

Impact Study of Rural Electrification Project: *Mechanism of Poverty Alleviation Fostered by Rural Electrification*



Abul Barkat,
SH Khan, M Huque, R Ara,
S Zaman, A Poddar



Human Development Research Centre

Prepared for

JAPAN BANK FOR INTERNATIONAL COOPERATION (JBIC)

Representative Office, Dhaka

Dhaka: 10 November, 2003

EXECUTIVE SUMMARY

INTRODUCTION

Rural Electrification Program (REP) in Bangladesh was founded in 1977. The program is based on the concept of member-owned *Palli Bidyut Samities* (Currently, 67 PBSs). The primary objective of REP is to *ensure a stable and reliable supply of power to the rural areas at reasonable price* aiming at ensuring higher standard of living of the rural people.

REP is a success story of the joint efforts of the Government and the development partners. However, after long 25 years of such efforts, the RE program has resulted in a present power network access for about 22% of the rural population. In this backdrop, the National Poverty Reduction Strategy Report 2003 identified rural electrification as one of the four priority areas to ensure increasing growth and bringing a pro-poor orientation in the growth process.

OBJECTIVES OF THE STUDY

JBIC supports 7 PBSs under 3 projects to electrify the rural areas by constructing and rehabilitating distribution facilities. The projects comply with one of the priority areas of JBIC's assistance strategy for Bangladesh, which is to support the poor through rural development. The first phase of 3 JBIC-assisted projects started in 1995 in 3 PBSs: Jhenaidah, Kurigram-Lalmonirhat, and Rajshahi – the study PBSs. The three PBSs are located in the western part of Bangladesh. The service area comprises 20 upazilas (sub-districts) covering 4,217 villages and 615,886 households.

The objectives of the study are three-fold:

1. To investigate the various economic and social effects of the project under study.
2. To investigate the mechanism of poverty alleviation in the context of rural development fostered by rural electrification, and identify associated promoting and impeding factors.
3. To recommend actions to be taken by various stakeholders (GO, NGO, LGI, Village Advisors) to enhance RE benefits towards poverty alleviation.

METHODOLOGY

The overall approach adopted in the study was a **case-study approach** intended to investigate the causal relationships between rural electrification and rural development, and between rural electrification and poverty alleviation. Although the approach was qualitative by nature, attempts were made to quantify the project impacts, to the extent possible.

The following terms have been used and operationally defined: poverty (including economic and human poverty), poverty alleviation, production and social sectors, social development. Poor household has been defined as those having up to 49 decimals of own agricultural land (poor has been categorized into three groups based on extent of poverty).

To collect information, a total of 26 data collection instruments (of six types, mostly qualitative) were used, and 12 Research Assistants were deployed in the field during August-September 2003. A total of 9 villages were covered with 3 villages in each PBS: one electrified developed village, one electrified not-so-developed village, and one non-electrified village.

ELECTRIFICATION ACHIEVEMENT AND OVERALL IMPACT IN 3 PBS AREAS

The current village electrification rate is about 40%, up from only 1% in 1995 prior to the project. The average annual growth rate of village energization is 65% since the initiation of the project.

The average household electrification ratio is 17.9%: the highest in Rajshahi (26.6%) and the lowest in Kurigram-Lalmonirhat (11.9%), and below the average in Jhenaidah (17.5%). PBSs started with a low base of household electrification ratio in 1995, average being 0.3%.

The estimated amount of annual net revenue earned by 1703 RE-run industries in 3 PBSs would be about Tk. 10,698 million, where a 70% of the net revenue would not have been possible without the RE-facilities. RE-connected 1703 industries employ a total of 21,480 persons.

A total of 4,597 RE-run irrigation equipment cover a total of 128,097 acres of land area under irrigation. Had their been no RE, 75% of the currently RE-irrigated land would not have been covered under irrigation. Approximately, 255,563 tons of rice has been produced from HYV *Boro* and *Aman* in RE-irrigated lands, which is around 30% of all similar types of rice produced in the catchment areas. Around 48,632 persons have been directly involved in farmlands through use of electricity powered irrigation equipment; and 25% of this employment can be directly attributed to RE.

A total of 17,088 shops use RE and employ 45,224 persons. The estimated annual sales turnover of electrified shops comes to Tk.13,481 million, while 16.3% of the annual sales turnover of the electrified shops and 44% of employment can be attributed to electricity.

