmly in the communities they serve and ensuring that they are closely regulated by their consumers. Rural electrification was taken up in the United States in 1930s, and the government initiative was the driver for achieving close to a hundred percent electrification of households. Since then not much has changed, and there are Co-Ops or Community utilities which are running the power retailing in rural areas. These Co-Ops are running on no-profit, no-loss basis. The tariff for rural supply is being fixed by the Gas and Power regulatory authority of the state. The Co-Ops Board is to frame policy, make long-term strategic decisions, and is responsible for submitting the tariff proposal to the Regulator. However they have appointed a professional manager to run the Business of power retailing in the rural area.

Background: Electric cooperatives began to spread across rural America after President Franklin D. Roosevelt created the Rural Electrification Administration (REA) in 1935. The Executive Order establishing the REA, and the passage of the REA Act a year later marked the first steps in a public-private partnership that has, over the last 70 years, bridged the vast expanse of rural America to bring electric power to businesses and communities willing to organize cooperatively, and accept responsibility for the provision of safe, affordable and reliable electric power. Today more than 3000 electric cooperatives power village households, fishing villages, dairy farms and the suburbs and exurbs in between. They provide reliable and technologically advanced service to 200 million Americans while maintaining a unique consumer-focused approach to business.

Federal Assistance to Electric Utilities: According to Nobel Laureate economics professor, Lawrence R. Klein of the University of Pennsylvania, all types of utilities Investor Owned Utilities (IOUs), Municipal Owned utilities and electric cooperatives enjoy some form of subsidy. Electric cooperatives receive minimum or the least amount of subsidy per customer. The difference in federal subsidies for each type of utility becomes even sharper after considering that electric cooperatives typically serve sparsely populated areas: they have an average of 7 customers per mile compared to 35 for IOUs and 47 for municipal owned utilities. All electric utilities receive federal subsidies in one form or another. Calculations based on federal government financial reports show that rural electric cooperatives receive the least federal amount of subsidy per consumer. This is in spite of the fact that RECs serve only 7 consumers per mile of line compared to 35 for IOUs and 47 for city-owned utilities.



However there are few cases of GAPs and Governance issues in independent run co-ops in the US too. The Johnson City-based Pedernales electric co-op is the largest in the country, with more than 218,000 member-owners and \$500 million in annual revenue, and operates much like a monopoly with an exclusive service territory larger than the state of Massachusetts. In 1999 state law removed electric cooperatives and city-owned utilities from Public Utility Commission oversight. However, municipal utilities such as Austin Energy are still subject to open records and open meetings laws, but co-ops are not. In the absence of any allegations of criminal misconduct at Pedernales, far-flung members who want to keep the inquiry open face a tougher challenge than customers of municipal utilities. However the disclosures have indicated freewheeling spending the top

executives and board members of the co-op, which didn't begin to pay dividends to its members until late 2007. Over a five-year period, Pedernales board members spent about \$700,000 in credit card charges on costly purchases, including first-class airfare, stays at top-notch hotels and meals at top steakhouses. Full disclosure of executive salaries, travel expenses and other closely guarded financial matters, has led to the most controversial information to be exposed since then. The US state administrations are trying to evolve a system to control such situations in future.

### **4.3 Rural Electrification in Costa Rica**

A relatively small country in southern America has also achieved a high degree of success in terms of 85-90% coverage of population. The country has followed its unique rural electrification model with Initial loans from USAID, and concessional loans to the cooperatives. The terms for these loans were 40 years, with a grace period of 10 years at an annual interest rate of 1% to 2.5%. In its financing model of its own, the Communities were required to come up with part of capital costs if they were too far from network. Communities are required to pay for the difference between the rate of return allowed by the regulatory agency and the investment costs by the cooperative. Cost covering prices after grants and concessional loans are taken into consideration.

The tariff fixed for rural electricity supply is subsidized and is graded with residential minimum charge (\$1.28) for 1<sup>st</sup> 30 kWh, and increasing block rates for 30-100 (\$0.04) and higher for higher consumption. In addition there is a thermal factor charge of \$0.04 per kWh added to the bill. Apart from this, as a welfare scheme, poor consumers can receive a concessionary connection fee.

The Costa Rica model of RE supply is a participative model with co-operatives. The unique features of Costa-Rica model is cooperative ownership, Extensive outreach, and community involvement at the beginning of service. A senior official at the rank of General Manager runs the company, and participation of consumers is low. Cooperatives provide discounts on electrical appliances and insurance, and establish a scholarship fund for needy families. The National Rural Electrification Authority, NRECA provided

technical assistance to development of cooperatives. Cooperatives cover 20 percent of the population, and national public utility covers the rest of the country. Other cooperatives were well accepted prior to the rural electrification program.

#### **4.4 Rural Electrification in Thailand**

The Rural electrification in the country started with initial grants from USAID. This grant was used for feasibility studies and formulating a master plan. However, project funding was on soft loans and grants from World Bank, Japan, Saudi Arabia, and Asia Development Bank. The success of Thailand RE program was based on the right blending of commercial and concessional loans important for the program. There was support to rural consumers from the Government. Through this process, the Government has mandated lower bulk power prices from state run electricity producing company (EGAT), providing rural companies with one-third lower energy costs. Some contributions from rural communities enabled Distribution Company to serve more consumers. Moreover in Thailand the national pricing structure is carefully based on the load of the distribution company. Subsidies to poor consumers are made up by higher prices to higher consuming, higher income consumers. The utility has followed the residential tariff and the lowest category involves a minimum charge, with rising blocks. Higher consumption blocks do not benefit from the subsidy given in lower blocks slightly higher rates for commercial and industrial consumers increasing the financial viability of distribution company expanding rural service.

The Thailand Government has ensured that all electricity companies should be financially viable after soft loans. In 1979 direct budgetary subsidies were for supporting electricity tariffs. However, the main electricity companies organized to eliminate subsidies and return to the principle of adequate pricing and financial viability. Close attention to load promotion and planning during the initial stages of the program lead to greater revenue and better financial viability. Cooperation with local communities was stressed very strongly in the program. Local bill collecting by leaders in many parts of the country was really helpful. Village assistance was sought during the construction phase of the project in the form of transporting materials and providing the right of way for poles and wires.

To make the RE work participatory, villagers were hired during the construction phase of the project. Moreover the success of the scheme also hinged upon extensive commitment to customer service by the rural companies. An innovative method was adopted by the Thailand authority, giving autonomy to the office of rural electrification. This was set up specifically for rural expansion within the distribution company serving all non-metro Bangkok areas. The Office of rural electrification can borrow money and has its own budget. Once expansion is complete, rural areas are turned over to the distribution company for all aspects of electricity service. Since the completion of the task, the special office of rural electrification has been eliminated.

#### **4.5 Rural Electrification in Mexico**

Initially in the 1950s the federal government, state and local governments contributed funds for rural electrification. In 1970 the Mexican government developed a plan to distribute social development funds to the states, and the amounts were inversely proportionate to the economic level of the state. A Planning and Development Committee allocated the funds. Total budget for rural electrification investment between 1997 and 2000 was about 60 million dollars per year from a mix of federal, state, municipal and local funds (including social funds). The government has had a tariff subsidy policy for many years. Although many subsidies have been eliminated, today there is a subsidy for agriculture and residential customers. In Mexico, over the years, the tariff has fluctuated, sometimes coming close to costs but sometimes being well below costs. The operating cost of the overall electricity sector in Mexico is not financially viable based on the revenues collected from customers. During 2000, the national electricity sector received a fiscal transfer from the federal government of 5.8 billion dollars, or about 1% of GDP as an operating subsidy. The subsidies cannot be broken down into urban and rural components, but they amount to 65% for residential sector, 12 % for agriculture, and 23% for inefficiencies in terms of losses.

There is no local participation in the program at the grass roots level. But the funds for infrastructure are now decentralized to the municipalities and the states. Municipalities

now select the infrastructure program that they would like to implement, and then the work is contracted to the public electricity

## 5.0 Rural Electricity Supply – Diagnostic Analysis

### 5.1 Field force analysis:

It is well accepted by planners, policy makers and the power professionals that the rural electrification in India has not been a success story in the past. To inculcate and bring about a healthy change in the approach of rural electricity delivery in the country, a restructuring is proposed. There would be radical changes required to be undertaken to meet this challenge. In such changes there would be few enabling forces working in its favour, however there would be many constraining forces trying to oppose it. An exercise was conducted to plot the forces which are working in favour (enablers) of the revised model, and those which are opposing (constraining forces) to maintain the status quo. The figure -1 depicts the position of eleven forces on the field force map and can be further analyzed as under:

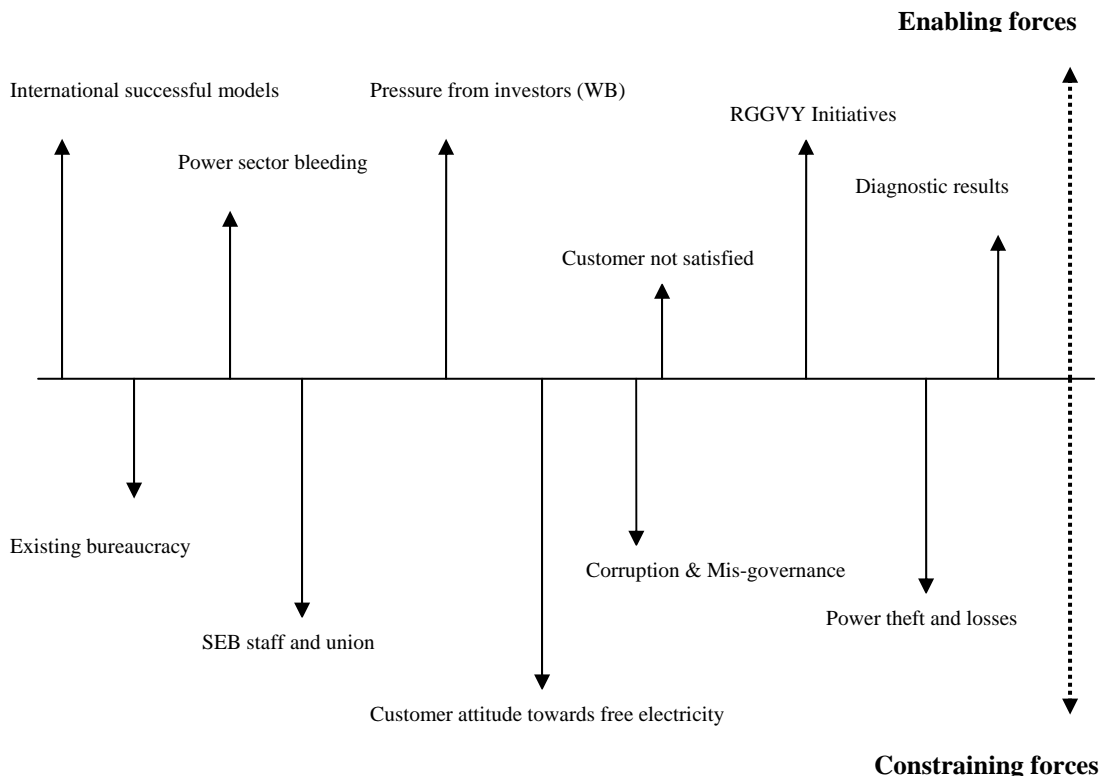


Figure: 5 – Force field study of restructuring the rural electrification model

The proposed restructured organization would have few enabling forces such as consumers, potential partners in the restructured organization, proactive Government organization. However there would be several constraining forces to pull it down and resist changes. Investing for sustainability—that is, assessing the way social, economic, environmental, and ethical factors affect the strategy and valuation of businesses.

