

ALLEVIATING ENERGY POVERTY THROUGH INNOVATION: THE CASE OF JYOTIGRAM YOJANA (RURAL LIGHTING SCHEME) OF GUJARAT

Pramod K Mishra

Introduction

Access to electricity is an important instrument for alleviating energy poverty and bringing about inclusive growth in developing countries. In India 81 percent of the villages are electrified. However, there is a wide variation across States – 31 percent in Jharkhand to 100 percent in Haryana. Further, electrification of a village does not ensure that all the people have access to electricity. According to the Government of India's definition of village electrification, a village would be declared as electrified if electricity is provided to public places like schools, *panchayat* offices, health centres, dispensaries, community centres etc. and the number of households electrified is at least 10 percent of the total number of households in the village.¹ In other words, a village can be declared to have been electrified, even if a majority of the households does not have access to electricity. According to available data, the extent of electrification of households in India in 2007 was 55.5 percent which was much lower than in many Asian countries. There are two other aspects that adversely affect access to electricity. First, the households that have electricity connection may have supply of electricity only for a few hours in a day due to inadequate and erratic supply. Second, some households may not like to avail of electric connection because of such poor delivery of electricity. There are, of course, others who cannot afford electricity.

Thus village electrification and even electrification of households do not necessarily ensure access to electricity. For example, even in a relatively more developed State like Gujarat though most of the villages are electrified, availability of electricity in rural areas was inadequate, uncertain and erratic. This was for several reasons. Supply of electricity through rural feeders was for a few hours ranging from 8 to 14 hours. There were interruptions and instability. The quality was poor in terms of voltage profile and other parameters. Thus, even though the villages were 'electrified', actual access to electricity was extremely limited. In other words, there was energy poverty even though most villages had been electrified, and the people were relatively better-off in comparison to those in many other States.

This paper analyzes how the above problems could be addressed in the Indian State of Gujarat through a simple but innovative approach, because of the vision, political will and determination of the democratically elected government, and project implementation capability of the tecno-administrative structure.

Backdrop

Gujarat is one of the more progressive and developed States in the country. It has a population of 56 million and an area of about 196,000 sq. kms. The per capita net State Domestic Products (at current prices) in 2007-08 was Rs. 45,773 as compared to per capita net national product of Rs 33,283 for the country [Government of Gujarat 2009, p. 95]. The per capita consumption of electricity in 2007-08 was 1486 kWh as compared to 717 kWh for the country. It has a literacy rate (according to the census of 2001) of 69 percent as compared to 65 percent for the country. The contribution of agriculture to the State Domestic Products is 18 percent, but about 52 percent of the workforce depends

on agriculture for their livelihood. Gujarat is one of the more urbanized States in the country with an urban population of 38 percent; the remaining population of 62 percent lives in rural areas. Thus, the role of rural economy and access to electricity for the rural people are extremely critical to socio-economic well-being of the people.

Though Gujarat had two private power utilities, namely, the Surat Electricity Company Ltd. and the Ahmedabad Electricity Company Ltd. from the pre-independence days, the Gujarat Electricity Board (GEB), created after the formation of the Gujarat State, was the main player in the electricity sector. It undertook generation, transmission and distribution of electricity. In the 1990s Independent Power Producers (IPPs) emerged in the power sector. The Gujarat Electricity Regulatory Commission started functioning from April 1999. During the later part of the 1990s efforts were made to restructure the Gujarat Electricity Board. By April 2005 the GEB was unbundled into seven separate companies: one each for generation and transmission, four distribution companies and a holding company - the Gujarat Urja Vikas Nigam Ltd. (GUVNL). The holding company functions as planning and coordinating agency in the sector. In recent years, the power sector has been transformed. It has shown improvement in terms of both technical and financial parameters. The role of private sector has also become more significant. In this context, an innovative and path-breaking approach to the electricity distribution system for villages has brought about a sea change in the rural electrification scenario and in providing access to electricity for the rural people.

In Gujarat, as mentioned earlier, even though almost all villages are electrified, majority of households did not have adequate access to electricity. Even those who had electric connection did not have access to electricity for a large part of the day because of

non-availability of power supply. In fact, till 2003 power supply to villages was for a limited number of hours ranging from 8 to 12 hours, in some cases even less. This was because a common feeder catered to different types of use of electricity: residential, agricultural, industrial and commercial. As it was not feasible to supply electricity throughout the day for the purpose of agriculture – that accounted for about one-third of the total supply from the utilities - the power supply was limited to a few hours. Even during these hours, there were interruptions. Consequently, power supply for domestic, commercial and industrial uses was irregular, inadequate and unpredictable.

The above situation resulted in unauthorized use of power through illegal means. The quality of power supply deteriorated on account of (a) frequent failure of transformers (b) wide and frequent voltage fluctuation (c) grid disturbance and (d) low reliability of power supply.

