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A photograph of a woman in a purple top holding a young child in a patterned shirt. They are in a room with a solar light fixture on the wall. The child is looking up at the light with an expression of wonder and excitement, with their hand raised. The woman is also looking up at the light.

**IMPERATIVES OF SCALING UP
OFF-GRID RENEWABLE
ENERGY IN INDIA**

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Foreword

India is currently deemed the fastest growing economy in the world, and is on an unprecedented growth trajectory fueled by industry, technology and innovation, and steered by its extensive youth population. Growth in India is driven through financial and social inclusion measures, industrial development and service offerings to the international community. One of the key factors that propel this growth is 100% energy access to all, and currently there is a shortage of energy supply, amid the growing demand which is the mark of an emerging economy.

The issue of energy security is only exacerbated by the rising subsidies for fossil fuels and a systemic lack of proper access to reliable energy. The shortfall is reflected in the unavailability or irregular supply of electricity in the unconnected and underserved rural locations. A Yale report indicates that 30 crore people in India do not have access to reliable electricity, and this adds up to almost 7.5 crore households. Despite an ambitious rural electrification program, 2013 Energy statistics state only 55.3% of the rural households have proper access to electricity.

Almost 70% of the electricity in India is generated from fossil fuels. These conventional sources leave a substantial environmental footprint through the carbon emissions and resultant pollution, which is a major cause of concern. In the given scenario where the need is to generate both clean and cost effective power for domestic or small scale use, these conventional methods are neither suitable nor viable. Therefore, there is pressing need to look for and explore options of off grid power generation, and implement them to enable and empower these rural villages.

Off-grid generation of electricity is among the most significant opportunities before our country in order to bring energy inclusivity. The off grid renewable energy market in India is currently at a very nascent stage, and although the market opportunity is tremendous given the sizeable rural population of India, the current players have not been able to tap it effectively. A number of barriers, of which many are unique to this market, make it difficult for the companies to scale up and increase their reach as much as they would like to. These barriers need to be addressed through focused and specialized solutions.

Today, with the advent of newer and better technologies in the renewable energy space, it is possible to generate electricity domestically from various sources of energy. Even as solar photovoltaic is the most popular technology being put to use currently for domestic electricity generation, there are many other sources that are waiting to be tapped. Biomass has long been used as a source of energy in India, but efficient ways of producing electricity from it is still largely not applied.

Although growing awareness, falling prices of the technology, and improved access to finance have played a positive role over the years, these have not been successful in bringing about change at a desirable scale. The impetus for a more rapid and large scale growth of the off-grid renewable energy products in India has to come from better technology and effective policies, and sustained through functional business models and specialized financial solutions.

This report tries to bring to light the different methods that can be used to create an eco system that can both grow and sustain the off grid renewable energy market in India. This report is a precursor to a series of four reports which will discuss the possibilities, challenges and the way forward for off grid renewable energy.

A transformation at such scale will need concerted efforts and engagement from all, by creating an eco-system in India where the off grid renewable energy companies can prosper, we would not only create an environment attracting investments, but also successfully improve the access of many rural households to reliable, clean and affordable electricity.

CONTENTS

Introduction	1
Leveraging the continuous technology innovations to propel off-grid uptake	7
Innovative and collaborative business models – The right way to close the demand-supply gap	11
Financing options for ensuring success of off-grid businesses with Long-term vision	15
Supreme role of Policy and Regulation in creating and ensuring market for Off-grid businesses	21
Off-grid revolution: Potential to bolster the Rural Economy	25



INTRODUCTION

Introduction

India is currently deemed to be the fastest growing economy in the world, and is on an unprecedented growth trajectory fueled by industry, technology and innovation, steered by its extensive youth population. The inclusive growth strategy of India is currently driven primarily through financial and social inclusion measures, and one of the key features of inclusion is access to reliable energy, which is indispensable for social and economic development and has the potential to transform lives.

In India more than 95% villages are grid connected, but owing to irregularities and unpredictability in power supply, over 30 crore people lack access to reliable electricity supply. For achieving 100% access under conventional electricity distribution system that predominantly depends on thermal power, huge capital expenditure is necessary. As of now, approximately 70% of the installed 272 GW capacity for electricity generation is met through fossil fuel fired thermal power plants. In an economy like India, where the power portfolio is highly skewed towards thermal, reliable grid connectivity would come at a cost to the environment as power generation contributes to 38% emissions globally. It is clear that **alternate clean sources of energy have the potential to avoid higher emissions while meeting the increasing demand for access to electricity.**

In a country such as India to ensure energy access for all, a combination of grid-based electricity and off-grid energy solutions are required, as the former alone will not be able to cater to the needs of majority of the villages that currently do not have access to energy. This lack of access to energy has been a major barrier to inclusive growth in the country. Currently, a large majority of rural households use kerosene and biomass for lighting and cooking requirements respectively, which cause health problems and also result in higher greenhouse gas emissions. These issues can be easily addressed by increasing the generation of off-grid and grid ready decentralized energy using renewable and cleaner sources of energy in rural

areas. India being a developing nation, achieving energy security and energy access would improve many human development indicators such as alleviation of poverty, sustainable livelihoods, and education as well as access to affordable healthcare.