**Enabling forces:** The forces in favour of radical changes to enforce a restructuring in rural organization to deliver electricity is tilting towards a major thrust in reforms and reengineering of the delivery model. The urgency to change shown in the recent past both by the provider i.e. the Government, and the consumer i.e. the customers located in far flung villages, is the single most important enabling force. However several other strong enabling forces which may effect the restructuring of the rural set-up of the existing utility are international experience and a successful model. The huge financial losses incurred by the state-run power companies in India which has forced an eminent change, has resulted in continuous pressure from the multilateral funding agencies to the Indian Government and Utilities to reduce the AT&C losses, reduce corruption, and improve the system of collection of revenue. The federal / central government has taken the initiative with the RGGVY scheme to electrify and create a sustainable rural infrastructure within a fixed time-frame. It cannot be ruled out that the strongest enabler would be the customers themselves. The diagnostic surveys conducted in rural areas have significantly indicated a failed system. This would be an enabler to push for change. The international experience and success story clearly speaks out for an organizational structure which is essentially different from the one being practiced by SEBs in India. The success of these models and their sustainability for almost a century strongly advocates for restructuring the rural model in India too.

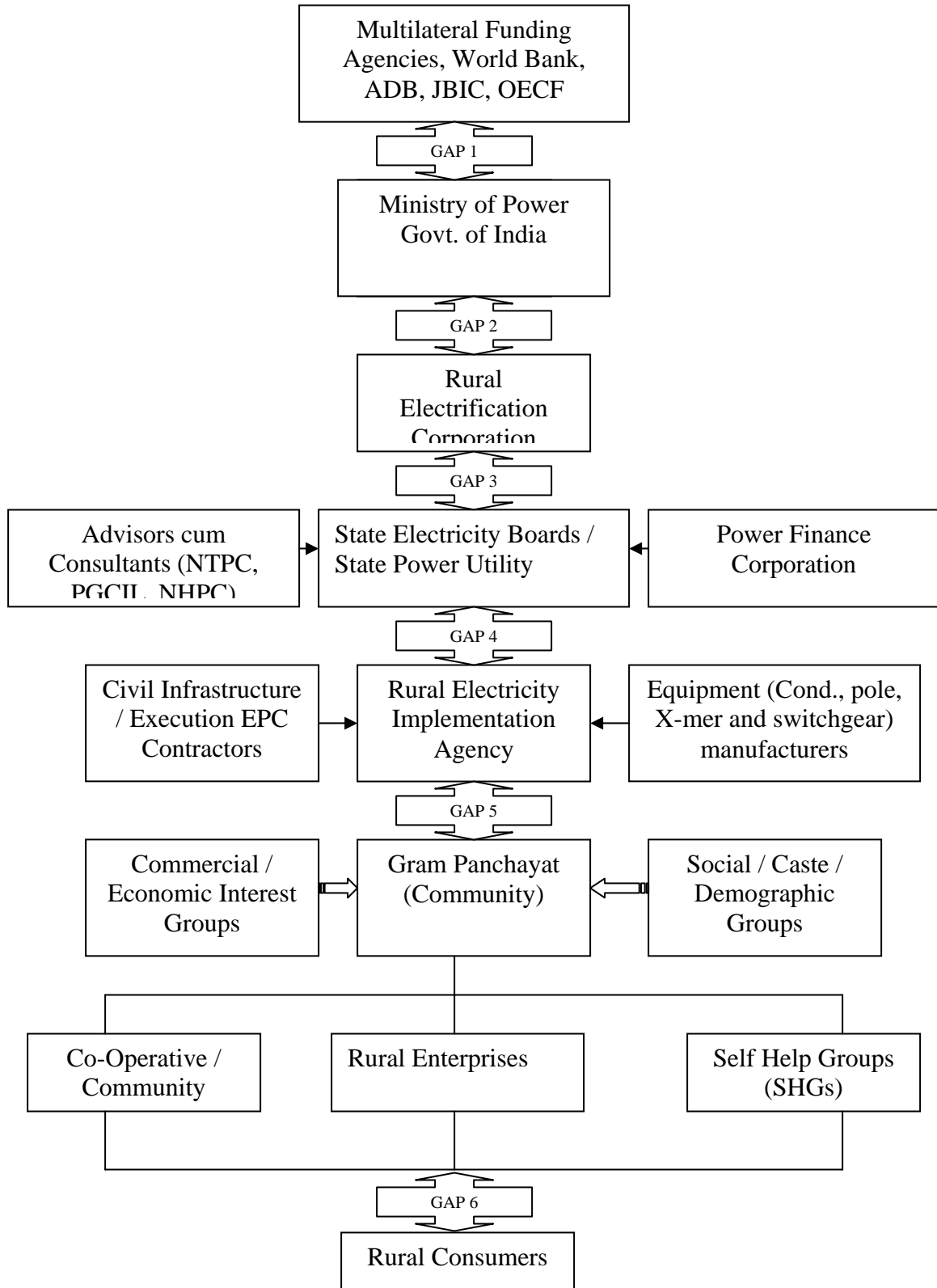
**Constraining Forces:** there were major constraints working against the restructuring of the power sector in the past. The initiatives taken to reform the ailing SEBs started in the year 1991. Even after sixteen years, the SEBs in many states still exist and with them the inefficiencies and rampant theft. The constraining forces are stronger as there is no single nodal agency to implement the apex level policy decision at the centre. Power being in

the concurrent list of items, states with their own political agenda have either delayed, or demanded concessions to implement the reform process. Considering the record of reforms in the Power sector, we can prioritize the issues required to be countered for effective restructuring process.

The restructuring would be opposed most by the players who are getting benefits of the inefficient system with huge revenue losses. The lost revenue is indirectly getting shared by non-paying customers, the distribution utility employees who are indulging in unfair practices. The cost of this inefficiency and losing revenue stream is borne by the paying customers. The tariff calculation by the SERCs is on a normative principle of recovering the expenses and cost of the utility from the customers distributing it on per unit rate. This would not be possible in the restructured Co-Op model of retailing.

The employees of SEBs who are getting benefits from the present system would emerge as the strongest constraint in implementing the restructuring based on Co-Ops. The linkage of employee unions and political parties would be a dampener for the entire process. In the last fifteen years of reform process in India, different political parties have changed their stands and created a sense of uncertainty to bring about the desired change in the rural power supply in particular and power sector in general. The employees of SEBs are creating obstacles for any change. The rural customers who are availing power without paying are also constraining the restructuring process. Apart from them, there would be social forces which would create hindrances to bring about changes in the existing system. In villages there are other social dynamics and dominant forces which are of the opinion that it is easier to manipulate the Government-owned utility rather than a Co-Op, or an enterprise which would be more professionally managed.

## 5.2 Governance Analysis – Rural Electrification projects



**Fig – 6: Governance GAP Analysis to assess the revenue leakage at different level**

The entire structure of rural electrification flow chart is summarized in the table above. The planning is a top-down approach driven by the RGGVY scheme initiated by the central government. The scheme is to electrify all the villages by 2009. The GAP analysis is conducted to find out the losses of both resources, and or initiatives as it reaches the final beneficiary i.e. rural customers. In the flow chart as shown above, there appears to be essentially six GAPs as analyzed in this report. However there are possible three more GAPs which is not being considered for analysis. The perceived GAPs between various stakeholders in the Rural Electrification process is itemized as under:

1. GAP-1 (Perception of funding agencies towards RE and that of the Central Government): the Multi-lateral funding agencies or Development funds, perceived the RE work as sustainable rural development for eradication of poverty and improving the quality of life of the rural poor. Whereas in the past, the Government had taken up these RE initiatives as a project and achieving the desired numbers of village declared electrified. This perception has caused a lack of coherence between the villages and households electrified. The earlier definition of village electrification i.e. even electrifying the community office in villages, would entitle it to be counted as electrified village was a result of such GAP. Governments in the past have lost the objective of the scheme in a pursuit to achieving numbers. The political implications and the viewpoints of the respective governments have had a direct impact on their approach towards rural electrification.

The Governance GAP-1 has diluted the very purpose and objective of rural electrification at the apex level. As per the observation of former Secretary Government of India, R.V. Shahi while launching the National Power Policy, 2005, “The definition of village electrification used by Indian planners in the first fifty years of the scheme is an indicator of the shallow approach towards rural electrification. Mere achieving the targets set by simply connecting a village panchayat office at the low voltage level did not serve either the purpose of reaching the village household nor was it sufficient to cater the required quality of parameters at far flung areas.” The allocations of resources from the Loans, Grants and Aids from International funding agencies were also influenced and

misappropriated with the interference of politicians and powerful social groups at the apex level of the central Planning Commission, Ministry of Power and Central Electricity Authority. The fund allocation to SEBs for implementation of such scheme lacked proper monitoring both at the state, as well as central level. The annual progress reported several times were either inflated or misrepresented by the rural electrification authorities at the state level. In some of the northern states such as Uttar Pradesh, Assam, Rajasthan and undivided Bihar, there were cases when a village was declared electrified on papers and state records where as in reality it was not. Therefore before launching the RGGVY scheme, it was considered essential to reassess the electrification scenario and those which was earlier declared electrified was recorded as de-electrified villages. There are several cases registered against State Board officials for irregularity and dereliction of duty.

2. GAP-2 (The funding GAP between the central agencies): in the past the rural electrification funds have been channelised through REC, the large PSU organization has its own Board and nominated / appointed members by Government. There had been some GAP between the objective and purpose of rural electrification as earmarked by the central Government and that of REC. REC being a Grant / Loan provider it has been more focused on disbursement to the SEBs, and meeting their annual targets. The overall objective of running a sustainable rural electrification and long-term objective was perhaps not on their agenda all the time. That resulted in the REC performance rated excellent by the central government, inspite of the fact that the overall rural electrification targets were way behind the electrification of rural areas, and particularly of rural households.

The Ministry of Power in India has not linked the real achievement of rural electrification and household electrification with the performance measurement of these central Government organizations. The organizational objective for REC in an absolute sense remains far from the desired level. In spite of that, the central sector organization could receive recognition from central ministry for a status of Navratna (a status accorded to elite nine PSUs in India). The Gap-2 is more a performance objective gap rather than Governance gap. However the varied perceptions of performance objectives and

measurements thereof have resulted in unquantifiable loss due to project delays in rural electrification. In consequence, this has a larger bearing on the accrued losses due to cost over runs and repetition of the same activity.

3. GAP-3 (The GAP between the central agencies and State Electricity Boards): SEBs are the nodal agency to implement and manage the rural electrification work in Indian states. The provincial or state governments, and the federal or central governments, may or may not have the same ideology and plans to address rural electrification. In the past, the central plans and policies had not always been a binding force for the states. Few of the policy decisions, such as waiver of outstanding electricity bills for villagers in Punjab are in clear contrast to the policy laid down by the centre. The patrician and political bias towards areas and regions supporting the political views, rather than a uniform rural development policy has created a major GAP between the central approach and SEBs.

Power being in the con-current list in the Indian Constitution, there has been a degree of disagreement between central policies and state level implementation since independence. This has further aggravated with the central government's initiative of the reform process in the sector in 1991 to control aggregate losses, whereas the states were not ready for restructuring and allowing more disciplined approach for various political reasons. Similar was the fate of 1998 regulatory commission act and more recently enacted Electricity Act 2003. Both these Acts were promulgated in consultation with states, but the implementations of the acts were painfully slow and the response from states varied in degree. The timeline fixed for implementation has been extended more than once due to non agreement of various political parties on some of the controversial clauses such as open access, privatization of distribution, protecting the interests of existing Worker's and Engineer's union. The opinion of Left Parties who are a coalition partner at the center, and the liberal Congress party towards power reforms also are not the same for the rural poor and agricultural labors. This Gap has created a sense of uncertainty, and slackens Governance in the state sector to a large extent.