Another aspect is that most of the agricultural connections are not metered. Payment for supply of electricity is based on what is commonly known as 'horse power tariff'. A consumer pays a fixed amount based on the capacity of his electric pump in terms of horse power. This not only results in excessive use of electricity, but also underreporting of the capacity of pump which leads to excess demand and unmanageable demand-supply gap. Furthermore, there is no accurate measurement of energy supplied for different purposes through rural feeders because most of the agricultural connections are not metered. Consequently, even energy units pertaining to irregular and illegal use of electricity for purposes other than agriculture could be accounted for as agricultural consumption. The transmission and distribution losses would not be accurately estimated resulting in loss of revenue to utilities. It is in

this context that the *Jyotigram Yojana* (JGY) – the Rural Lighting Scheme – was introduced.

The design of the scheme and its implementation

The basic approach of the scheme is that the load for agriculture purpose is segregated from that for other uses such as residential, industrial and commercial. Agricultural feeders continue to cater to the demand for irrigation; whereas the new Jyotigram feeders were laid to cater 3-phase power supply for 24 hours for the purpose of residential, commercial and industrial use. There is metering of transformers of JGY feeders. The JGY feeders cater to the village site or residential part of the village. Some farmers reside in farm houses. Agricultural feeders give power supply for 8 hours. For the remaining part of the day there is no power supply to the farms, and consequently to the farm-houses. In order to address this problem, the engineers of the distribution utilities designed special transformers to be installed on agricultural feeders for providing 1-phase power supply to farmers residing in their farms for the period when there is no power supply to agriculture. This was a remarkable innovation.

The *Jyotigram Yojana* (JGY) was launched in September 2003 on a pilot basis. It was introduced as a Government–local body participatory scheme, but largely funded through government grant. The pilot scheme covering eight districts which have large agriculture demand was successfully completed in October 2004. The scheme was later extended to other villages. By March 2006 it was implemented throughout the state covering over 18000 villages and about 9700 hamlets. The total expenditure on the scheme was Rs. 1100 crores (Rs 11 billion or US \$ 0.25 billion).

The JGY involved erection of 1.6 million electric poles, installation of 15,500 transformers and laying down of 75,000 kms. of electric lines. This was implemented in two and a half years from October 2004 to March 2006.

Expected outcomes and benefits

Prior to the JGY, there was 8-14 hours of 3-phase power supply, 10-12 hours of 1-phase power supply and 3-4 hours no power supply in rural areas. There were frequent interruptions even during the period when the utility was expected to supply power to agriculture. There was irregular use of power and illegal conversion from 1-phase to 3-phase use in several cases. After the JGY, there was 24 hours 3-phase supply through JGY feeders and 8 hours 3-phase continuous supply through agricultural feeders. The following are some of the expected benefits.

- Improved quality of power supply.
- Less interruption and more stable power supply both to agriculture and other consumers.
- Households would be able to use electrical appliances (some relief from drudgery to housewives).
- Scope for development of cottage and small-scale industries.
- Scope for improvement of better health, education, information technology and other infrastructure facilities in rural areas.
- Less migration from rural to urban areas.
- Better energy accounting and reduction in loss to utilities.

The scheme has tremendous implications for social and economic well-being of people in rural areas. It facilitates more balanced and stable

power supply to agriculture. Earlier, power supply to agriculture ranged from 8 to 14 hours, but it was erratic and inequitable. Some areas could get it for longer hours and others for less, but in all cases it was unreliable with frequent interruptions. After the JGY, it is feasible to provide for agricultural purpose more reliable power for 8 hours to all areas. Of course, in the event of a long dry spell that can result in damage to crops, efforts are made – as during the monsoon season of 2009 - to provide power to agriculture even for longer hours.

The JGY can have a significant impact on non-agricultural and social sectors. Access to electricity for households can improve their social well-being in terms of education, health and day-to-day social life. Students could be able to study better because of domestic lighting, particularly during evening peak hours. Health facilities, wherever available, can provide better quality of services. Commercial and industrial activities can improve employment opportunities and income. There is tremendous potential for development of the rural non-farm sector which is extremely important for augmenting and stabilising income of farmers in rural areas. It is well known that the agriculture sector has limited scope to provide increased employment opportunities and income in rural areas. There is a need to develop the rural non-farm sector for increasing income, ensuring more stable income for those depending on agriculture for their livelihood and reducing poverty. The JGY has opened up new opportunities for development of the rural non-farm sector.