The annual net income of 110,063 households having domestic RE connection in 3 study PBSs would be Tk.10,155 million, and 16.4% of the annual net income of electrified households can be attributed to electricity.

MECHANISM OF ELECTRIFICATION: PROCEDURE, CRITERIA, STAKEHOLDERS

Each PBS has its clearly defined area of jurisdiction. A PBS area is divided into several electrification 'elaka' (areas). The members from each 'elaka' select one member to the Board of Directors for a term fixed by the PBS By-laws. The fourteen-member Board with three Female Advisors is headed by the President elected from among the Board Members. The executive power in the PBS lies with the General Manager. A Village Advisor is nominated in each electrified village for coordination between the consumers and the PBS. Each PBS provides training to a number of rural youth to work as Certified Electricians in their villages.

There are two types of stakeholders: Supply Side (GoB, REB, PBS, development partners), and Demand Side (direct and indirect beneficiaries or consumers). REB has set criteria for village electrification along with procedures of electrification for different consumer categories. A master plan for electrification is prepared keeping in mind such factors as concentration and prospects of irrigation facilities, concentration and prospects of industrial units, concentration of commercial units, contiguity of household settlements, revenue considerations, and social equity considerations.

With regard to priorities given to respective customer categories for provision of RE connection, the PBS managerial staff maintained that such priorities were dissimilar by PBSs. This pattern indicates assigning of high priority for high-return sectors, and low priority for the households, that is, the low-return sector.

The production sectors of the not-so-developed villages are not electrified at the same level as the developed villages mainly because of their far location from growth center, distant location from highway/ big roads, and absence of entrepreneurship.

MECHANISM OF ELECTRIFICATION'S IMPACT ON PRODUCTION SECTOR

As soon as the rural areas had been provided with electricity, most of the old (diesel-driven) irrigation pumps switched over to electrified irrigation. The reasons for shift were the following: benefits from electrified irrigation, relatively lower cost of production, possibility for

expansion of command area, reduction of the necessity for human energy, relatively lower level of health hazards, and prospects for employment generation.

Increase in cropping intensity has led to crop diversification. As the winter is generally drier than the rainy season, easy supply of irrigation water from the electrified irrigation units has enabled the farmers to start cultivation of winter vegetables that were not grown earlier.

In the agriculture sector, the growth of poultry farms has also expanded as a result of expansion of the rural electrification network.

The introduction of electricity has been instrumental in electrification of the previously non-electrified rice-husking mills and establishment of new ones.

Cold storage facilities have been created to preserve vegetables. Rural electrification has facilitated the installation of saw mills that have increased the local supply of timber.

As a result of increase in crop production, trading in different crops has also increased. Electric lighting and fans have enabled the local traders keep their stores open for long hours after sunset. Many of the traders keep radios or TVs in their stores in order to attract clients. The shop-owners feel encouraged as their sales increase adding to their income. All these were instrumental in the growth of shops, especially the electrified ones in the market places.

One of the most significant characteristics of electricity is the generation of resources in the rural areas through the promotion of inter-subsectoral linkages. Electricity increases output which then triggers the growth of other sectors and sub-sections.

Rural electricity-led irrigation pumps, rice mills, cold storage, saw mills, and irrigation pumps need continuous repairs for which they have to depend on mechanical engineering workshops. Electricity connection has facilitated the growth of lathes for producing spare parts and welding machines for repairing various machines as well as fabricating windows, doors and gates used in the construction business. Expansion of industries and commerce necessitates the telephone connection linking the remote areas. Besides, as electricity connects additional shops, industries and services, the demand for electric equipment have increased. As a result, shops for selling electric goods as well as repairing workshops are increasing.

MECHANISM OF ELECTRIFICATION'S IMPACT ON SOCIAL DEVELOPMENT

RE has left remarkable impact on health depicted through enhanced public health awareness, health education, advice and information to improve upon health seeking behavior on the one hand, and decrease of risk taking behavior on the other, and seeking services delivery in due time. Due to electrification, health information is transmitted through television. The villagers, through access to electrification, are well-aware of ANC, PNC, pregnancy-related complications and their treatment, sanitation, abuse of drug, breast feeding, immunization, family planning, balanced diet, iodized salt, food and nutrition, environment conservation, and effects of vitamin 'A' deficiency. As a result of enhanced health awareness, the demand for healthcare service has increased. Enhanced health seeking behavior encourages establishment of private hospital, clinic, diagnostic centre and pharmacy in the rural area.