4. GAP-4(The GAP between SEBs, and the agencies or contractor who undertake RE Projects): the rural electrification projects in the past have been ill famed due to poor quality and delays. There had been a substantial GAP between the expectations of quality standards as set by the SEBs in terms of technical specifications and tender documents, and the infra-structure created and delivered by the vendors. The GAP was a result of lack of clarity in terms of materials to be used and skill sets required for executing a quality job. In the past, the equipments used for RE infrastructure was not standardized, and as locally available materials were used, there was ample scope for manipulation and compromise in terms of quality. To add to this GAP, there was lack of supervision and check points by the SEBs to ensure implementation of the project as per the specified technical and commercial terms. To make it further complex, the role of engineers deputed for quality checks also came under the scanner for their alleged collusion with the contractors. The corruption charges leveled against engineers have led to suspensions and dismissals from jobs. However, GAP 4 has not only resulted in poor quality infrastructure, but also created a sense of mistrust and gloom in to the entire system of rural power supply.

MDI, Gurgaon's report 2003, on role of SEB's in the power-sector reform process has highlighted that "Governance gap at project implementation level is the consequence of the mind-set of the state owned utility towards the entire rural electrification projects." It is alleged that rural projects were the breeding ground of corruption and malpractices in rural area in the sixties and seventies. Prior to the electrification of these villages, villagers were leading a simple life but some of the unethical rural electrification and infrastructure contractors educated them in the way the rural consumers (particularly socially influential groups) could draw power from the electrical lines illegally without depositing the initial deposits or the monthly charges. The present state of high level of leakage of revenue from rural areas is a direct outcome of technically ill-conceived distribution technique adopted for extending rural connections. The low-quality tapping and droppers directly from the LT lines has led to a situation of difficulty in identifying the theft of power and the legal supply. The lack of vigilance and monitoring for rural projects is due to the remoteness and inadequate awareness of the beneficiaries. The habit of non-payment and enjoying free electricity during those periods have further

aggravated the governance issues, and since then spread like a cancerous disease to rural populations to an uncontrollable proportion.

The implementation of RGGVY scheme has incorporated processes to address some of the issues to control the leakage and illegal tapings with usage of new designs of insulated distribution wires, HV distribution scheme, distribution through junction boxes, enlisting turn-key reputed EPC contractors. However technical solutions to curb the theft of power need to be augmented by the change of mindset of the consumers.

5. GAP-5 (The GAP between the agencies or contractor and the stakeholders / local bodies) there had been a wide GAP in the perception of the agencies who undertake the rural electrification work on behalf of the SEBs and the stakeholders. In many parts of the country the agencies or contractors engaged by the SEBs who do not enjoy a clean image, and there are several of these contractors who are local goons and enjoy a nexus with anti-social elements. It is also perceived by the stakeholders / beneficiaries that agencies engaged for RE contract get these contracts after paying bribes or using their coercive and manipulative skills. They are not always welcome in the villages, and there is a psychological resistance which starts from that point itself. The agencies get resistance from villagers in the form of not allowing for the ROW (right of way), resistance also in the form of filing writ petitions, not co-operating by denying local supply items and construction material and labor. Moreover there is stiff resistance from villagers who will not allow skilled workers to be employed from outside. The perception of the owner of the establishment, and the employees engaged for such work also has an image problem. Generally villagers do not consider them as partners in development, and hold a grudge against them for harassing and terrorizing them for disconnection, or alternatively, indulging in extracting the undue benefits for the services they render. This GAP has a serious implication on the success of rural electrification projects. In the RGGVY scheme companies with a better resources and professional project management approach are being engaged, thereby ensuring a reduction in this GAP to a large extent. However, the local bodies and the agencies involved in RE need to bridge the GAP to an accepted level.

6. GAP-6(The gap between the consumers and the Utility supplying electricity / State Electricity Boards): perhaps the most neglected aspect of Indian rural electricity supply institutions. This GAP is the most significant one and accounted for the failure of the sustainable electricity delivery model. The SEB (state electricity board) officials and employees have considered the new projects for electrification as the one which is of more interest to them rather than providing electricity or the related services to make electricity available to the villages. In the last six decades, rural Indian consumers have not been treated as a customer but as the beneficiary of a government welfare scheme. If there is a breakdown of the supply, the resumption takes days and in some cases months. The service obligations in the rural area are not governed by any commitment from the service Utility. Consumers get 8-10hrs of electricity in a day, that too during off-peak hours when it is of little use for them. The services rendered to the rural consumers are far below the expected minimum level of services in many of the states in general and particularly the state of Bihar where a consumer perception survey was carried out. However there is a perception GAP between the supply company and the customers as they feel that rural consumers would not be willing to pay even if the quality of service level is improved. The bridging of this GAP is essential to make the rural electricity supply system sustainable without any subsidy.

As per the survey conducted for this study, as well as earlier studies by USAID in 1999 the services rendered to the rural consumers for electricity delivery are substantially stumpy in terms of availability, and meeting the basic technical parameters such as voltage and fluctuations. The local retail issues at village level do not get the attention of the Utility as it is low on their priorities. Utility deny the right of the rural customers by quoting their poor payment records whereas rural consumers defy the invoices of electricity bills quoting the quality as reasons for non-payment. However the Gap between the perception of supplier and consumers can be bridged if the customers are participating in the distribution process. The theft and leakage can be controlled if the village representation is accountable for any improvement or deterioration in the supply. The village level representation in the distribution company may also initiate planning at the grass root level, with results anticipated to be positive locating -planners at the site of activity. Some of the innovative modes of meeting the evening peak hour demand of

lighting and single ceiling fan supply can be planned through localized generation at relatively higher costs compared to grid supply. The operational and commercial transparency at the village level would be the essence of such success. Optimization of resources through a common pool can also be achieved in many houses even in smaller towns. Small size DG sets as back-up is used in cities, towns, District and Block level towns and even in villages. As per a trade survey conducted by Diesel Generator manufacturer Kirloskar in 2004, the back-up diesel Generator installed capacity in India is almost equal to the installed capacity of grid connected large thermal and hydro Generators. Operation and maintenance costs of these machines are much higher, and if the capital expenditure and the environmental cost of pollution is added to it, the cost of generation is three times to the grid-supplied electricity. These sources cannot be removed in immediate future, but the running and operational cost can be reduced if operational planning is done at the customer-representative level.

There are perhaps few more Governance Gaps which were ignored in the Governance Gap analysis conducted as above. The notable ones are the vertical reporting gaps between the suppliers of equipments, Civil Infrastructure contractors, EPC contractors and the nodal agencies implementing the project. These are assumed to be compatible single units for simplicity, but there are Gaps which are reflected in the delay of rural electrification projects and the compromise with the quality standard. Existing within this framework are horizontal relationships between the SEBs and the central agencies such as NTPC, NHPC, and POWERGRID which has been entrusted the role of Advisor-cum-Consultant in some states, and even the implementing agencies in few other states. The perception and the organizational culture of these organizations towards rural electrification have been different. These central organizations have been assigned few states and pockets of un-electrified villages. Their project management skills are better than SEBs, but they are not responsible for workable holistic solution of village electrification and delivery of electricity to homes. Therefore works executed by these agencies are not being appreciated by SEBs. The planning and execution of the rural electrification in India has been a top down approach since the beginning. The stake holder's participation is missing.

### **5.3 Field Survey Analysis**

This report is the result of research conducted on Rural Electrification Projects in Bihar covering in-depth surveys and critically, the aggregative as well as annual state achievements for rural projects. The basic observations are based on the data available for district wise progress of schemes of rural electrification undertaken by BSEB. As per the analysis of the status of the RGGVY scheme started by central Government deploying some of the central utilities so far is the most successful scheme for rural electrification in Bihar. There are hindrance and minor delays but the quality of execution by turnkey vendors in RGGVY schemes within specified technical parameters to be ensured, is far superior to the earlier state-sponsored schemes. Apart from the time and cost over-runs, some of the projects were marred by compromise on the standards and quality. The smaller vendors engaged were lacking resources and the necessary skill and relied heavily on favors from utility officials and influence of political leaders. The scheme presently being executed under RGGVY is not totally free from political interference, or influence of local goons, but still the situation is by far under more control compared to earlier schemes.

#### **5.31 Rural Electrification Survey in Bihar- A Consumers Perspective**

The diagnostic survey was carried out in 28 villages from five districts spread over different part of Bihar, spread over five districts of Gaya, Madhubani, Purnea, Bhagalpur and Kaimur. The survey was conducted to assess perception of rural consumers about the distribution company. Two diagnostic sample surveys with a set of questionnaires were conducted in twenty-eight villages of Bihar. The consumer survey based on a tailor-made questionnaire consisting of twenty seven parameters was for consumer perception about the Governance issues and other rural supply related service issues. The sample size was approximately twenty-nine hundred rural consumers. The second survey was addressed to the employees and operational staff of the BSEB (the utility) for the state of Bihar. The aim of the second survey was to assess the perception of employees towards the issues

and the difficulties they face in serving rural customers. Both the surveys were conducted simultaneously by different sets of field staff.

The sample size of 2893 rural consumers spread across twenty-eight villages in five districts of Bihar are randomly selected from diversified cultural, social, caste, economic and consumption size of the rural customers. However to avoid complexity in analysis, and keeping the focus on the research agenda, the sub-groups within the rural consumers were not considered separately. The response was collected, tabulated and analysed for the customer perception about the Governance-related issues in rural supply as well as the quality of services being rendered in these villages representing the rural population of Bihar.

The results obtained after analysis of the field survey reports were a true reflection of the business environment study conducted, based on the published World Bank / ADB reports, analysis of primary data collected, media reports. The results of customer perception analysis are grossly against the performance of Utility. More than eighty-four percent of customer responses indicate poor rating of the Utility, as against eleven percent rural customers showing some satisfactory services being rendered by the company.

In response to the Utility Company's Attitude to rural consumers, more than eighty-six percent rural customers are not at all happy with the way they are treated by the supply company. They are very critical about the honesty and integrity of utility staffs, and almost ninety-eight percent of the respondents raised doubts on these traits shown by the utility staff. This is a very critical parameter and needs attention from the planners and decision makers. The responses from rural consumers in these districts are not anything which utilities can feel good about. The rating for almost all the parameter for services rendered fall in a high percentage of poor rating. It is clear from the survey results that rural customers are mature enough to respond freely, and consumers rate the Utility's performance to maintain the connections, timely distribution of bills, accuracy and correctness of bills, promptness in providing new connections, accessibility of Utility Engineers over phone, quality of Power Supply available in village – Voltage, Utility's

concern for Customers and ability to control theft of conductor / hardware with more than seventy-three percent assigning the services at the lowest possible rating.

The customers responded with anguish and unhappiness with a highly polarised response of more than eighty-two percent assigning lowest possible rating to the operational efficiency of the Utility. In response to the following areas of the survey to assess

- The availability of spares for repair,
- Technical competence of personnel attending RE work,
- The fairness and equal treatment to all,
- Quality of material used for new rural projects,
- Speed of execution of new RE Projects,
- Ability of utility to curb illegal connections,
- Availability of 3phase supply to run pump-sets,
- Providing safety of devices used for rural electrification,
- Ability of create awareness-generation scheme to save electricity,
- Utilization of RE funds by SEB provided by center,
- Ability to successfully reduced the leakage of funds through middlemen,
- Ability to deploy of right Technology / Manpower for execution,
- Proper survey and feasibility study carried out before planning a new line,
- Ability to provide power more than 12hours per day in the household supply;

The response was harsh and eighty percent and more responded by venting their anger and rated the utility with the lowest possible rating.

