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BRIEF NOTE ON

RURAL ELECTRIFICATION IN RAJASTHAN: STATUS, ISSUES AND CHALLENGES

BACKGROUND

As per Census 2011, around 75 percent of the total population of Rajasthan still resides in rural areas. Hence, ensuring an inclusive economic growth and social development in rural areas is quintessential to ensure high rate of growth and development at the state level. In order to make the process of rural development less dependent on successful implementation of government policies on the ground and empower the citizens to take up the cause themselves (Bottom Up Approach), there is a need to ensure that social development is accompanied by economic development of the rural population.

A self-sustained process of economic development requires the rural populace to have a set of employable skills, equal opportunities and easy access to the market along with an initial push by the government. For instance, the Government of Rajasthan has given an initial push to the small and medium scale industries by simplifying regulatory procedures and providing various financial incentives to encourage setting up of such industries. However, for a small scale industry or even a small retail shop in rural areas of Rajasthan to be financially sustainable, it would need inputs like access to reliable source of electricity and a well-trained labour force to undertake various manufacturing and marketing processes; as well as easy access to market to sell the manufactured goods to consumers. While the initial push by the government in the form of various incentives is necessary for setting up of such enterprises in rural areas, their efficient functioning can only be ensured in the presence of a favourable ecosystem around it, of which access to affordable and reliable energy is a critical part.

The importance of ensuring access to affordable, reliable, sustainable and modern energy for all has been confirmed by its inclusion as goal number 7 in the recently formulated Sustainable Development Goals (SDGs), which aim to end poverty, fight inequality and injustice, and tackle climate change by 2030. The progress report of the state under Deen Dayal Upadhyay Gram Jyoti Yojana (DDUGJY) estimates the level of village electrification in Rajasthan to be around 99.3 percent. However, at the household level, as on 30th April 2016, approximately 24.65 lakhs rural households i.e. around 30 percent of the total rural households in the state lack access to electricity and have to rely on subsidised kerosene as their primary source of lighting. [1] Given that kerosene is not only relatively more expensive than other energy sources but is also more polluting, there is a strong case for diverting the subsidies on kerosene to cleaner sources of energy. The above mentioned gap in the level of village and household electrification level is due to the definition adopted by the Ministry of Power, as per which the village is considered electrified if at least 10 percent of its households has access to electricity. Moreover, a majority i.e. around 53 percent of the un-

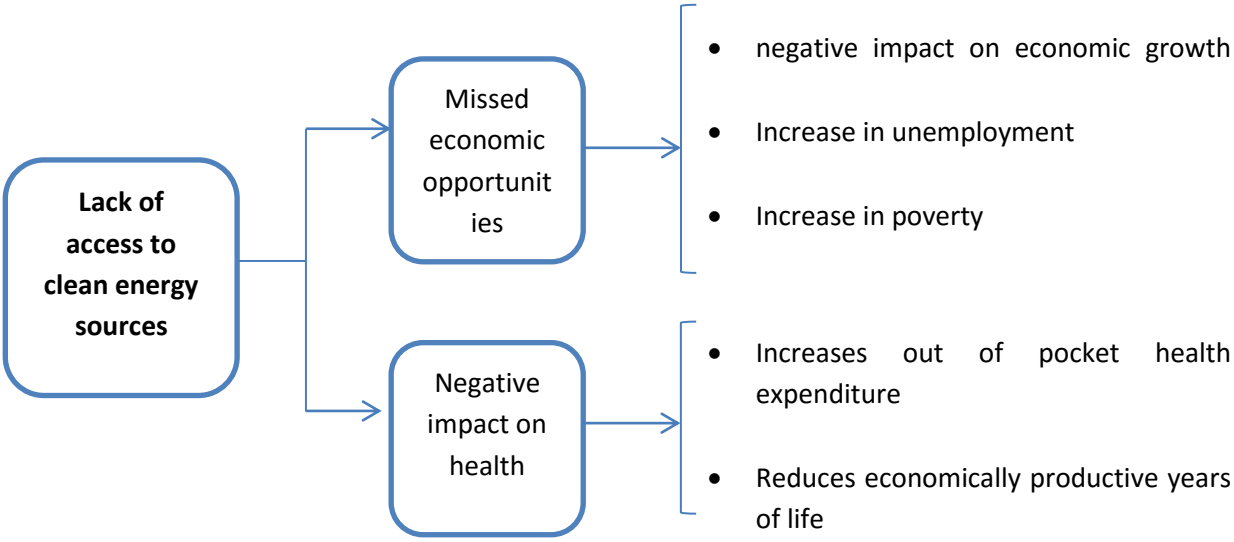
[1] Status of Rural Electrification in Rajasthan;
http://www.ddugjy.gov.in/mis/portal/state_wise_summary1.jsp?stateCode=08

electrified villages in Rajasthan are located within Jaisalmer, Udaipur and Jodhpur districts, all of which are rich in renewable energy (RE) resources.