Because of the increased number of customers, both the demand for doctors and medicine increased. As a result, pharmacies were established; scope of having refrigerator in the pharmacy has been created to preserve emergency medicines and vaccines. Life-saving medicines for which the people had to depend on distant urban centres, is now available after the introduction of electricity. This reduces time, cost and health hazards of the rural people. Setting up of clinic, health centre, pharmacy – all lead to creation of employment. X-ray, ECG, ultra-sonogram are done in a few clinics. Even oxygen is available and minor

operation is done at clinics in Keshherhat village (Rajshahi). All these contribute to health poverty alleviation. All these mechanisms starting from health-education to seeking of service in the clinic have generated income-earning opportunities for many people in the vicinity.

Electricity has made significant contribution to general, technical and vocational education. Electrified schools are qualitatively better than non-electrified schools. Due mainly to fans for comfort, the students are more attentive than before, and the teachers feel comfortable to teach. Performance of the students has also improved. In some schools, double shifts have been introduced. Adult literacy course is going on in some schools. There are 5 to 6 computers in Pillapara village (Rajshahi) and Nrisinghapur village (Jhenaidah). In some electrified schools, computer training has been introduced; science students can participate in practical work; and the students arrange cultural programmes at night.

Vocational centres have been established in electrified villages for imparting training on welding, electric wiring, poultry farming, sewing, lathe machine, and repairing workshops. Technical education has helped increase employment.

The use of lights and fans made life comfortable: Even in excessive heat of summer, children are more attentive in study, sleep well, and spend more study time at night. Before electrification, children had to read in the light of *'kupi'* and *haricane* which were harmful for eye-sight and its smoke was also hazardous to health.

NGOs reported that as a result of rural electrification, the number of women beneficiaries for raising poultry has increased, which has enhanced socio-economic status of women. Due to lights and fans, NGOs have a conducive environment for training. Rural electrification has ensured women's access to and control over resources in the following ways:

Economic resources: through participation in income generating activities (IGAs), skill training, employment, micro credit, and savings.

Socio-political resources: leadership skill, decision making, social mobility, security, credibility, self-confidence, exposure outside the home, participation in CBO/NGO activities, awareness on legal issues and human rights.

Health resources: Access to health care service and protection of reproductive health.

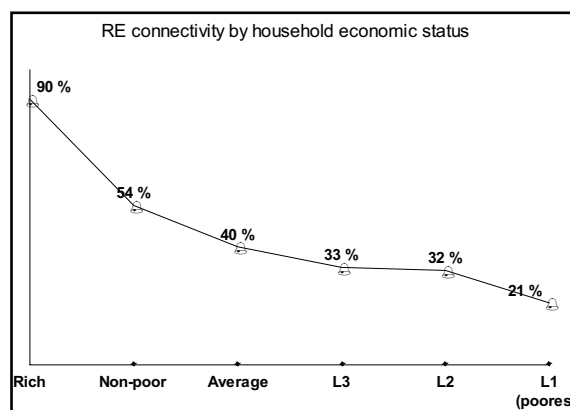
Time: Better management and use of time.

POVERTY PROFILE AND HOUSEHOLD ELECTRIFICATION STATUS: CASE VILLAGES

The concentration of poor households is much more pronounced in the electrified villages than that in the non-electrified villages: 60% in the electrified and 48% in the non-electrified.

In electrified villages, pattern by extent of poverty was as follows: 4.7% poorest of the poor (highly poor or ultra poor, L1), 42.2% (hardcore to moderate poor, L2), and 13.3% upper level poor (less poor among the poor, L3).

Access to electricity is not socio-economic status (or class) neutral. The actual connectivity of households to electricity declines with the declining economic status of a household; while on average 39.7% of households in the electrified villages are electrified, the same ratio is as high as 53.5 % for the non-poor and only 30.6 % for the poor; while over 90 % rich households (those having 750 decimals and above land ownership) possess electricity, it is only 21% among the poorest (L1) households.