The analysis of survey results indicate that the responses were mixed when consumers were asked their opinion and perceptions towards the new schemes such as RGGVY, local body (Panchayat) participation for RE projects and performance of Gram-sevak (Village Volunteers) for maintenance. The response in case of local workers in rendering maintenance services was overwhelmingly appreciated with seventy- seven percent responding in its favor. More than fifty one percent are keen that the local bodies must run the rural electricity organization.

It emerged overwhelmingly that the customers are not at all pleased with the utility. The overall issues emerged from these surveys may be analyzed and reported as apathy toward customer needs, pestering of consumers by officials in collecting bills for poor quality of supply, partial or unfair treatment depending upon the influence one has in the socio-economic levels.

### **5.32 Rural Electrification Survey in Bihar- Utility staff Perspective**

Sample collected from 181 personnel of Bihar State Electricity Board posted for distribution of power in rural areas including Electrification work in 28 Blocks and Villages spread over five different districts namely Madhubani, Bhagalpur, Purnea, Gaya and Kaimur located in different geographical locations in Bihar. Apart from geographical location, the demography of these consumers also changes, even though the economy of rural Bihar is predominantly agricultural. The districts fall under four different distribution companies recently formed by disintegrating the SEB. The fifth distributing company is to cater to the customers in the state capital. Therefore the sample covers the rural customers from all regions of the state.

The perception survey was aimed to assess the attitude of the utility engineers and staff towards the services they render and their expectations from the rural customers. The responses of the operating and commercial personnel engaged in rural electrification were very different from the anticipated results, with a majority of the response accepting the perception of the customers and expressed their helplessness to improve the service conditions. Regarding the response for rural consumer's record of paying electricity bills, more than eighty-one percent responses were critical about consumers not paying their bills. They also responded overwhelmingly opposing the claims of the consumers that they do not get their bills in time, and even if they get them, they are erroneous. Ninety-seven percent responses confirmed that there are proper distributions of bills and the bills are accurate and correct. However seventy-four percent admitted that the utility is unable to maintain the connections, and has failed to provide timely servicing of new connections.

Surprisingly, the employees themselves admitted that the honesty and integrity of utility staffs are not of the highest standards, and fifty-two percent questioned the integrity of their own peers. Seventy-four percent are skeptical about non-availability of spares for repair, but eighty-three percent feel that they are technically competent to attend RE work. Ninety-one percent responded in the survey that the maintenance staffs lack common facilities for maintenance i.e. phone, mobile phones, walkie-talkie, repair vans etc. fifty-eight percent admitted that there is high level of political and social interference in the rural electricity supply services, and they showed their inability to thwart political and social influence. As a custodian of government property, fifty-six percent showed their inability to control theft of conductor / hardware in their jurisdiction. Fifty-five percent agreed that they may not be competent to handle power theft. Reflecting a similar response, fifty-one percent showed their inability to reduce the leakage of funds through middlemen.

However the response does not clearly indicate that the materials used for new rural projects are of sub-standard quality, but the response is also unable to confirm the high standard. The field staff is not satisfied with the speed of execution of new RE Projects, and fifty-nine percent responded that the present progress is poor.

Eighty-five percent of the employees favored participation of local body (Panchayat) for RE projects. In response to the level of support Utility gets from Gram-sevak (Volunteers) for maintenance, seventy-eight percent agreed that they are getting reasonably good to excellent support. However the employees of the utility were non-committal in response to their ability assessment towards competence to curb illegal connections, Availability of proper tools and plants, effectiveness of awareness-generation scheme to save electricity. Eighty-six percent of the respondents showed their faith of success in the RGGVY scheme, and achieving objective of RGGVY\* as promised. But they are not so confident that the state can manage these projects, fifty-seven percent voicing their opinion against proper utilization of RE funds by SEB provided by the center.

Seventy-seven percent of the respondents expressed the opinion that the deployment of sufficient manpower is available for RE works, but in contrast to this, eight-three percent

declared that the Quality of Power Supply available in villages in terms of availability in the day, as well as the voltage is not up to the mark. A large number of employees responded that there are no safety devices used for rural electrification, and that the training in right Technology is lacking. However, in an overall assessment of their own performance as representatives of the utility, the respondents showed a mixed response, with eighty-two percent showing a moderate to high level of satisfaction.

### **5.34 Other Findings from the Field.**

Several respondents in the remarks column included interesting comments which were not covered in the questionnaire. From these points based on the reports of field surveyors, a few interesting issues emerged. One of them is that there are some rural or semi-urban hamlets where electricity is being provided by unauthorized suppliers without licenses. They are running a second network, and distributing power generated through Diesel Generators.

Bihar suffers an acute shortage of power. The plant-load factor of the two plants in Bihar is abysmally low at less than 20%, and the availability of these plants is one of the lowest in the country. For 8% of the country's population which reside in the state, the installed capacity is 0.6% of the total national capacity. There is a gross mismatch in the two parameters. The average per capita consumption of electricity that is an indicator of the quality of life, is much lower than the national average. The gap between the revenue generated by selling the electricity to the consumers, and the amount payable to the central generators and the running of its own plant is negative. The loss is increasing each year, and the leakage in the revenue is alarmingly high. The present scenario is abysmal, and the availability of electricity to rural households is very low. As per the census of 2001 it emerged that only 6% of rural household are electrified.

An important aspect which is not quantified with statistical numbers is the quality of supply which the rural consumers get apart from the fact of the QoS (Quality in terms of availability / reliability and technical parameters such as voltage and frequency). It is pertinent to mention that the data collected from some of the interior areas of Bihar was an eye opener in the sense that the average non-available period of electricity is more

than 18hours a day, and that too, when power does come, the voltage level is so low that there is no scope of using it for any practical purpose.

It is also reported from many of the users that Power is available only when they need it least i.e. after ten at night, and after two in the afternoon. This is being done to manage the load balance between the supply and demand. This is intentionally done to reduce the peak load hours of the power supply. The mean time to repair (MTTR) for any breakdown is as high as 72hrs to a few days for major repairs. Some of the reported major breakdowns such as transformer replacements in rural Bihar even take days together to get a replacement, or a deployment of a maintenance team. Whenever there is a proposal for extension of lines, the utility company (state Electricity Board) has no means and intent to undertake any system analysis to assess the voltage and other parameters. The connection is extended mostly on pressure from the leaders, and or from local administration. The Utility Companies has always considered deployment of resources in rural areas for operation and maintenance as a financial burden on the company. The attitude towards revenue collection and meter reading is still pitiable. The project teams in the past, however, were keen to take up new rural electrification projects for reasons best known to them. Awards of contracts to get these projects were prompt, but executions were tardy, and records indicate that these projects were marred by both cost and time overruns.

## **6.0 Recommendations:**

The rural electricity supply and retailing in the present form and structure through state owned Boards and Distribution companies in India are both unviable and not sustainable. The situation is likely to further worsen with the rising cumulative losses, deteriorating quality and reliability of services rendered to the rural consumers. The central Government-sponsored schemes such as RGGVY, has augmented the number of villages electrified, but still there are stark differences between village electrification and reliable supply to the rural households. It has been observed that there are two distinct functions a rural electricity supply entity is performing, namely: new electrification projects, and running the retail business of distribution to the rural customer. The top-down development model as followed in India can bear results till it pertains to infrastructure creation and laying rural lines, but a similar model has not succeeded well in by state owned companies. The organizational structure and the Governing boards of these organizations are both subject to critical review.

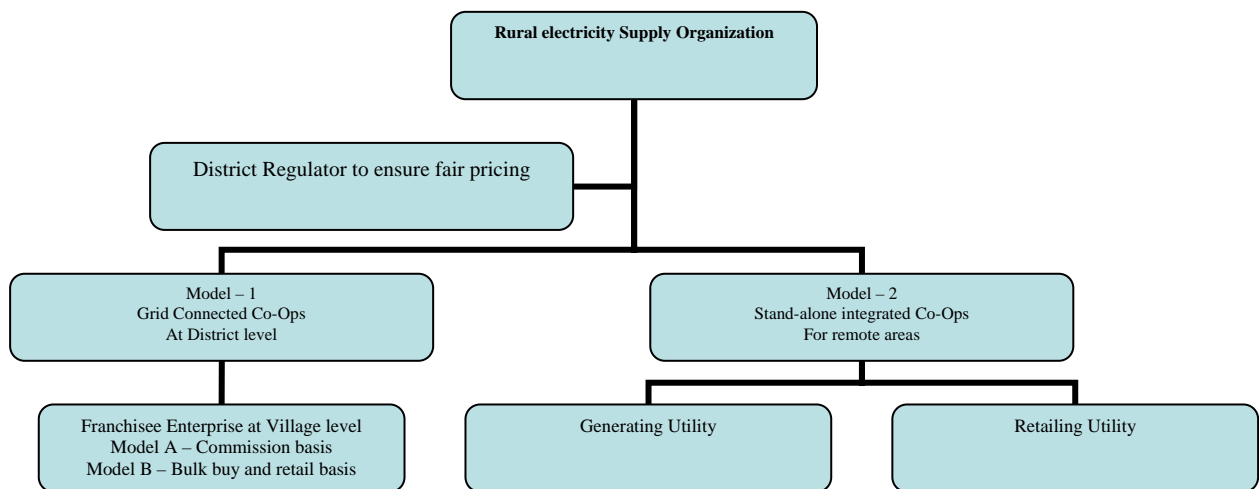
In the present study of internationally successful models of rural supply, it has strongly emerged that the participatory model has worked better than the centralized large rural agencies. In India, governance and power theft remain the most vital point of concern. The three different approaches to analyze the issue of Governance and managerial failure to run the rural electric supply in India as a sustainable business have all strongly indicated that there is a need to overhaul the rural delivery structure. In India the centralized state-controlled distribution companies under SEBs have failed to deliver the obligatory results of reduction in AT&C losses and improving the quality of supply. Therefore alternative delivery structures need to be identified.

The restructuring of the rural supply institutions is the requirement of a successful rural electricity retailing and delivery on sustainable basis. However, in the past, analyzing the different successful and failed models from different countries across the globe, it has emerged that one single model may not be workable for all the countries and more so for a large country like India with diversified geographical, demographic and economic

strata. This must take into account the geography, as well as the spread, reach of the grid, paying capacity, usage of electricity in rural areas.

The report recommends two different models for two specific requirements of Indian rural electricity delivery. One is for the areas which are situated near the grid and where it is preferable to buy power in bulk from the large generating stations at a reasonable price. A new independent enterprise, preferably one in each district, would be a Co-operative establishment. The board of the company may be elected by the members of the C-Ops, and there would be one professional Business head / CEO to run the business appointed by the Board. Considering the large number of consumers to be served by each Co-Op in a district, it would be recommended that the company may recruit franchisee for retailing in villages which are at a distance, and where there is difficulty in exercising control of revenue and pilferage of electricity. The focus for these restructured organizations must be on revenue collection and minimizing losses. The participation of stakeholders and consumers would be the key of success.

