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Socio-Economic Impact of Electric Power System in India

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ABSTRACT

This article examines the nuances of the socio-economic transformation brought about by rapid expansion of electric power system in India. Indeed, large scale rural electrification carried out by various state governments in the country proved to be a game changer in terms of improved quality of life, mobility, livelihood opportunities, and access to healthcare, education as well as recreational avenues. However, a large section of population in Indian villages is still reeling under darkness due to lack of electricity or intermittent power supply. This article looks at the current state of socio-economic impact of electric power system and provides perspectives for the way forward.

KEYWORDS*:* Electric Power System, Socio-economic Impact, Quality of Life, India

INTRODUCTION

An electric power system entails a web of electrical modules positioned to supply, transmit and consume electrical energy such as electrical grid comprising generators, transmission systems and distribution system. Starting in 1880s, it has now grown as major industry all over the world. Electricity assumed significance as public service during 1950s and most of the developing countries have now adopted ambitious objective of 'power to all' as part of their respective national policies. Indeed, electric power system has transformed the lives of

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the people in a phenomenal way touching all the aspects of the communities and businesses. There are two broad categories of electric power system viz. residential power system and commercial power system. Considering the significant socio-economic impacts of electric power system, the Government of India and various state governments in the country have made concerted efforts to continuously enhance power generation capacities and streamline the power transmission and distribution systems so that the magnanimous goal of 'power to all' can be accomplished in due course through participation of private players as envisaged in the Electricity Act 2003. In fact, the Electricity Act 2003 has unfettered the power sector from the archaic state regulations such as Electricity Act 1910, Electricity Supply Act 1948 as well as Electricity Regulatory Commission Act 1998. The power sector has received a fresh impetus through National Electricity Policy, rural electrification, open access in transmission, phased open access in distribution, obligatory State Electricity Regulatory Commissions, license free generation and distribution, power trading, compulsory metering and severe punishments for theft of electricity in the reformed ecosystem.

Currently India has total installed power generation capacity of 371977 megawatt out of which 46.9% comes from private sector while contribution of the state governments and the central government are 27.9% and 25.3% respectively [1]. In the last ten years, energy deficit in India has reduced from 9.8% to 0.7% (See Table 1) which a remarkable feat in view of the various constraints plaguing the power sector in the country. However, an array of issues related to power supply such as efficacious pricing, zero outages, uninterrupted transmission among others remain unresolved in spite of corporatization and increased participation of private players in the power sector [2].

Table 1: Power Demand-Supply Matrix

Sl. No.	Year	Peak Demand MW	Peak Met MW	Surplus/ Deficit	
				MW	%
1.	2010-11	1,22,287	1,10,256	-12,031	-9.8
2.	2011-12	1,30,006	1,16,191	-13,815	-10.6
3.	2012-13	1,35,453	1,23,294	-12,159	-9.0
4.	2013-14	1,35,918	1,29,815	-6,103	-4.5
5.	2014-15	1,48,166	1,41,160	-7,006	-4.7
6.	2015-16	1,53,366	1,48,463	-4,903	-3.2

7.	2016-17	1,59,542	1,56,934	-2,608	-1.6
8.	2017-18	1,64,066	1,60,752	-3,314	-2.0
9.	2018-19	1,77,022	1,75,528	-1,494	-0.8
10.	2019-20	1,83,804	1,82,533	-1,271	-0.7

(**Source:** Government of India, Ministry of Power)

Improved electricity supply over a period of time, especially in the rural India, has transformed the lives of people in terms of quality of life, access to resources, livelihood augmentation, income security, access to improved primary healthcare, access to improved primary education, access to media through information and communication technologies and rapid mobility from villages to towns and large cities and vice versa for jobs as well as businesses. Hence it is imperative that the socio-economic impact of electric power system is examined a bit more systematically to take stock of the current scenario and develop perspectives for the future course of action vis-à-vis public policy concerning generation, transmission, and distribution of power as well as issues revolving around pricing, access, and above all, environmental impact.

RELATED WORK

Over a billion rural people in the world and about 200 million people in India do not have access to electricity [3, 4, 5], thus jeopardising their struggle for a better quality of life, livelihood and survival Even the Sustainable Development Goals have focused on access to energy for all as a categorical target to be accomplished by 2030. Already, the Government of India is trying its best to ensure regular power supply in all the villages, towns and cities through an ecosystem conducive for rapid growth of energy sector in the country with greater participation of private players under a strict regulatory regime so that the poor consumers of power do not remain at the receiving end. However, the scenario is not quite encouraging at the ground level. While private distributors of power in the large cities are doing yeoman's service, small cities, towns and villages fail to get adequate power supply.