On average, 39.7 % of the households in the electrified villages have electricity connections. This rate is highly skewed by villages: a low of only 11.1 % in Guriadhah, a not-so-developed village, and a high of 78% in Kesharhat, a developed village.

Two aspects pertaining to the relationship between the village level development status and household electrification rate are worth mentioning: (1) on average, household electrification rate is much higher in the developed villages (57.8 %) than that in the not-so-developed villages (33.3 %), and (2) in each PBS, household electrification rate in developed villages is much higher than that in the counterpart not-so-developed village.

MECHANISM OF POVERTY ALLEVIATION THROUGH ELECTRICITY

Electricity has contributed to a great extent in generating resources, employment and income. Electricity contributed to this process by generating additional employment in agriculture, generating income from new industry, expansion of business, and developing the service sector. Almost all the poor electrified households, one-third of the poor in the non-electrified households in electrified villages, and about one-fifth of the poor in the non-electrified villages have mentioned that they have been amply benefited from electricity in the sense that at-least one member of their households has direct relation with electricity-mediated source of earning.

Industrial enterprises and other income-generating activities spread quickly in a village where there is a traditional *hat* (small weekly village market) or bazar. This traditional *hat* expanded rapidly with electricity connection. Expansion of market encouraged the people in income generating activities.

The quality of life indicators such as access to education, training, IGA, health, education, housing conditions, sanitation, decision-making, awareness of legal issues - all have generated significant impact on electrified households. Household electricity has contributed significantly in creating gender awareness and participation in income generating activities and empowering women.

Electricity has helped creation of employment and generation of income for non-electrified households by way of working in the electrified facilities. Women in the non-electrified households of electrified villages are aware of health education, legal issues, gender issues, ANC and PNC, through watching television in the neighboring houses. The male members are also aware about important issues watching television in the shops and the market.

Electrification brings indirect benefits to the unemployed people of non-electrified villages: when industrial and commercial units flourish, it becomes the centre of attraction for the people of neighboring non-electrified villages. There are numerous examples of residents of non-electrified villages having shops in electrified markets.

Skill training without access to electricity has limited potential for economic poverty reduction.

PROMOTING AND IMPEDING FACTORS TO RE BENEFITS TO THE POOR IN ELECTRIFIED VILLAGES

Poor's desire for electric connection is influenced by flow of regular minimum income. There is a strong synergy between electricity and credit/skill training for IGA; poor's accessibility to electricity (in many instances) is promoted by having an IGA accompanying with micro-credit and skill provision. Socio-cultural values like homestead beautification, homestead security, status symbol, recreation and comfort also play roles in accessing electricity.

Financial inability of the poor for the timely payment of investment cost and then payment of electric bills regularly appears to be the most impeding factor for poor's access to electric connection. The hardcore poor's desire for connection is at stake, because they do not have own homesteads.

The need for market of the local products, strengthening of their technical knowledge through imparting training in IGAs, the role of poor-friendly transport in facilitating their movement and transporting agricultural and non-agricultural products – all are RE-benefit promoting factors. It was also revealed that increased working efficiency of the electrified poor households together with credit provision has been instrumental in changing lives of the poor.

Non-electrified households derive RE benefits through indirect sources, such as `business enterprises opened or expanded by others, having land in the command areas of deep or shallow tube-wells of the owners of such installations.

Increasing cost of irrigation due to increased tariff, non-existence of street lights, non-electrified educational institutions and disrupted supplies of electricity were reported to have impeded RE benefits to the non-electrified households.

RE benefits to the poor in the production sector can be further promoted by electrifying more irrigation equipment and industrial units in the electrified villages. Retail shops, wholesale shops, *hat* and bazar which are not yet electrified should also be electrified for giving them more scope to work and earn. If more health facilities and schools are electrified, the poor can get two-fold benefits: they can work in the electrified institutions, and receive improved services.

Unmet need for electricity in reference to elongated operation of large/medium irrigation installations and medium level industries, has been highlighted as an impeding factor which seems to be natural because prevailing demand much exceeds the supply. Because of rising electricity tariff, the poor are facing economic hardships for buying electricity from the irrigation installations.

Poor are not generally invited to participate in PBS or village level meetings. They might have been ignored because of giving over-emphasis on revenue criteria and lack of emphasis on equity consideration. The poor are consulted only when theft of wire/electric meter/transformer occurs or for emergency - tackling like removing trees from electric lines.