Understanding Renewable energy in India

Renewable energy is usually defined as energy that comes from resources which are naturally replenished on a human timescale such as sunlight, wind, rain, tides, waves, geothermal energy ocean energy, biomass and biofuels, and also include municipal and industrial waste , or hybrids of any the of above. Indian Renewable energy sector has received a huge impetus from the Government with the recently announced targets of achieving 175 GW installed capacity by 2022. In the below sections, this report analyzes the country's targets against its potential, and how these targets define and direct the future of renewable energy in India, especially of the off-grid market, keeping in mind the current capacities and aspirations

The potential for renewable energy, especially solar energy is immense given the abundance of incident sunlight almost throughout the year in most parts of India. According to MNRE, the country's solar power potential is estimated to be at 750 GW (India receives solar radiation equivalent to more than 5,000 trillion kWh/year, which is far more than its total annual energy requirement), whereas the installed capacity stands at only 4.06 GW. Whereas the current target to harness 100 GW by 2022, amounting 13% of the total potential, is indeed a welcome move, it is clear that much more can be achieved to harness clean energy sources. The Government's target of harnessing 60 GW of wind energy relates to 50% of the identified 102 GW potential, whereas the current installed capacity stands at 23.7 GW, i.e. 26% of the potential, making India the fifth largest producer of wind energy. The biomass potential, as of 2010 is estimated to be at 35 GW of which only 4.4 GW has been realized through grid connected projects. The Government's target intends to more than double the current installed capacity. Small-hydel installed capacity currently is at 4.1 GW, while its potential is estimated to be 20 GW, and the Government's target aims to achieve 5 GW in next seven years.

Given the comparably high potential of solar power to that of other forms of renewable energy sources, surprisingly, there is only 1% of potential solar energy harnessed while there is 5% of the potential harnessed from other sources. Renewable energy targets set for the wind, small hydel and biomass power seem surmountable by 2022, with enough support through right policy reforms and adequate financing.

Achieving the 40 GW installed capacity through Rooftop Solar Systems – The Case for Off-grid Solar systems

The solar energy target set by the Government includes 40 GW to be generated through rooftop solar systems, which is equivalent to 4 lakh large scale rooftop solar generation units with 100kW capacity each, costing INR 252 thousand crores altogether, even after the 30% subsidy through the Central Financial Assistance (CFA) provided by the MNRE. In terms of micro-power solar systems with 10kW capacity, the number of units needed would be 40 lakhs to achieve this target. If rural electrification were to be achieved simply via these methods, these numbers definitely seem daunting.

However, there is a large potential available for generating solar power using unutilized space on rooftops and wastelands around buildings. Small quantities of power generated by each individual household, industrial building, commercial building or any other type of building can be used to partly fulfill the requirement of the building occupants and surplus if any, can be fed into the grid. The roof-top SPV systems on building's roof space can be installed to replace DG sets for operation during load shedding. The price of power generated from solar plants installed today is at par with or lower than the commercial tariff for consumers, as per MNRE reports, and the cost of solar power is on a gradual decline.

Most rooftop systems so far have been located in rural locations, and to include semi-urban and urban areas into the fold, the MNRE recently launched a pilot scheme for promotion of large scale grid-connected roof top solar PV projects with the SECI designated as implementing agency for this scheme. The pilot scheme with aggregate capacity of 50 MWp in various states across the country envisages installation of grid-connected roof top solar PV projects on the roofs of government offices, PSUs, Commercial establishments, hospitals, cold storages, warehouses, industry and educational institutions and private houses. The generated solar power will be utilized for captive application and the surplus power will be fed to the grid. The scheme aims to reduce the fossil fuel based electricity load on main grid and make building self sustainable from the perspective of electricity consumption, to the extent possible.

With the current installed capacity of rooftop solar systems estimated at 300 MW, and with SECI's mandate to install 50 MW capacity in the pipeline, the goal of achieving 40 GW rooftop solar power seems beyond the bounds of possibility. However, considering the 30 crore people without access to proper electricity,

approximating this to 7.5 crore households, off-grid solar systems can be the energy access solution that we are seeking for.