Assessment of the impact

An important question is whether the intended benefits have actually accrued and the impact of the JGY is significant. Though the scheme has been

implemented for three years, there does not seem to have been any comprehensive evaluation till date. However, field experiences indicate that in several villages there has been significant increase in the number of consumers of electricity, in the use of electricity for commercial and industrial purposes, and also in the total quantum of electricity used. In some villages, the number of consumers increased by 30 to 50 percent after the introduction of the JGY. Distribution loss in respect of JGY feeders is still very high in many cases, but the overall transmission and distribution (T &D) loss has declined.

The Indian Institute of Management, Ahmedabad has commenced a study for assessing the impact of the JGY and also to estimate the benefits. The study is based on four sample surveys: a household sample of 6000 units, an agriculture sample of 1997 units, a small-industries sample of 1980 units and a village sample of 490 units. The preliminary results show that there has been improvement in terms of duration of electricity, voltage profile, response of utilities to complaints, reduction in breakdown of electrical equipments and a positive impact on operation of enterprises. For example, among the sample of households 38 percent reported 24 x 7 hours supply of electricity, 24 percent between 12 and 14 hours of supply and 35 percent between 8 and 12 hours of supply. About 4 percent reported less than 8 hours of supply. No doubt all the households do not have 24 hours of supply; but the present situation is certainly better than what it was before the JGY and also the all-India average. A majority of the sample households reported that there was improvement in the voltage profile; over 36 percent responded that there was distinct and substantial improvement. Thus, there is no doubt, according to the study, that with the implementation of the JGY,

the quality of electricity supply and voltage profile has improved significantly. Over 75 percent of the sample units reported 'significantly less' or 'very much less' breakdown of electrical equipments. The study also brings out that there has been substantial positive impact on the operations of enterprises after the JGY. Only about 20 percent of the sample units showed no improvement or negative improvement whereas 5.5 percent claimed marginal improvement. It is important to note that 24 percent said that their output improved 'significantly' or 'substantially' as a result of improvement in power supply brought about by JGY and associated activities.

Vision and political will

The JGY is based on a simple principle of segregating agriculture load from the other load. Basically, the approach is to have separate electric feeders for agriculture and other purposes. An interesting question is: why was such an apparently simple approach not adopted earlier? Several measures have been taken for rural electrification for over half a century after independence. There have indeed been discussions and deliberations to have separate feeders for agriculture. It was contended both by technical and financial experts that such segregation would not be feasible nor viable. Even when a suggestion – in fact a decision- came from the political leadership to introduce the separation of feeders, there was intense debate at the level of the then GEB and the relevant departments of the Government. After months of deliberations, the GEB was persuaded to take up a pilot project. The functionaries concerned started the pilot project with hesitation and apprehension regarding technical and financial implications. A number of problems and issues did emerge. Efforts were made to address

those issues, which could be done successfully because there was political will, clarity of objective and a vision – the welfare of the rural people and their support.

The rest is history. The scheme became so successful that the Planning Commission and Government of India advised other states to adopt and replicate the experience. This a remarkable example of political will and government's commitment to innovation and to introduce simple but new ideas which have far-reaching social, political and economic impact. It was primarily because of the decisiveness of the Chief Minister. It was in a way due to out-of-the-box thinking and an instinctual perspective of its impact – both economic and political – on the vast majority of rural population. In a democracy political, social and economic objectives can converge to bring about path-breaking innovation in improving infrastructure, governance and delivery of services enhancing well-being of the people who are more vulnerable and deprived.

Concluding remarks

Access to electricity - which is an important instrument to eliminate energy poverty in rural areas of developing countries - remains a challenge even in relatively more developed States of India. In spite of rural electrification schemes, people – including those who can afford, though many others cannot – in numerous villages do not have access to electricity, because of inadequate and erratic power supply. The *Jyotigram Yojana* (Rural Lighting Scheme) of Gujarat implemented during 2004-06 transformed the rural electricity distribution scenario bringing about immense opportunities for socio-economic development. It shows how vision and political will can transcend the boundaries of technical and financial expertise and systemic rigidities, and facilitate

successful adoption of simple but innovative approaches for alleviation of energy poverty and bringing about socio-economic development. This experience is relevant not only to other States of the India but also to many developing countries.

References

Government of Gujarat, Directorate of Economics and Statistics, 2008, *Socio-Economic Review of Gujarat State 2008-09*, Gandhinagar.

Government of India, Ministry of Agriculture, 2008, *Agricultural Statistics at a Glance 2008*, New Delhi.

Government of India, Ministry of Finance, *Economic Survey 2008-2009*, New Delhi.

Government of India, Ministry of Power, Central Electricity Authority, 2009, *All India Electricity Statistics 2009*, New Delhi.

Gujarat Urja Vikash Nigam Ltd. (GUVNL), Reports and presentations

Indian Institute of Management, Draft chapters of the ongoing study report on JGY

Joshi, R. M., 2008, 'gujarat electricity board's turnaround', *The Smart Manager*.

ⁱ Government of India (2009), p.179