Lack of knowledge about primary investment cost, ignorance of the procedural steps for getting connection, and wrong ideas about household electrification costs were highlighted as knowledge gap related problems for the poor which can easily be solved by holding village level meetings and/or reactivating the Village Advisors to do their job as a special aid to the poor.

ROLES OF VILLAGE ADVISORS, NGOs, AND GOs TO PROMOTE RE BENEFITS TO THE POOR

Village Advisors (VA) are a rare acquaintance to the consumers in general, though the RE consumers generally know that there is always a VA in each PBS. Though there is still scope for PBSs to further democratize the process of selection of the VAs, it has so far remained a mixed process of 'selection-and-election'.

Initially, a 25-member committee is formed in order to provide RE in a particular village. Representative of PBSs are also not well-known to the RE consumers, implying that they still have room for improvement on their communication and liaison with the RE consumers.

A total of 11 different NGOs were found working in the 9 study villagers with at least one NGO working in each village. Micro-credit program is common to all NGOs; and their major program activities are diverse ranging between 3 and 7 different activities in each of these NGOs.

Some NGOs foresee the possibility of their imparting of training on various businesses (like poultry-raising, handicrafts-making etc.) to enable the poor attain financial self-reliance through use of RE. Some NGOs are interested to initiate negotiations with PBSs in their respective areas facilitating provision of RE to its rural mobile phone users.

There are different community-based organizations (CBOs)- namely samities, clubs and youth groups operating in the study areas. These organizations are, at present, not really attached in any way with PBSs.

Local Government Institutions has no system or practice for promotion of the use of RE.

RECOMMENDATIONS FOR STAKEHOLDERS TO ENHANCE RE BENEFITS ON POVERTY ALLEVIATION

How to increase poor's accessibility to electricity

Poor households' connectivity to electricity should be increased. However, in designing pro-poor policy and strategy, it should be recognized that 'poor' as a socio-economic category is not a homogeneous one. The poor constitute 60% of all households (in electrified villages) and the levels of poverty among the three types of poor (L₁, L₂, L₃) vary. Therefore, in designing intervention plan and implementation mechanisms, it should be recognized that **one size will not fit all**. This is more so, because, among the factors impeding poor household's access to rural electricity, the most frequently mentioned ones were inability to incur the one-time investment (Tk.750-Tk.1000), inability to pay the monthly minimum bill (between Tk.90 and Tk.100), and inability to pay the monthly bill (Tk.125- Tk.150) regularly (because of lack of monthly fixed minimum income and/or seasonality in earning). **Therefore, the main sustainable solution lies in ascertaining a condition where the poor households will have a regular flow of minimum earning/income.** This can be ascertained by a combination of both with and without direct access to electricity. This strategic thinking is important because, as of today, in Bangladesh only 44% villages and only 20% rural households are electrified. Therefore, all possible strategies will matter, which may include the following:

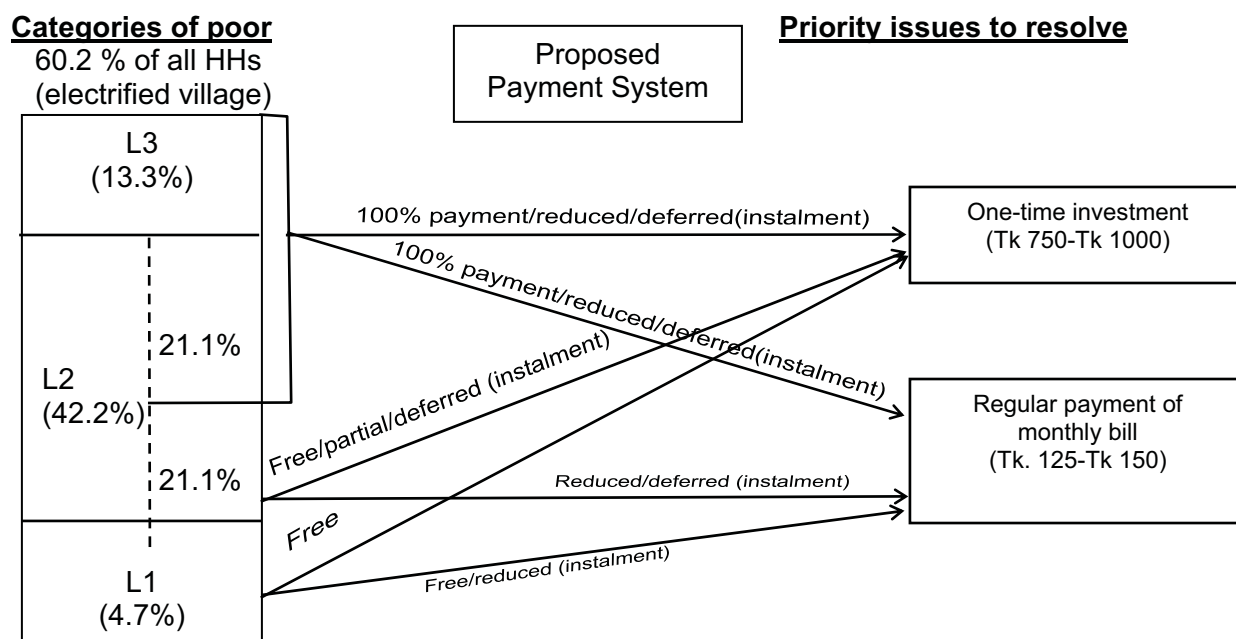
1. Expand 'poor peoples' employment base by expanding electrified irrigation, industries, and commercial ventures.
2. Impart income-generation related skill development training to the poor, and empower them by providing micro-credit. The poor will be self-employed; and household income will increase upto the level of their ability to pay for electricity. Both the NGOs and the Government can think proactively on this strategy. Under the purview of this strategy, poor people's skills can be developed in those areas having direct linkages with the use of electricity for productive pursuits.
3. Broaden opportunities for the poor in ownership and access to public resources. These broadened opportunities– by strengthening poor people's access to physical assets will have direct impact on their earning, as well as enhance their productivity (if health and education is taken care of).

The above three broad strategies comply fully both with the Constitutional Obligations of the State and with the Poverty Reduction Strategies adopted by the Government (I-PRSP).

It is suggested to design different approaches for the three different categories of the poor (L₁, L₂, and L₃), and pilot-test those approaches before replicating the design on a broader scale. The suggested approach gives a differential solution pertaining to the incurring of one-time investment and payment of regular monthly bills by the different categories of poor is presented for further discussion and decisions by the relevant policy planners. This suggested pro-poor approach bases firmly on the critical analysis of those forwarded by the poor themselves as well as by the relevant civil society members at the PBS level. The strategic approach indicates that depending on the level and extent of household level poverty and vulnerability, various payment schemes (market segmentation) should be devised to resolve the problems of need for one-time investment (Tk.750-Tk 1000) and regular payment of electricity bills (Tk.125-Tk.150 per month). The suggested payment schemes (options) include the following: 100% subsidy or no payment (for example, for

female headed poor households), reduced payment (say 25%, 50%, 75% subsidized), no subsidy (100% payment), and payment by installments or deferred payment (because of seasonality in income). It should be kept in mind that, provisioning of demand side subsidies constitutes one of the many ways to empower the poor, but how well they reach the poor is a major problem. This strategy, most likely, will work, only if the poor customers are empowered through information and they participate (not tokenism) in decision-making and monitoring of the system instituted for them. This will necessitate concerted actions of all stakeholders in the process.

Approaches to increase the poor’s accessibility to household electricity (in electrified villages)



In addition to the above scheme (options) of differential payment for one-time investment and monthly bill by 3 categories of poor (divided into four categories by further dividing the L2 into two sub-categories), it is suggested to think about the withdrawal of monthly minimum charge system (Tk 90 to Tk 100 by PBSs) and institute the system of “pay as per consumption”, as well as think about differential tariff for different categories of poor (i.e., price sliding by poverty status). **In this endeavor of pilot, the NGO services and expertise can be gainfully utilized. The whole process should be participatory by the poor, in which the local government and PBS should be seen as major stakeholders.**

