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Policy brief on Off Grid Energy Access Systems

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Abstract: Access to energy services is essential to fulfill the basic necessities of life, along with economic growth and human development. The statistics on access to electricity in India stand at 66.3%, leaving one third of the population, or 403.7 million people without electricity. This is less than the global average of about 73%. Access to electricity provides direct and indirect social and economic benefits to the communities, which can be met through off grid or decentralized energy access systems which reach out to those areas where grid electricity is inaccessible or has not yet arrived. These off grid systems use renewable or hybrid energy sources which emit less or no emissions. In today's world where emissions are a major cause for global warming, renewable energy sources must be explored to their full potential in India, where solar and wind energy hold great potential. Unfortunately, due to lack of systems in place to promote the off grid energy sector, it is delimited with regulatory, financial, institutional and technical issues which need urgent hearing. We have made an attempt to look into these issues and their solutions through extensive research and discussions with other concerned stakeholders.

Keywords: Policy Brief; Micro grids; Off grid energy access

INTRODUCTION

India is a country where fuel wood or other biomass oriented fuels have traditionally supported people's requirements, and kerosene has slowly penetrated their lives and is used extensively[29]. Due to the adverse effects of such fuels on people's health and the environment, a need for clean energy has emerged. There are about 18,000 villages which are yet to be grid connected, accounting to one third of the Indian population, compelling them to rely on unclean fuels[5]. Off grid energy access systems are an attempt to reduce reliance on unclean fuels and help communities have a better standard of living. Energy itself is a derived-demand[1] where the want is for energy services such as lighting, heating, pumping, transport, etc[11]. Energy access is an issue which has gained enormous importance and various government and non-government institutions have attempted to deal with the matter through projects in remote areas. Over the years various technical, institutional, financial and regulation related concerns in the sector have come forth, requiring immediate attention[23][24]. There is a lack of suitable policy frameworks and technologies used in the sector[13]. Many marginalized pay more than the better off due to inefficient technologies and lack of standardization of monitoring systems followed. Since the major objective of these projects is to meet the needs of the communities while providing them clean alternatives, a people centered approach must be followed where there is reach beyond technical issues and people's needs are a priority; hence meeting the Millennium Development Goal of an inclusive growth[22].

REGULATION

The regulatory arrangement for governing off grid or decentralized electrification in India has received very little attention. The existing system is less organized which impedes the growth of the off grid sector and requires several amendments to fill the gaps that exist[28][29]. Development of appropriate business models, which are location specific and take into account the local needs is extremely essential for any off grid project to sustain. Unfortunately these business models are not given as much consideration by the implementing agencies as required. In most of the cases a successful project is reproduced without much reflection on adaptation, increasing its likelihood for failure[21]. The tool of regulation can play a key role in building a system which can address these issues. The electricity act is one such regulatory legal arrangement which helps in monitoring monopoly and prevents consumer exploitation. The regulation also helps control business activities, states conditions to supply, maintains activities requiring prior approval, lists tariff related provisions and ensures consumer protection[16]. However, in order for these provisions to be implemented appropriately, there is a need to build the capacities of the service providers as well

[1] *Derived demand is a term in economics, where demand for one good or service occurs as a result of the demand for another intermediate/final good or service. This may occur as the former is a part of production of the second.*

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as the regulators. There is also a lack of integration between various policy making bodies, such as Ministry of Power (MoP), Central Electricity Authority (CEA) and Ministry of New and Renewable Energy (MNRE). Finally, lack of a legal acknowledgement of off grid energy generation is another setback which may hamper its growth[5][11][28].

IN THE ABSENCE OF NEW POLICIES, THE NUMBER OF PEOPLE AROUND THE GLOBE RELYING ON BIOMASS WILL INCREASE TO OVER 2.6 BILLION BY 2015 AND TO 2.7 BILLION BY 2030 (ONE THIRD POPULATION) BECAUSE OF POPULATION GROWTH[17].

EXPANSION

Due to the large number of areas facing problems of access to energy, there is a need for the expansion of decentralized energy systems. However, this extension is not free from complications[5][3]. Ambiguity in demarcation of areas covered under direct connections and those requiring off grid access hinders the outreach of such projects. The standards followed by the off grid systems may be different from that of the grid, which often cause problems in embedding these systems into the main grid[6]. These differences exist due to the variation in duration of supply by these decentralized systems, which are usually for a short period of time, amongst other technical reasons. Maintaining reliable supply even with increased demand in the future is an issue that most off grid access systems face. In order to meet this demand, there is the need for load forecasting, system planning and demand management activities[10].