Although 'power for all' remains an elusive goal today, rural electrification in large parts of the country has started showing signs of positive change in the countryside. Most importantly, power supply in the Indian villages have resulted in a number of non-farm sector income-generating activities such as electric flour mills, make-shift theatres, and other small business enterprises [6]. Further, it has been observed that the commencement

of power supply in three Indian villages led to 20% increase in business activities [7]. Thus, it appears that rural electrification invariably opens up new income generating and direct as well as indirect employment/self-employment opportunities in the villages. Rural electrification creates conducive ecosystem in which hundreds of micro-enterprises might thrive and survive for long time while ensuring decent income for them.

Globally, positive economic impact of rural electrification has been reported. Electrification has often been linked to increase in Gross Domestic Product [8]. At the micro level, power supply in the villages results in increased income generating activities and rapid development of infrastructure with concomitant employment opportunities. For example, 25% of the rural families with power supply ran small enterprises from their homes in Philippines as compared to 15% without electricity connections [9]. In rural Nepal, 54% increase in rural industries was observed after electrification leading to significant enhancement in employment [10]. In rural Zimbabwe, there was an upsurge of 270% in employment after electrification [11]. In rural Indonesia, families with electricity connections demonstrated augmented participation in non-farm sector and there was 43% increase in rural enterprises after their villages got power supply [12].

Further, rural electrification has been linked to quality of life, especially for the females in rural areas. It has been observed that power supply has led to increased usage of electrical devices which in turn has provided a lot of free time for education and recreation [13, 14]. Available free time also leads to enhanced income generation activities in the villages [15]. Also, enhanced income generation activities leads to prosperity which ultimately correlates with improved quality of life.

In terms of social impact, electrification has largely resulted in better health, increased educational opportunities and improved habits, lifestyle and social networks. Many scholars have observed that access to power supply has improved health parameters of the families, especially in rural areas [16, 17]. Use of electricity has helped people reduce indoor air pollution resulting in lesser incidence of lung and eye-related ailments [18]. Earlier, the quality of indoor air used to be worse due to use of kerosene lamps which often caused lung disease and affected their eyes as well. Usage of electricity has also improved the indoor air

quality of premises hosting rural industries [10]. Moreover, machines operated by electricity contribute towards reduced noise levels, dust and smoke in the rural industrial hubs which invariably results in improved health and wellness among the workers [19]. Furthermore, power supply in the villages has led to increased use of water pumps thereby ensuring clean potable water which in turn has resulted in reduced incidence of water-borne diseases [20, 10, 15]. Power supply in the villages has also resulted in improved primary healthcare services [21, 22, 23].

Power supply has dramatically transformed the rural education. A number of studies have found definite linkage between power supply and improvement in literacy rate and schooling. In Indian context, a study conducted in Uttar Pradesh and Madhya Pradesh, the two densely populated states, reported significant increase the literacy rate as a result of rural electrification [24]. In yet another study conducted in rural Assam, 0.17 point increase in the percentage of literate people with every 0.1 point increase in access to power supply was reported [25]. It was also projected that literacy rate in Assam would rise from 63.3% to 74.4% in case all the villages in the state get power supply while all other factors remain the same [25]. Globally, power supply in villages has been linked to augmented educational opportunities and outcomes in terms of significant improvements in literacy rate, enrolment of female students, study time, and educational infrastructure [13, 14, 15, 22, 26, 27].

Power supply in the villages has been followed by remarkable changes in daily habits of the people and their interaction within the families and the communities. Rural electrification has amplified the extent of free time [7, 28] which people are using for studies, pleasure readings, recreation and religious as well as community development activities [29, 30]. Such leisure time interactions have also strengthened social ties among people in the villages with steady power supply [28]. Also, the rural electrification has resulted in increased interaction with the outside world [21]. More and more people are now connecting with people in other villages and towns or cities in connection with business opportunities, sharing of ideas, and working together on matters of common concerns. This, in turn, enhances people's socio-political awareness and their abilities to get involved in community development initiatives as well as social and political action.

However, there is a contrary point of view as well. Critics have observed that the role of electric power system in improving socio-economic status of people has been overemphasised. It has been found that mere access to power supply does not automatically lead to spurt in economic activities in the villages [31]. Several researches [14, 32, 33] have indicated that power supply must be coupled with an enabling ecosystem at the village level so as to augment educational opportunities, entrepreneurial ventures and income-generating livelihood projects. Indeed, the subtleties of rural development and rural electrification have multiple underlying elements which must be considered while looking at the socio-economic impact of electric power system [14, 28]. Furthermore, it has also been observed that extent of the impact of power supply and consumption is by and large contextual and hence broad conclusions regarding socio-economic impact of electric power system cannot be drawn [34].