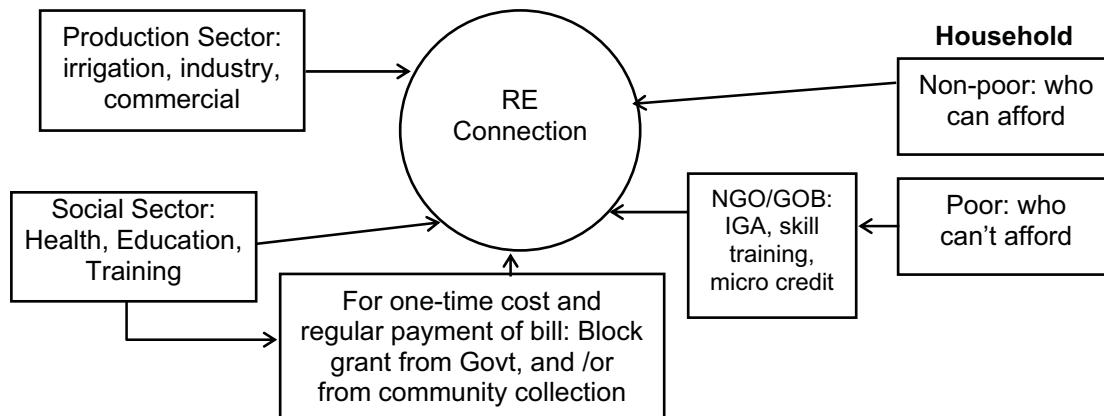
How to ensure pro-poor rural development by electrification

In order to expedite the process of pro-poor rural development by electrification, in addition to the enhancement of poor’s access to electricity, the following suggestions are in order :

1. Broaden electricity connectivity of the irrigation equipment, labour intensive industries and commercial establishment.
2. Give incentive for rural industrialization using RE (especially cottage, small and medium industries).
3. Assign high priority in connecting various social sectors, (health and education).
4. Develop a system of “collective meter”-based domestic connections for the poor households in a cluster.

5. Devise mechanisms to ensure un-interrupted power supply and mitigate the problem of load-shedding.
6. Workout a mechanism to avoid “political energization”.
7. Ensure poor people’s participation in the process of decision-making and implementation of RE-mediated rural development.

**Suggested mechanisms to enhance access to electricity
by various sectors: direct and indirect access to PBS-RE**



How to ensure the connectivity to social priority units

In order to ensure connectivity of the relatively less connected but social priority units, for example, health facilities, educational and training institutions, poor households, the following suggestions are in order:

1. *The Government should allocate block grants and/or the community including LGI should collect resources.*
2. Both the Government (including local government) and NGOs should devote their resources to ensure connectivity of the poor (who can not afford to pay) by organizing income-generation activities for the poor based on skill development and backed by micro-credit mechanism.

Possible roles and coordination among various stakeholders

The extent of coordination between the PBS and other stakeholders is moderate to non-existent. There is virtually no coordination between the PBSs and the NGOs or most of the local government bodies.

In order to enhance RE’s catalytic role for poverty alleviation, various stakeholders, based on their comparative advantages, can perform roles (active or moderate) on the following: identification of poor, organizing poor, motivating poor, assisting poor in skill development for IGA, provisioning micro-credit, disseminating information about RE benefits, assist in procedural matters in getting connections, bill collection, arrange for RE connection in schools, and health facilities etc.

Potential roles of various stakeholders

Roles/activities	PBS (Village Advisor)	NGO	CBO	LGI
1. Identification of poor	Active	Active	Moderate	Active
2. Organizing poor	Moderate	Active	Moderate	Active
3. Motivating poor	Active	Active	Active	Active
4. Dissemination of information about multidimensional benefits of RE	Active	Active	Moderate	Active
5. Assisting poor in skill development		Active		
6. Assisting in IGA		Active		Moderate
7. Provisioning micro-credit		Active		
8. Assisting poor in performing official formalities for RE connection	Active	Active	Active	Active
9. Bill collection	Active	Active	Moderate	
10. Arrange for RE connection to schools	Moderate	Moderate	Active	Active
11. Arrange for RE connection to health facility	Moderate	Moderate		Active

Because of the huge size and gravity of the problem, as well as because of NGOs' comparative advantages in reaching the grassroots, and experience and expertise in addressing poverty, it is suggested that a **pilot project for coordination between the REB/PBSs and NGOs/other institutions be launched aiming at enhancing RE-benefits to the poor including accelerated access of the poor households to electricity**. Such project shall be designed based on the above mentioned approaches by involving the poor at all stages—from design to implementation and monitoring.