TARIFF

The fixation of tariffs for decentralized energy projects has always been an important issue for discussion. Affordability of this energy and willingness to pay by the end users play a crucial role in the success of any project[14][20]. One of the major concerns associated with tariffs of off grid systems include the constant comparison to the tariffs of grid supply[4][8]. The energy generation process with the help of off grid systems is usually more expensive than the conventional systems. Areas which are not in complete isolation from the grid may particularly face the demand for price parity[7]. Some traditional tariff related issues such as the case for cross-subsidies [2] depending on the demand or usage pattern and the need for and financing of subsidies for such services continue to exist. However, funding such subsidies initially and in the long run can be more challenging. The tariff may vary depending on cost of off-grid supply of electricity generation and supply technologies used. Price parity in such cases between different off-grid service areas can emerge as a regulatory issue[9].

TO IMPLEMENT THE GOAL ACCEPTED BY THE INTERNATIONAL COMMUNITY TO HALVE THE PROPORTION OF PEOPLE LIVING ON LESS THAN ONE DOLLAR PER DAY BY 2015, ACCESS TO AFFORDABLE ENERGY SERVICES IS A PREREQUISITE[28].

TECHNOLOGY

Apart from the various regulatory and institutional issues associated with off grid systems, there are also several technical problems connected with it. One of the challenges lies in the wide variations in performance of power converters in terms of their efficiency and reliability[9]. Monitoring of load shedding systems, startup- shut down systems and voltage control systems are required for better efficiency and continued service. There is a need to make judicious choices between AC and DC systems, which should be site specific and must fulfill the user requirements. Non-standardization of voltage levels and switchgears creates several technical issues. The future of off grid lays in its ultimate integration with the grid, which is posing several technical concerns such as difference in voltage levels, loss in energy during transfer and conversion from AC to DC systems[12].

The rural areas which require operation of off grid energy are characterized by geographic remoteness, dispersed consumers, high costs of supply and maintenance and limited ability to pay. There is thus a need to develop technologies which can cater to such a population and meet their demands without compromising on quality. Energy storage is another technical issue which requires great interventions to ensure electricity for longer durations[27].

RECOMMENDATIONS

- Before any momentous changes are brought about in the area of decentralized generation, there is first
- need for the sector to attain legal recognition under the law and policies of the country.
- Amidst the issues surrounding the off grid sector, there is a need to make the system more comprehensive and inclusive. Hence, there is a need to use participatory methods in order to build business models for decentralized energy systems to ensure sustainability.

[2] Cross subsidization is the practice of charging higher prices to one group of consumers in order to subsidize lower prices for another group.

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Village level planning could be an effective approach towards making this a reality.

- Installation of sophistic technologies should be avoided in rural area, as they become extremely difficult to maintain. Locally available material should be encouraged to be used in such off grid systems.
- Consumer interest friendly solar PV services, such as guarantee on the system, assurance on energy output performance, better after sale services and stating of hidden costs such as that for plant maintenance can encourage use of solar systems in urban and semi-urban areas.
- In order to increase the area cover by off grids, there is a need for demarcation of areas which require a cover through decentralized systems and where the grid is inaccessible.
- Technical issues, such as the need for more reliable and efficient power converters which help the AC and DC currents to integrate without much wastage, need to be urgently addressed.
- A knowledge management system which can give detailed information regarding decentralized projects is required.
- A lack of data dealing with the off grid technical, social and institutional aspects is a major setback hampering the growth of the sector. Hence there is an immediate requirement to have a data base for the same for a speedy progress of the sector.

CONCLUSION

In spite of the various efforts made in the off grid sector, there is still a long way to go to ensure access to a wide population. Sporadic efforts made are not adequate to improve the situation without strong state initiatives in terms of proper planning, programme design, financial support and institutional arrangement. There is a need of proper integration of local resources in hybrid technology combinations to ensure adequate, reliable and affordable supply[1]. Among other challenges, however, the financial, regulatory and governance challenges continue to remain strong and are often not foreseen. Mobilization of financial resources for enhanced electricity access and ensured conducive business environment through an appropriate regulatory governance arrangement would require significant attention in the future[1].

There also must be location specific business models formed through participatory approaches for better service delivery which best suit the local conditions. Capacity building efforts in rural electricity supply can be a breakthrough for the off grid sector. Among other drawbacks in the decentralized generation sector, there is a general lack of understanding of off grid projects[13]. There is thus a requirement of compilation of case studies and their systematic analysis using appropriate framework, which can be a rich source of information and understanding.

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