However the second model is more suitable for those regions in the state which are far from the electricity grid, and it is not feasible to connect the villages at a reasonable cost. The example of remote villages in the hilly terrain of the Himalayas, and remote villages in the forest districts of Bastar in Madhya Pradesh are few of the many such possibilities. The proposed rural organization would be an integrated utility with the captive generation and fixed area of operation for distribution of power.

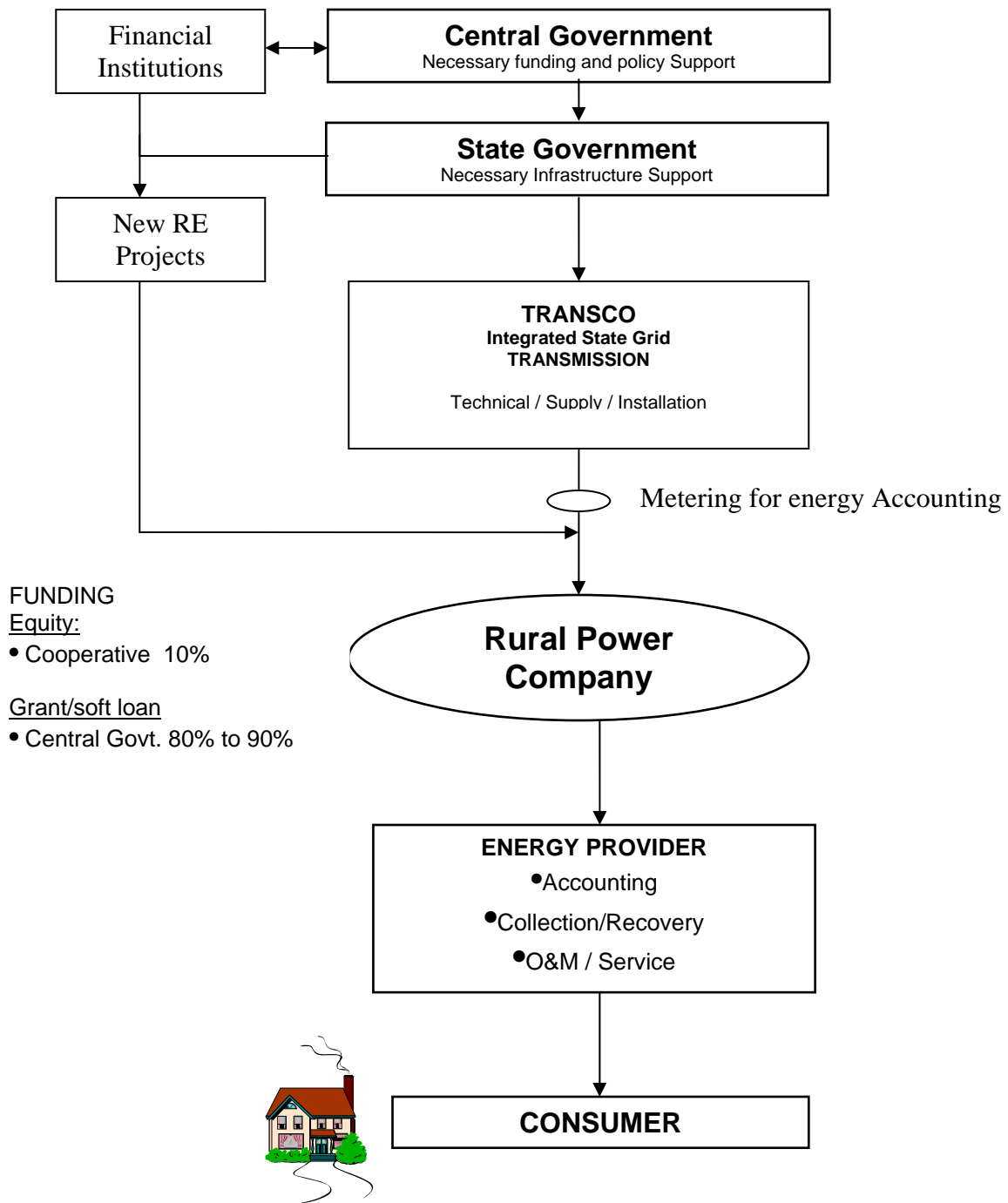


### **Fig. 7 – Proposed organization model for rural electricity supply in India**

In case of state of Bihar, it is proposed to have thirty-seven rural Co-Operatives to be created, one in each district. The modified USA model of rural utility managed by Co-operatives is a fine model which can be emulated. The organizational structure, distribution channels and regulations need to be modified. These which would be different from the USA model. The basic difference proposed is deployment of franchisees in village distribution. The crux of success of such co-operative would be proper representation of consumers and various social groups. The vital avoiding factors to succeed would be to keep it away from politics and also from the influence of anti-social elements.

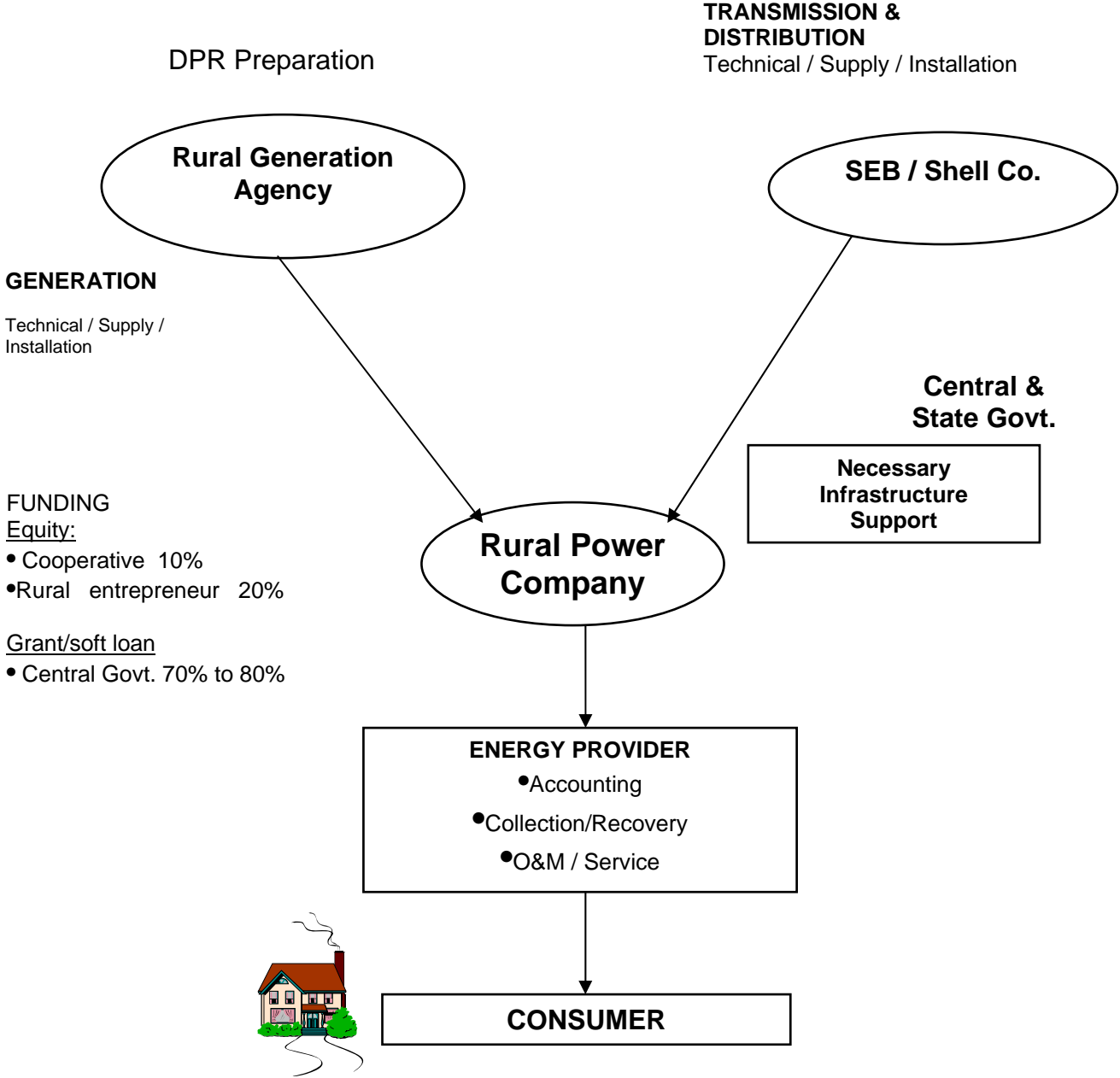
It is proposed that the Co-operatives be regulated by a nominee of SERCs in each district, the nominee can be a full time representative or it can be handled by a person of integrity and high repute from each district (serving district court judge with additional responsibility / Head of Educational Institution / Retired government or Police officials / Retired Bank officials). Every utility Co-Op would be a functionally, financially and administratively independent entity and work as a SBU. The role of government would be limited to provide infrastructure and support in terms of law & order. In the Indian context, it is essential to recognize the social dynamics of villages. Each district comprises of thousands of villages. More often than not, each of the villages do not resemble each other in terms of spread, population, caste, economic standard of living, electricity usage etc. The large population, and comparatively bigger size of districts, require decentralized working and scope for franchisees. The role of the franchisee would depend upon the business potential of the village.

**Fig-8: Grid connected Rural Supply Utility – Model 1**



The second models are for those areas where it would be difficult to get the feed from the grid. There would be some small villages or cluster of hamlets and villages which may be best served with a localized and self contained generation, and would be unviable to connect with the grid.

**Fig 9 – Isolated Rural Utility – Model 2**



India being geographically large and spread across a variety of terrains, dissimilar economic conditions in states and regions, socio-political environment and demography have varied requirement of rural electrification in different parts of the country. One, or more than one, suitable sustainable rural electrification and supply model may be required to be tailor-made for Indian conditions.

The success of rural retailing would be largely dependant on entrepreneurship development at the lowest level of the value chain. A possible one quarter of a million entrepreneurs can be deployed for retailing the rural electricity supply, and maintaining it. This model has worked successfully for the TV Cable industry in small towns and city suburbs. In spite of changing technology and the digitalization of TV transmission which makes it a capital intensive business and to the advantage of large corporate players, customers still prefer to avail the services of their known “cablewala” due to a strong relationships and the availability of services at the doorstep. The rural co-ops may engage franchisees effectively to manage such challenges. There is a scope of encouraging large numbers of entrepreneurs who can deliver the services of prompt services at the local level of villages. The village level supply can be managed as under:

Revenue Franchisee- Input based / Model-RF: this is simplified version of outsourcing the revenue collection and distribution of bills to the customer. The financial stake and deployment of initial capital of the franchisee is minimized by lesser risk and a simplified collection method. The invoices would be raised by the co-operative organization, and the target revenue collection would be set. Anything above the target would entitle the franchisee for a better incentive, whereas the minimum is the agreed target for the raised invoices. This would be applicable for the customers who have their own energy meters installed in the premises. The other set of customers such as BPL households and a cluster of households can be fed through a common meters. Although the feeding point may be common for all the customers, in such cases too the revenue is required to be collected individually from these households. The role of franchisee here would be to issue a monthly bill just like TV cable operators. In these specific cases of the input-based franchisee for non-metered cluster of customers, the input energy into the residential area covered is measured by the utility and the targets for revenue collection are set. The approach is to have a close local level monitoring of unauthorized connections and drawl within a certain permitted level. The second approach of cluster metering may not be a technically sound concept, but considering the mammoth job of providing meters for each household this may be applied for a transit period. The billing would be flat monthly charges on average household connections. To protect the interest

of utility co-operative, the initial security deposit to the tune of two months receivables from the village, may be deposited by the franchisee. As the infrastructure upkeep would be the responsibility of the co-operative, regular patrols and check would be scheduled. The franchisee can still opt for operation and regular minor upkeeps at agreed outsourced charges. The tariff and pricing would be in the purview of the Co-Op, and the franchisee would work within an agreed bi-lateral contract and would be entitled for a percentage of revenue collections. The franchisee would be entitled for his or her share once it crosses the set target. The entire customer database under this arrangement would be maintained by Co-Op Utility.