MNRE reports the total off-grid installed capacity stands at 1.2 GW, of which solar is 234 MW, biomass is 772 MW and small/micro power is 17 MW. Off-grid wind solutions are currently not viable in India, given the high setup costs and the resulting infeasibility of even attempting at grid parity. The biggest challenge faced by the Indian Government today is to translate the solar power target, (both grid-connected and off-grid), to reality, and CEEW, in one of its reports, estimates that in an optimistic scenario, this would require USD 135 bn.

Large scale utility projects seem to be the focus with private enterprises ramping up solar power generation across the country. There is a visible positivity in the market with regard to large scale solar power generation. This report has established the need to ramp up off-grid solar power generation with more rigor to provide uninterrupted access to clean, reliable power. World Bank data shows that in India, up to 17% electricity losses are due to transmission, distribution and pilferage. **Off-grid solutions being mostly installed in smaller pockets can potentially save on transmission and distribution losses as well and drastically reduce related costs.**

Off-grid solutions are not a recent revelation, but are considered nascent despite the vintage and scale they have achieved in developed countries. An IRENA report embellishes the fact that rural households spend an estimated USD 37 billion annually on accessing conventional lighting solutions such as kerosene and candles. While there is no doubt that stand-alone renewable energy solutions such as solar home systems are cost competitive with the conventional options, this still keeps private companies from tapping into this market. The report goes on to say that the answer lies in getting the fundamentals of market development right: assessing the demand, identifying the right technology solutions, quantifying the willingness to pay and gaining the trust of communities. Simply put, the four differentiating factors are Technology, Collaborative Models, Finance, and Policy reforms. The report would cover in detail, the above identified factors of success.

This report 'Imperatives of Scaling up Off-Grid Renewable Energy in India' would cover mostly off-grid solar solutions, as a span across available forms of off-grid solutions indicates that it is hard to beat the advantages of solar: No moving parts; long term warranties and minimal maintenance.



Leveraging the Continuous
Technology Innovations to Propel
Off-Grid Uptake

Leveraging the Continuous Technology Innovations to Propel Off-Grid Uptake

Natural resources have always been used by humans for passive energy -wind and water to create momentum, and sunlight to provide heat. Windmills were used to grind grain and pump water before they became a source of electricity. Solar energy was used in Roman bathhouses in the first century to heat up water. Architects still continue the smart practice by orienting structures and their windows to make use of available sunlight and wind.

Solar, wind or hydro power that actually provides usable electricity is relatively new. The photovoltaic cell that we use today was developed in 1954 and the first windmill used for the production of electricity was built in July 1887. As with most technologies, solar power was extremely costly in the beginning which limited its use initially to small applications like calculators and wristwatches, or to massively funded projects as NASA's space program. Despite humble beginnings and slow growth, **the renewable energy technologies have leapfrogged in recent years that solar power is expected to contribute 16% and wind power is expected to contribute 18% of the global electricity demand by 2050.**

Today, with the advent of alternate and more cost effective methods of manufacturing solar panels, the use of PV cells for electricity has become a more viable option. The use of SPV for the domestic energy needs has also increased at a considerable rate. Almost 90% of the world's photovoltaics are based on some variation of silicon, and the main difference in the types of panels made is the purity of the silicon used and depending on it, the solar cells are broadly of two types: monocrystalline and polycrystalline. Today, with more efficient processes string ribbon solar cells and thin-film solar cells are also produced. These PV cells are more efficient in terms of cost and efficiency.

The biggest technology roadblock today in the off-grid energy systems is storage. Solar panels have already become quite cost competitive as the system size keeps

increasing. On the contrary, the battery costs increase as the size of the system increase. Currently the batteries are expensive, occupy huge spaces and are extremely heavy, which poses challenges in cost effectiveness, space constraints and mobility of installed systems respectively. The traditional lead-acid batteries which are used more popularly are less expensive needing more maintenance. New batteries that use sodium ions from saltwater as electrolyte costs the same as the lead-acid batteries, but lasts twice as long, cutting the cost to half in the long run. Batteries have considerably reduced in size making them more convenient and easier for domestic installation, but are twice the cost and last fewer years. Therefore, **next generation energy technology needs to be around energy storage that can potentially transform the renewable energy sector in general and solar energy market in particular.**

Another challenge is the unavailability of updated technology at an affordable cost, which can be addressed through indigenous production of solar panels through incentivizing the multiple players involved or through enabling technology transfer and sharing from the developed world through policy mechanisms.

A potential opportunity that technology can deliver on is to bridge the gap of off-grid solutions transforming to a grid-connectable solution. There are grid ready outfits in the forms of captive power plants, micro and mini grids, even solar home systems, but to make these systems grid ready at an affordable cost is key. In the event of grid connectivity to the currently unconnected areas, the existing systems need to be technology-ready to be integrated to the grid.