Given the significance of ensuring electricity access to each household, the Central Government now aims to electrify 100 percent of the rural households. Yet, the recently launched Grameen Vidyutikaran (GARV) dashboard and mobile app still uses the old definition of village electrification and reports the number of un-electrified villages in Rajasthan as 479, which is almost twice the number mentioned as per the DDUGJY progress report. While the expedited work towards rural electrification undertaken by the Central Government in partnership with the State Governments under Deen DDUGJY as well as appointments of Gram Vidyut Abhiyantas (GVAs) to monitor progress on the same are welcome steps, there is also a need to do away with data discrepancies to ensure effective implementation.

Further, various evaluation reports of the Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY) point at the poor quality of supply in the rural areas of Rajasthan with a majority of the population getting only 7-9 hours of electricity supply in a day and with 0.5-2 hours of supply in the evening peak hours.[2] Further, as per the report of the National Sample Survey Organisation (NSSO), around 89 percent of rural Rajasthan uses firewood and chips as a primary fuel for cooking, which not only increases air pollution and green-house gas emissions but also has huge negative impacts on the health of women and children (Refer to Figure I).[3] An open fire using firewood and chips in the kitchen is said to be equivalent to burning 400 cigarettes an hour. In 2012 there were close to 1.7 million premature deaths attributed to indoor air pollution from cooking in the South East Asia region with India shouldering the biggest burden.[4]

Figure 1: Implication of lack of access to clean energy sources in rural areas



[2] Final Report on Evaluation of RGGVY in Rajasthan, Assam, Gujarat, Himachal Pradesh and Uttar Pradesh, IRADe; http://www.ddugjy.gov.in/mis/portal/evaluation/IRADe_Combined_Executive_Summary.pdf
[3] http://timesofindia.indiatimes.com/india/89-rural-Rajasthan-uses-firewood-2nd-highest-in-country-Report/articleshow/48470756.cms
[4] http://www.who.int/features/2014/clean-household-energy/en/

Although the negative impact of lack of reliable and affordable clean energy access has been widely recognised and the government has been making efforts towards ensuring 100% rural electrification, there is a need to upscale the existing efforts to achieve the desired results. The limited progress achieved in enhancing rural energy access using conventional energy sources is due to various reasons, most of which can be resolved if RE is used as a source for energy production:-

Issues faced in electrifying rural areas with conventional energy sources		Resolution using RE sources for rural electrification
Technical	• High cost of providing grid connection to remote rural locations • High maintenance of physical infrastructure	• Stand-alone systems: hence, eliminates the need for grid extension • Basic maintenance required
Commercial	• High cost of laying infrastructure results in high electricity tariffs • Poor quality of service given inadequate availability of energy sources • High cost of transportation of coal from coal rich states like Chhattisgarh contributes to 50 percent of the cost of energy production	• With declining average bids in the solar sector from Rs 6.8/kwh in 2014 to Rs 5.6/kwh in 2015 to Rs 4.34/kwh in 2016, solar has become competitive with coal-based electricity. Moreover, with increasing coal cess and new environmental norms for coal-fired power plants, cost of electricity produced from conventional sources is expected to increase by a minimum of 40-50 paisa per unit in the near future. • Provides good quality power since renewable sources are available in plenty • Saves the cost of transportation of raw material as energy production and consumption happens at the same place
Social	• Increasing instances of electricity theft, which is not considered a crime by a majority of rural population • Increasing instances of non-payment of electricity bills	• With stand-alone solar home systems, electricity theft is not possible • Once installed, no need to pay monthly charges for electricity

Apart from providing a source for home lighting and cooking, cleaner sources of energy can also be used to provide electricity needed for irrigation purposes by the farmers. Over 60 percent of the state's population depends for livelihood on agriculture or horticulture, which is often marred by low productivity due to unreliable, inadequate or non-availability of irrigation. About 70 per cent irrigation is done through wells or tube-wells energised mainly by grid-power or diesel generators. In the absence of grid extension to remote locations and given the long waiting queue of getting a new electricity connection for agricultural farms, farmers often suffer huge crop losses, which also has a larger implication on the national food security.

Given this backdrop, use of solar pump sets for irrigation will not only resolve the existing issue of long waiting queues for new electricity connections and limitations attached with grid extensions to remote locations, it will also provide an environmental friendly alternative to conventional diesel pump sets. Although the Government of Rajasthan is already implementing a solar water pump scheme, which has scaled up its target of installing a mere 50 solar pumps in 2010-11 to 10,000 in 2013-14; there is a need to further increase the number of these installations and explore innovative

ways to reduce the subsidy component on each pump set in order to reduce the financial burden on the government.