Energy purchase, sell and collection franchisee / Model-EF – this is a holistic approach of assigning the entrepreneurship to the franchisee in rural areas. The retailing at the village would be under the purview of the franchisee. Considering the critical mass of viability and optimum utilization of resources, one franchisee may bid for more than one village, but not more than five to maintain the quality and focus. Such franchisee shall purchase energy from the utility and sell to the consumers in the franchised area. The selection would be a two-part process. Once a franchisee bidder has met with the qualifying norm, the bids may be evaluated on the tariff they are going to charge to the retail customer within the cap set by the regulator. The franchisee would operate, maintain, liaise with customers and raise the electricity bills directly to the customers, as it owns the customer it is serving under its jurisdiction. The price of the electricity would be within the cap fixed by the regulator for rural supply. In some of the areas it may be viable for supplementing the existing grid connections with some other source of generation, such as bio-gas or DG sets during peak load hours when the rural supply is disconnected. The pooling of resources would decrease the capital and operational cost per household. The emergency power may be charged at a higher price than the normal grid supply.

The proposed rural utility organizational structure, and the associated business process to effectively cover the smaller towns and rural area in the country side would be through a consumer co-operative supported with rural entrepreneurs. As proposed in each

administrative district there should be one consumer co-operative. The Consumer Co-Op Boards would be an elected board of representatives selected from among the consumers. Qualified professionals may be deployed for management and technical functions preferably from the local area to reduce administrative cost. Co-operative boards would not only ensure the smooth operation of the network and revenue collection, but also explore possibilities for getting the most reasonably priced power from different generators through open access. The shortage of evening power may be met with levying higher tariff during peak hours, and using TOD (time of the day meter).

Local entrepreneurs, preferably the stakeholders, may be encouraged to take rural electricity retailing for Villages. Village level entrepreneurs may be selected on a two- part bidding process. On fulfillment of capability required, the bids may be evaluated based on the quoted percentage of revenue as service charges on the regulated price. The contract may be for a period of 2yrs. The franchisee performance would be reviewed monthly in terms of revenue collection and operational efficiency. The potential of business growth, and adding new customers through local marketing efforts and promotional activities would also be reviewed quarterly. The training in the area of new distribution technology, maintenance techniques and deployed of basic IT services processes would be the responsibility of district Co-operative utilities. To avoid any financial irregularity there would be simplified IT applications from the commencement of service by co-operatives and its franchisee, covering complete data base for customers and the computerized billing would be done with strict controls and checks. The financial results would be disclosed to the SERCs and also for the review of co-operative members. The key for sustainable retail electricity business would be the participation of local customers in business decisions, and winning the confidence of customers as fair and just organizations.

The franchisee area may be one large village or cluster of small villages (not more than five under one franchisee). To make the business attractive for franchisees the minimum customers must not be less than two hundred households.

To run the sustainable business of retailing electricity at the village level there must be a minimum guaranteed return to franchisee on meeting the operational performance and revenue level of franchisee for an initial period of one year. The estimated minimum

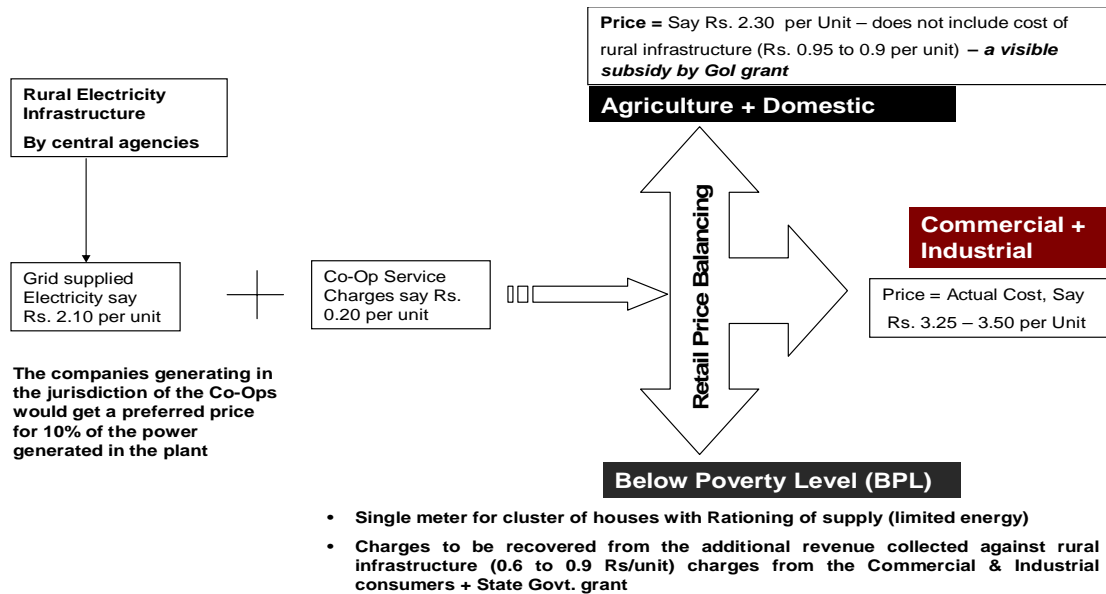
profit one franchisee can earn through this model would be INR 4000, but through the innovative way of enhancing the customer demand and promoting rural electricity retail business, the earnings is expected to go up manifold. Apart from the growth of the rural demand and customer base, the potential of utilizing the same establishment for marketing and after-sales service of electrical appliances in the village outlets by franchisees can be a major profitable venture for the franchisees.

There is a potential of creating one tenth of a million (one lakh) entrepreneurs in rural retail supply business with the implementation of this model. The employment potential of such a scheme can be four lakh new jobs created for unemployed youth directly at the village level, and approximately equal numbers through associated business and opportunities due to availability of power.

The prices for the Co-Ops would be regulated for first five years by SERCs. However there would be no direct subsidy by the Government in any form. The transfer of infrastructure at no cost, and on the ground that there is no mandatory ROI required to be returned to government would make it a no-profit, no-loss organization, and would ease the financial burden on the new entity. Depending upon the growth and adaptation to the new reorganized model, deregulated market may be achieved in ten years. There would be one nominated SERC representative to have a close regulatory watch on the activities of the Co-Op. To make the price level affordable for the rural consumers particularly the people living below poverty line (BPL) the co-ops would run as no profit organization. However to implement the affordable tariff to the rural customers following model may be adopted by the co-operatives and the SERCs. In all the developed nations the rural supply is given price advantage by a preferred price for a percentage of power generated in the jurisdiction of co-ops. The new generating plants may provide 10-15% of power to the local co-ops at a preferential rate. This would help in reducing pricing in the co-op areas. It is recommended that subsidy and government interference in retail business must be avoided and the fair and conducive market dynamics may be allowed to decide the pricing with a close watch of an independent regulator. In the model as shown below, the BPL consumers would be provided with a limited rationed quota at a price below the cost to service price, this category of consumer load should not exceed ten percent of the

total electricity sold. The revenue loss for such a welfare scheme should be compensated at the co-operative level itself.

The pricing of rural power, and making it more humane have been contentious issue in the past. The low purchasing power and paying capacity are reasons for fixing the rural pricing below the cost of power. The lower rates fixed for agriculture and rural supply has done more harm than good to the rural customers. The prices are unrealistically low for the utilities, resulting in an unacceptable level of supply. In this report there is no provision of subsidy to be given to rural customers either direct, or through cross-subsidizing it with other category categories of customers. However, as the Indian federal government as well as state governments are committed for a grant for rural electrification as infrastructure development, the benefits would, by design, pass on the benefits to rural customers making it affordable. As the capital expenditure of these projects are through grants under the RGGVY scheme, it is not required to be paid back, or no fixed ROI is required for such investment. The second source of bringing the price lower for rural customers would be to bring all the non-paying customers under the payment net, reducing the burden of high tariff for the paying customers. The Government can also plan to identify few low generating cost plants to feed the rural co-operatives, thereby giving the benefit to the rural consumers. This is also prevalent in developed nations like USA, as Co-Ops in the state of Texas are being supplied by no-profit organizations like LCRA, thus bringing down the purchase cost of Co-Ops.



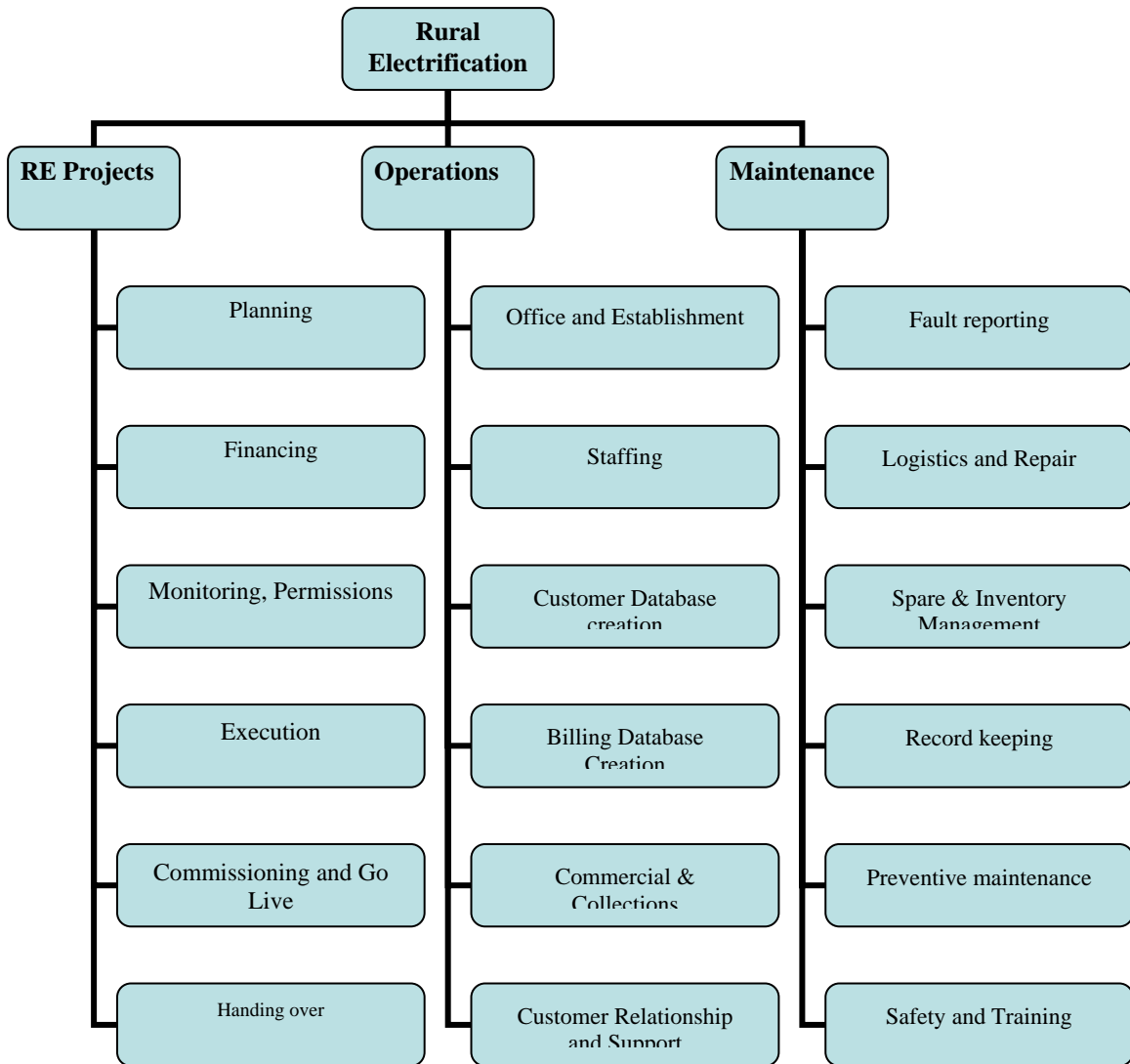
## Recommended Pricing Mechanism

However there would be a major shift of roles for SEBs from provider to facilitator of electricity in rural India. It is appropriate to look into the role of SEB officials and staff after this transformation process. As the average age of employees of the SEBs are more than fifty in many states, it would be prudent to handle them with a humane face but with no compromise on professional managerial wisdom of restructuring and re-engaging these ageing workforces for allied functions. The success of rural electricity restructuring would depend largely on redeployment of the honest and work-worthy employees for productive purposes. This weeding and cleansing of the rotten, and potential hazards for a future system would be of equal importance. Any tainted personnel or employees with a track record of corruption or malpractices may be dealt with golden handshake, VRS or retrenchment.