FINDINGS AND DISCUSSION

It appears from the integrated review of literature that electricity is crucial for overall improvements in the quality of life of the people both in urban and rural areas. As most of the urban areas across the world already have steady power supply, the focus now is on rural electrification and its socio-economic impacts. It has been observed that power supply in the villages lead to enhanced livelihood and income generating activities as well as improvement in governance and infrastructure development which is imbued with indirect job creation in the villages post electrification (see Table 2). Already, the governments of almost all the countries of the world have committed themselves to the promise of ensuring power for all by 2030 under the Sustainable Development Goals. While the Government of India has missed several deadlines to ensure rural electrification in all the villages of the country in last 70 years, it is likely that the flagship program of the Ministry of Power, Government of India i.e. *Deen Dayal Upadhyay Gram Jyoti Yojana* may accomplish total rural electrification within the stipulated timelines due to improved reporting and monitoring mechanisms.

Table 2: Economic Impact of Rural Electrification

Sl. No.	Livelihood and Income Augmentation	Improvement in Governance and Infrastructure Development
1.	New avenues of employment: electricians, plumbers, mechanics for electrical gadgets	Improved access to public services through local offices
2.	New avenues of income generating activities: electrical electric repair shops	Improved communication between the government officials and the communities
3.	New avenues of rural enterprises: cold chains, small movie theatres, food processing units, flour mills, oil mills, sawing mills	Increased participation of people in local self-governance
4.	Indirect job creation through rapid development of rural infrastructure/communication networks	Increased influence of local communities in decision making vis-à-vis issues related to governance and infrastructure development

[**Source:** By Author]

Apart from economic impact of rural electrification which enhances prosperity in the village communities by way of income generating activities as well as direct and indirect job creation, various benefits on account of health and wellness, educational opportunities and recreation and socialization have also been observed (see Table 3). Improved quality of life in the villages is the pooled effects of both the economic and social benefits accruing from rural electrification. Further improvement in quality of life in villages is possible through steady power supply which is still a major issue in the country. It also provides an opportunity to the community leaders to supplement the energy requirement through alternate means such as small solar roof-top power plants for which the state subsidies are also available.

Table 3: Social Impact of Rural Electrification

Health and Wellness	Educational Opportunities	Recreation and Socialization
Improved Primary Healthcare: emergency care, child birth	Increased time for studies due to adequate lighting in the evenings	Increased access to television and radio in the family or community
Retention of qualified healthcare workers	Retention of qualified teachers	Increased socialization and interaction within and outside the communities
Increased participation in	Expanded adult education	Increased free time for

wellness activities/exercises	and pleasure reading opportunities	community service activities

[Source: By Author]

However, there are certain social costs involved in creating infrastructure for power supply. Power stations often result into large scale displacement, loss of livelihoods, permanent loss of farmlands, and loss of eco diversity. Besides, photovoltaic technology of power generation leads to toxicity. Nuclear power stations have their own typical hazards. Hence the government needs to promote unconventional sources of energy like solar power plants and windmills which have relatively lower social costs of productions, transmission and distribution of power. Hence, instead of rural electrification through conventional means, the government should focus on promoting grid-connected roof-top solar plants in a big way for more visible results on the ground.

CONCLUSION

This study clearly indicates that the rural electrification leads to remarkable improvements in economic as well as social indicators vis-a-vis quality of life in the villages in terms of improved income generating activities, expansion of employment opportunities, rapid development of rural infrastructure, better governance, improved health and wellness, enhanced educational opportunities and expanded socialization and community service opportunities. Thus, electrification facilitates an enabling ecosystem for economic growth and development while promoting social ties and augmented community development activities. Rural electrification consistently increases free time both at home and farm or non-farm enterprises which the people use for self-improvement, pursuing their hobbies, getting involved in community service or supplementing their income through some part-time job as per their competencies. Thus steady power supply in the villages creates direct and indirect socio-economic value in equal measures. A number of villages have leveraged the power supply advantage to enhance prosperity of the entire community by means of people's initiatives instead of waiting for the state support and subsidies.

However, a large number of Indian villages do not access to electricity as yet. Besides, power supply in villages having electrification is not steady. As a result, such villages are not

able to leverage the socio-economic benefits that might accrue from rural electrification. Hence, it is imperative for the government both at the centre and the states to make a time-bound program for rural electrification in all the left-out the villages so that the country accomplishes holistic development of the entire nation. Furthermore, considering the lesser social costs of renewal energy, the government needs to promoter solar power plants and wind mills in order to bridge the energy deficit gaps. There are enough evidences to support the point that socio-economic impacts of solar and wind energy are same as that of the conventional energy.

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