Although energy production from RE sources provides a resolution to the above mentioned issues, the large scale deployment of RE sources currently faces the following major hurdles:-

- **High upfront cost of installation of RE**- While the operational cost is negligible, there is a huge upfront capital cost associated with installation of RE systems. Hence, the lack of possession and access to finances by a majority of the population residing in rural areas may come in the way of large scale deployment of RE in rural areas.
- **Lack of proper after sales services**- As service centres are located close to urban markets, it is not feasible for the rural populace to travel long distances to get the RE appliances repaired. This often results in RE appliances lying unused for a majority of their useful lives.
- **Lack of public awareness on economic feasibility of RE products**- While the stand-alone as well as grid connected RE sources are increasingly becoming more competitive to the conventional sources of energy production, there is a general lack of awareness about this fact amongst the rural population, who still consider the energy production from RE sources not affordable.
- **Lack of availability of vast areas of land for installation**- As compared to other states in India, Rajasthan has vast expanse of uninhabited land that can be used for installation of RE plants. The Government of Rajasthan has also provided government-owned land for development of large scale solar parks. However, there is still a need to ease administrative procedures as well as ensure seamless handing over of land from government to project implementing agency to ensure effective implementation of RE projects.

Rajasthan has a natural advantage in harnessing RE resources for energy production given its geographical location. Hence, the state is in a leading position to overcome the above mentioned hurdles and set successful examples that can later be followed by other states in the country.

PROMOTION OF RENEWABLE RESOURCES IN RAJASTHAN: SOLUTIONS

Following are some of the ways in which the state can overcome these hurdles and promote RE as a means to enhance energy access in rural areas.

Major hurdles in using RE as source of energy production in rural areas	Possible solutions	Expected consequences
High upfront capital cost	• Leveraging existing schemes like Jan Dhan Yojana to strengthen linkages of rural population with financial institutions • Diverting subsidies from energy inefficient and polluting fuel resources like kerosene and diesel to RE resources • Increasing level of financial literacy of rural population through bank mitras	• Strengthened financial linkages and enhanced financial access in rural areas • Optimal utilisation of state's funds

	• Using community financing and self-help group models to finance purchase of RE products • Utilising MPLAD and MLA fund to set up the required infrastructure • Increasing awareness about available financial schemes through advertisements in radio and television • Developing mechanisms to allow for sale of surplus electricity to ensure a high rate of return to consumers	
Lack of proper after sales services	• Providing basic skills to users of appliances to enable them to do minor repairs themselves • Providing advanced skills to rural labour force to set up retail and servicing stations in rural areas	• Increase in the number of skilled manpower • Increased employment levels in rural areas • Emergence of new job opportunities • Longer hours of operation of earlier businesses that had to shut down in the evening hours due to lack of electricity
Lack of public awareness	• Increase awareness on lifecycle cost of RE, which is much lower than that of electricity produced from using coal • Increasing awareness about RE products and their suitability for rural households through radio, TV advertisements, pamphlets, bank mitras etc.	• Increase in rural access to quality electricity supply

CONCLUSION AND ISSUES FOR DISCUSSION

The adoption of RE as a source of energy in rural areas will not only empower the rural population by enhancing their access to quality energy but will also provide them with additional direct and indirect employment opportunities. The achievement of the **175GW RE target by 2022 is expected to generate more than 1 million full time and many part time jobs by 2022** at the national level.[5] With Rajasthan being one of the leading states in RE deployment, the state is expected to reap a considerable part of this benefit.

[5] https://www.nrdc.org/experts/anjali-jaiswal/indias-100-gw-solar-target-could-create-1-million-jobs-2022

The technological innovations, large scale production and hence, reduced cost of production as well as expanding market of the RE products over the last decade and a half has given new hopes of enhancing rural energy access. The methods of distributed and decentralised generation (DDG) of electricity, and mini and micro grids have the potential to provide solutions to some of the above mentioned problems including the high cost of connecting remote locations to the grid and the inadequate supply of power. While DDG comprises stand-alone home lighting and heating systems and pumps for irrigation, and other appliances, mini grid, in a way is a replication of the conventional grid at a community level, although powered by renewable energy sources. While the former has already witnessed a certain level of success in terms of scale of adoption in rural areas, the technical and commercial feasibility of the latter is still being debated for adoption in rural areas.

Given this backdrop, following are some of the emerging points of discussion with regards to deployment of RE sources in rural areas:-

- How is the ratio of grid to off grid-based electricity connections in rural areas envisaged to change in the next 5-7 years?
- Appropriateness of DDG for rural electrification - Is it just a temporary solution?
- Is the incremental demand in rural areas expected to surpass the capacity of stand-alone RE home systems?
- What are the challenges faced in installation, operation and maintenance of mini and micro grids in rural areas?
- Impact on cost and quality of electricity supply under DDG vis-à-vis mini/micro grids?
- What is the envisaged increase in economic activities in rural areas with access to quality and reliable energy?
- Are the RE sources of power suitable for irrigation purposes? What are its implications on cost, usage and level of ground water?
- What are the concerns related to after sales service for RE products?

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