There would be a new challenge for state governments in terms of thousands of franchisees in hundreds of co-operatives created within the next 2-5 years opening immense business opportunities in the states. This will change the role of the SEBs which may perform the role of facilitator for the transformation process. Preferably an interim nodal agency consisting of three members may be carved out from SEB for a period of 3 years to be appointed for this specific mission. The schedules and timeline will be followed individually by each state government to manage and oversee contracts between

public, existing generating and transmission companies and other new players such as co-operatives and private entrepreneurs. The state government through this interim agency can provide and ensure the smooth transformation, and protect the legal rights and obligations of parties in terms of service and tariffs. This agency should have a representation of managers with engineering, finance and legal background of utilities as it would require managerial and technical competence to engage with franchisees, inspection of installation, verification of delivery of service to standards, performance monitoring, legal expertise, establishing bulk-power purchase agreements with generators with fuel cost provisions, minimizing the risks and lowering transaction costs in general, and the training required for commencement of such services.

It is recommended that the proposed model for rural electrification should be executed by professional Managers based on a transparent, effective and realistic approach and intention. The target is the actual beneficiaries and stakeholders; they need to be empowered such that they can understand, participate and contribute to develop the rural projects. Rural electrification projects are the ones which can change the lifestyle of the people and the rural economy. An effective implementing agency to execute the rural projects is one of its most basic requirements. However, considering the three obvious different functions of the rural electrification organization, it is recommended that three organizations may be carved out from the present setup. The role that each rural organization is performing fulfills the following functions:



**Figure – 8: Function performed by a rural electric Utility**

It is pertinent to realize that the first is a Project management function with large capital outlay, and the requirement is different from operation and maintenance of the retail supply of electricity in villages. The rural projects do require support and right of way from the local people, but beyond that the time and cost over-runs are a major area of concern. These can be addressed by resourceful construction companies under central project implementation agencies. However, the other two functions and more especially the operations, may be a participative function. The role of local stakeholders can change the level of success in a big way. International success stories are many to corroborate it this.

Funding the Rural electrification projects has always been undertaken by either the state governments through their limited planned resources, or the specific grants from central government in India. State Electricity Boards SEBs have tried to pitch in internal sources and loans from the REC. The debt burden was serviced through revenues from a regime of cross subsidies. With the best effort, only 5% in Bihar could have access to electricity after five decades of planned development. In the new globalized economy, it is necessary to reduce the burden of cross subsidy. This is required to generate faster economic growth and greater employment opportunities. Funding and financial sustainability has always been a source of major debt burdens.

The RGGVY was a milestone program in which to reduce subsidy, and in this scheme the government has tried to provide funding through government grants up to ninety percent and ten percent as loan. This may solve the funding issues for rural electricity projects to some extent. But this is only just sufficient for the VEI (Village Electrification Infrastructure), which is a basic requirement for village infrastructure. It is essential to have the infrastructure and connectivity, but grants to do away with the cross subsidy may be a short term solution for the larger problem ahead. Keeping the villages electrified, and using the village electrification will initialize resultant economic activities.

The financing requirements / funding in about the report are beyond the creation of REDB. Rural distribution backbone has to transform to a sustainable rural supply entity. Subsidy and grants may trigger the much needed impetus to create the necessary infrastructure. But once it is created, that needs to be operationally and financially self-sufficient. The efficiency level has to be drastically improved, and the Governance issue including AT&C losses is required to be looked into. Each SEB can continue as a holding company, having the minority stake of less than 26% stake transferred to Co-Operatives in a district, and the balance stake can be in the form of soft loans from state government. To reduce the employment cost the following structure may be recommended:

1. Regular Rural Employment Scheme (10% of the total manpower) - Core team: The core team in each village would be essentially manned by two trained professionals selected from the local area, preferably; one Head – Operations and the other Head – Finance. This would be a regular employment; which is permanent in nature. The majority of salary components and other compensation would be directly linked with revenue.

2. Contractual Employment (70%): This type of job is project-based in nature. Working hours remaining the same as in a regular employment, the contract is made for a certain period of time, with a fixed salary paid at the end of the day/month. The employment ends when the contract expires. The persons engaged for such contractual positions may be imparted with the necessary skills and training, and this would be essentially for all the major maintenance work, and for undertaking any new connection. There can be a pool of resources which can be located at a common location

3. Part-time Employment (10%): Local High School Students may be encouraged to apply for this type of job. Working hours are adjusted to match their class schedules, and the company need. This job also ends upon the completion of contract. This is obviously for less-skilled jobs such as distribution of bills, collection of revenue, training for saving power and using the electrical appliances, promotion of energy saving devices, fu (incompletesentence)

4. Internship (10%): Upon the completion of graduation courses, students may be assigned internship projects in their area of concentration. Under the supervision of a Regular / Contractual employee, they work for the company for three months to generate a report on the project findings and recommendation.

Partnership with Educational Institutions / Industrial Attachment: Students from Engineering/Technical institutes may spend some time in the company to get real life exposure related to their theoretical knowledge. During this tenure, technical experts and guides in the company accordingly would help them to enhance their knowledge.

We may compare the proposed model with a similar model in Bangladesh where Noble Prize winner Mohammad Yunus has been able to attract private capital to fund socially

driven businesses. Grameen Phone, a for-profit telecom outfit, is 62% owned by Norway's Telenor (TELN). It works with the not-for-profit Grameen Telecom to provide bulk airtime for so-called village phones. Funded by loans to individual women, these systems, built from simple handsets and solar chargers, function as pay phones in many rural areas. Now the idea of a "village phone lady" is catching on, along with other low-cost, high-tech systems, in other parts of Asia and Africa. The Noble Prize winner feels good development is good business. Since its inception, Grameenphone has been driven to be inspiring and leading by example, when it comes to being involved in the community. At Grameenphone the aim was sustainable development and that could be achieved through long term economic growth. Therefore, as a leading corporate house in Bangladesh, they intended to deliver the best to customers, business partners, stakeholders, employees and society at large by 'being a partner in development.'

The model proposed is tailor-made for large developing countries like India. The objective of the model is to get a substantial benefit from the planned capital expenditure. This research has identified crucial components of social capital necessary for sustainable development, and use of the rural energy sector in India. Many of the schemes such as Micro-financing which have received ample support not only from financial institutions in South East Asian countries, but also from the locals, are the basis for the proposed model. The successes of these projects have been due to participative mode of development rather than the top-down approach practiced earlier. The proposed model looks ahead to a similar kind of response and participation from the community served by the electric cooperative or stakeholders. It has been explored and found possible that the active civic participation at the grass roots level would help in successful development of the rural energy sector. After detailed study and analysis of successful and failed models, and also the factors that make a rural electrification project succeed, a first hand survey has exposed GAPS in the perception of stakeholders involved in the process of rural electrification including present planning and implementation processes. The report is a radical shift from the conventional wisdom that the state alone can provide rural electrification and subsidized electric supply.

Developing countries have adopted a different approach to these issues. A variety of approaches have been successful in different parts of the world. They include a separate rural electrification authority (Bangladesh); setting up rural electric cooperatives (Costa Rica); allocating rural electrification to a department of the national distribution company (Thailand); or delegating it to the regional offices of the utility (Tunisia). In Kenya, for example, where the rural electrification program depends on the availability of grant funds from donors, progress has been slow and intermittent.

The proposed model is a mix of a rural electricity supply organizational structure followed in USA and China. The model is further customized to Indian socio-economic conditions considering the fact that the Indian rural customers do not have enough paying capacity to buy power at higher commercial rates. The supply at fair prices would be an important aspect to get the acceptability of the consumers at the beginning. The financial support, if any, in the form of low-cost power at the feeding point of village from the Government, needs to be transparent and on accounts rather than vague indirect waiver of consumer dues in masses. Such political decisions only create a sense of uncertainty and doubts in the mind of customers whether to pay or not to pay in future.

Privatization per se of rural supply is a distant possibility as large private companies do not find it attractive enough. The business may not provide enough margins and attractive avenue for them. But in this proposal there is potential to create 0.1 million rural entrepreneurs, who would work for them, and that would make it click.

The rural electrification entrepreneurs programs as proposed in this report would be to encourage rural-level business leaders who are putting the principles of sustainability into action. The entrepreneurs in the rural villages would bring the necessary changes as they may come from all sections including youth, change agents from business, retired government officials, academicians and social workers from non-profit sectors. Sustainability principles are drivers for new business opportunities in the rural India. They would emerge as the tools to improve quality of life. To these entrepreneurs, success should mean implementation, high quality services at rural area for specific power-sector focused economic development. They would be similar to a social entrepreneur. Highly motivated village leaders are people who can recognize the social problems related to rural electricity distribution and its consequences. They would work

on entrepreneurial principles to organize, create, and manage a venture to make social change. The performance would eventually give its own profit and return. However these social entrepreneurs would get a larger return in terms of the impact they have on society. They may be from any walk of life including unattached, unemployed, private or governmental sectors.

There are possibilities to develop local entrepreneurs who can deploy a maintenance team for the rural network, provide security and check theft, collect revenue, distribute bills and run customer care centers with basic IT infrastructure. The local entrepreneurs can be engaged as franchisees to run the business professionally. Training and awareness would be two key words for success of the proposed model.

It is worthwhile to study the successful models for a smaller country like Thailand or Costa-Rica, but considering the spread, diversity, economic divide, political systems, scale of operation, demographics and paying capacity it would be prudent to assess the system and suitably modify it for Indian conditions. It is necessary, however, to evolve a right model, and would be more relevant to look in to the countries with similar backgrounds and spread. Countries like the US, China and Mexico have done their rural electrification in the past with a good success rate. The rural electrification model in US, through Co-Ops, on a no-profit, no-loss basis has successfully worked in the last sixty years. The US does have a large number of federal, states, municipal and rural cooperative electric utilities – their total number runs into about 3,000- but about 250 private investors owned utilities (IOUs), account for about three-fourth of electricity generation and supply. In the US, no attempt has ever been made to nationalize private electric utilities, nor has there been any significant expansion of the public sector after the 1950s. The system has been a well-accepted one both by the Governments and the rural consumers. There are stray incidents of misappropriation and mis-governance from few of the Co-Ops as reported by the media, but all things considered, the system has demonstrated great strength. The key difference between the US rural electrification and delivery model, and the Indian system is the economy of the rural area. While in America there is a much stronger rural economy, and the rural population has not much of difference between the living conditions with their urban counterparts and the paying

capacity. However the models being followed in China appear similar due to comparable background of the two countries, and the level of electrification both the countries had in the middle of the last century. Particularly in the western less-developed China, the electrification model is worth emulating for a developing country like India.

The Indian rural electrification model needs to address the key issues such as the huge requirement of funds, high AT&C losses, illegal connection, poor revenue collection records of SEBs, low paying capacity of rural consumers, economic disparity between urban and rural population, and the present inefficient rural delivery system of SEBs. In village and rural areas the role of grass-root stakeholders in the supply chain are very important. Indian states are administratively divided into districts, which have the appropriate size and number of customers for a Co-Op. These district Co-ops would be manageable and would also have the critical mass. The critical mass of a business unit is important, but it is equally important not to ignore the social dynamics of Indian villages. The village as a franchisee unit can work well in the areas where there are strong social divisive forces based on some cultural, ethnic or caste-based differences.

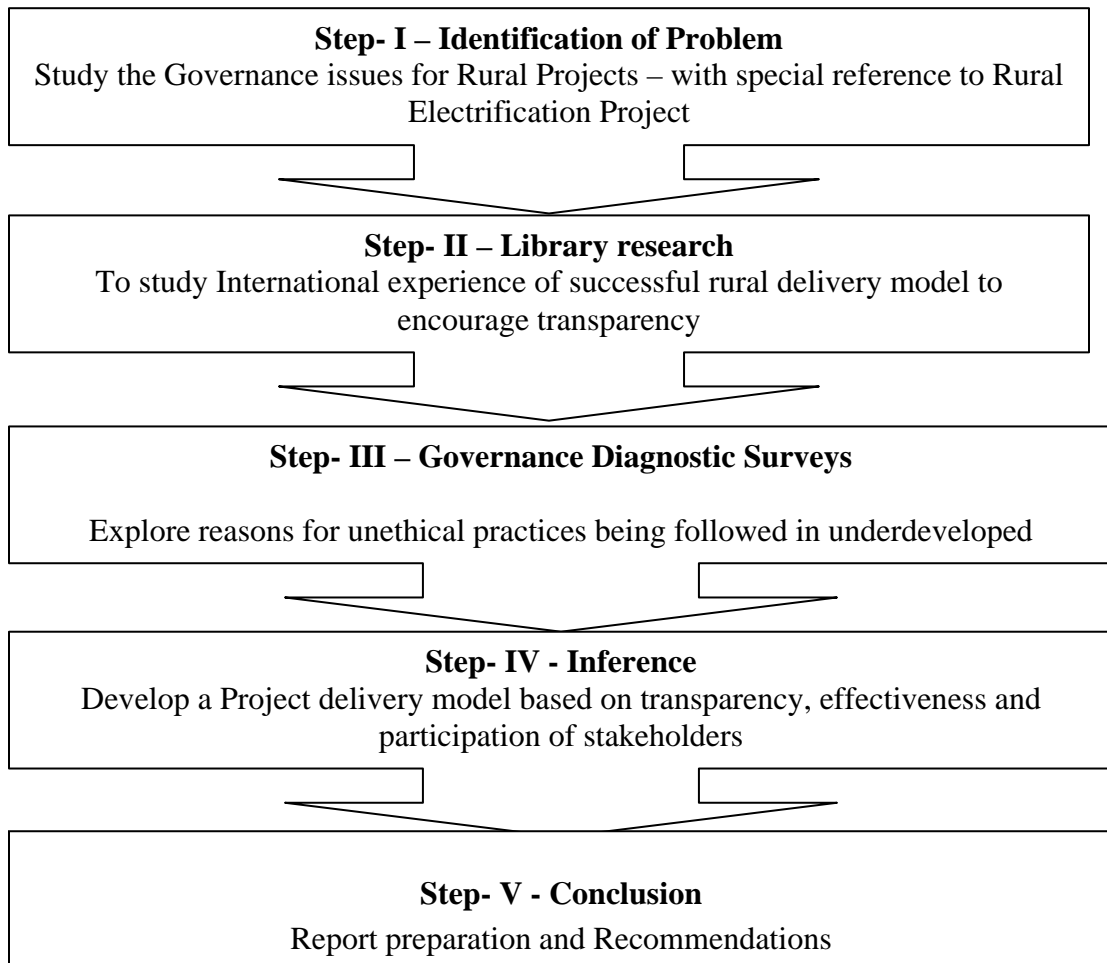
Considering the factors mentioned above, a consumer Co-operatives for rural electricity supply is the most viable option available for a democratic country like India. However the management of co-operatives is required to be monitored by a district level regulator appointed by SERCs. The success of American Co-Ops for rural supply are the cases to be recommended for adoption in the Indian system, however there are related issues of uncontrolled powers vested on the Boards of these co-operatives in USA which have emerged as a cause of misappropriation too. The few unregulated independent co-operatives in the state of Texas in the USA are being investigated for such alleged irregularities. Therefore with sufficient independence to operate, the disclosure and the financial health need to be monitored by an independent district level regulator.

# Annexure

## Annexure -I

### Methodology

The research findings are based on primary data collected from the field, as well as secondary data from various sources such as Government records, CEA databank, Internet, Utility records etc. Issues like the existing mechanisms of civic engagements and social connectedness, and status of rural electrification program in Bihar would be analysed on the basis of available secondary data. The diagnostic survey is based on the primary data collected through field study on the sample from electric utilities in the state of Bihar. The deliberations with the village Panchayat members, employees, and the administrators of the cooperative have also been used as important inputs to the analysis of different dimensions socio-economic dimension of Governance issue. Flowchart of the methodology followed is as under:



### Governance Diagnostic Surveys

The Methodology and approach towards diagnosing the issues and problem in successful rural electrification projects was to adopt a multi-pronged, separate survey of users of rural electricity / households, firms engaged in these implementations, public officials including utility officials and other non-governmental organizations in the state of Bihar under the Union of India. The tool used for REGA (Rural Electrification Governance Assessment) diagnostic surveys used for the assessment comprises of use of experience-based (vs. opinions/generic) type of questions, a broad governance and service delivery conceptual framework. The analysis of the Governance survey evolved to develop with this approach encourages local stakeholders to make use of the results to promote a constructive debate on institutional reforms, and can lead to a non-political debate on concrete changes. The key building block of this program

is the simultaneous implementation of diagnostic tools by local stakeholders. These diagnostic tools are designed to facilitate governance monitoring activity by providing inputs to policy makers and civil society. The reason for selecting the participatory design and implementation of diagnostic surveys was to allow learning through the close collaboration between external experts at UTA and local counterparts from utility company in India, promote long-term, sustainable partnerships between government and civil society; measure the results vis a vis a benchmark for governance and public sector performance; and monitor on a regular basis governance and public sector performance.

The complete diagnostic process includes the following components:

**1. Familiarization phase**, in which the researcher ensured a proper coordination with different stakeholders. The possibility of a NGO, Institutional support and partnership with local bodies were explored.

**2. Development phase**, included research and data collection for Assessment of existing institutional weaknesses, The design of survey questionnaire and diagnostic instruments to collect governance data: a special questionnaire was devised to come up with a diagnostic tool to assess and evaluate the weakness and the cause of failure of rural projects in the Electricity sector, and preliminary training of field surveyor to carry out the required field work.

**3. Fieldwork phase**, where the governance data is collected, using the questionnaires developed in Phase 2. This Phase is carried out jointly by local and external experts. The Diagnostic Survey in this research consisted of rural household survey, enterprise survey / public utility officials' survey at twenty-eight villages from five districts in the state of Bihar.

**4. Analytical phase**, where the data collected in Phase 3 is analyzed. This in-depth analysis, carried out to evolve a policy report on the causes of mis-governance and poor service delivery.

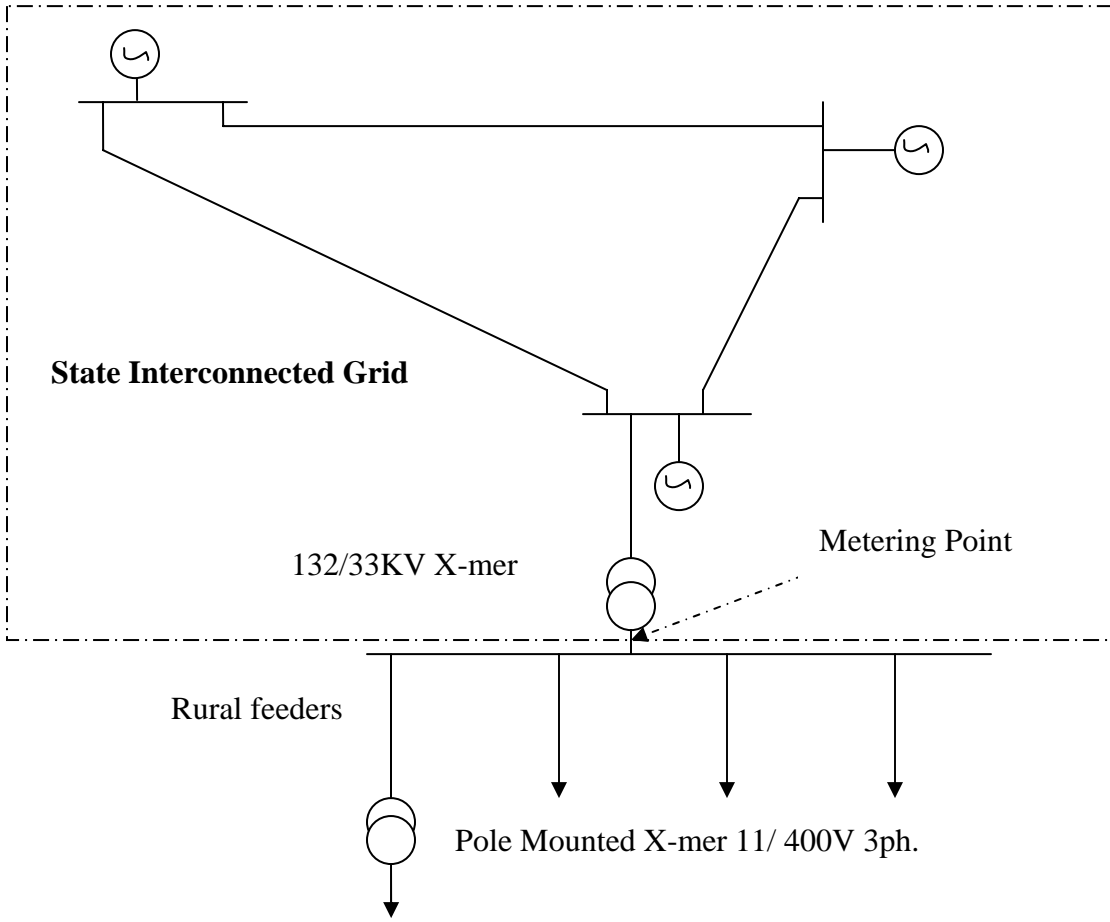
**5. Action-programming phase**, in which the findings of the governance diagnostic to formulate and design action plans and responses for policy reform.

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