Encouraging Research & Development at premier technological institutions through Government funding or private funding that can avail appropriate tax benefits, subsidies to the Indian entrepreneurs through existing platforms like 'Make in India' are a few ways in which the technology challenges can be overcome and opportunities leveraged.

Emerging Trends - Impact on the off grid market

Technology has been cited as a major enabler of development and has helped nations achieve inclusion and progress. With this inherent ability to affect change when used properly, technological advancements can change the face of the world as we know it, and we have seen it happen in the past few decades through computers, internet and mobile technologies. Especially in the clean technology space, a solid

commitment from the developed world to transfer, share and engage with emerging economies is needed to leverage and utilize this advancement for the furtherance of humankind.

UNFCCC estimates that 80 percent of the renewable technology is already accessible in the market. However, we know that technologies will continue to evolve, more rapidly in coming times, thanks to the burst of interest, innovation and growth. However, entrepreneurs and businesses cannot afford to wait in anticipation of improved technology. The key is to utilize the strength and opportunity presented by existing technologies and develop appropriate market models to build scale and capacity. There is historic precedence to learn from, be it the automotive industry or information communication technology where new generation technologies were launched almost every month. Key to building a sound business should be based on ability to be flexible and continuously upgrade. Emerging renewable technology offers that promise and potential for the market to grow.



Innovative and Collaborative
Business Models – The Right Way
to Close the Demand-supply gap

Innovative and collaborative business models – The right way to close the demand-supply gap

The off grid revolution is driven by its linkage to remote habitation or underserved markets and still being able to provide reliable services. The business model is strategic to achieving success, and needs to be customized to the local needs, matching the local demand. This does not indicate a new business model is needed for each locality, but the adaption of a plug-and-play system, powered by simplified technology solutions.

Any rural model needs to consider the **Four As of rural delivery: Availability, Affordability, Acceptability and Awareness**. Currently viable markets with low or no access to electricity have low awareness on the available systems and the new opportunities these systems present. While availability can be handled through concerted efforts by entrepreneurs and the Government, the systems offered need to be made affordable and acceptable to increase the penetration and success of these models. Success of off-grid models is also highly impacted by market distortions, such as kerosene subsidies, which need to be adequately considered when promoting off-grid renewable energy.

The biggest challenge is ensuring acceptability of the services offered. As households would take time to adapt and become loyal consumers, the ready target base to look at would be energy intensive local enterprises ranging from flour mills to irrigation pumps. This would provide the 'guaranteed load' or a captive consumer that is absolutely needed to initiate and sustain operations. For example, off-grid setups can draw from the example of how mobile telephony flourished with the advent of the Telecom Regulatory Authority of India (TRAI), for a similar institutional mechanism to streamline energy access by providing cleaner and reliable electricity to rural India.

This would be mutually beneficial as TRAI has unveiled green targets for the telecom sector in January 2012 that requires telecom companies to migrate 50% of all cell

towers in rural areas and 20% in urban areas to hybrid power by 2015. The numbers have to go further up by 2020, when the operators will need to run 75% and 33% of cell towers in rural and urban zones respectively on hybrid supplies. (Hybrid power has been defined as a mix of grid supplies and renewable energy based on solar, wind, biomass or fuel cells). Rockefeller Foundations' Smart Power for rural development model follows a similar approach, which provides power through a local mini grid. Under this model, solar power plants are built and run by the energy service companies which have higher capacities, not just for lighting homes and shops, but also for serving productive loads like micro-enterprises.

The success of these models in rural areas is also highly dependent on the local capacities, and the financial viability, given the affordability and accessibility/availability required in rural markets. Localising parts of the distribution value chain and training unskilled local youth to operate, maintain and repair solar systems would help better adapt services to local demand and improve the acceptance of the product offerings. This would just not bring down the cost of installation and regular maintenance, making the services more affordable, but also create livelihood opportunities in the community.

A key challenge in the early days of Bangladesh's market development was recruiting and training technicians. On the one hand, trained engineers did not want to work in off-grid areas if alternative opportunities existed. At the same time, not enough technical people were well versed in solar energy. So extensive training was provided to vendors, sales professionals. The solution was to realize the importance of local communities and understand that people are innovative and creative as they innovate on existing systems in a manner befitting their local contexts. This helps identify more local opportunities and scale up which would increase market capture. Engagement with local actors who are undertaking the ground work – setting up businesses, securing financing and developing projects – needs to be increased along various stages of sector planning and decision-making processes.

The existent business models are built around various payment methods ranging from upfront installation cost supported through equipment financing to weekly payment collection schemes. Few companies also offer pre-paid electricity cards integrate with smart meters that unlock ownership upon completion of payments to the consumer. While the differentiating factor so far has been payment schemes, building models around pricing and packaging can also be considered. One key recommendation is to include differentiated pricing for usage during peak and off-peak demand emulating the energy management in the off-grid sector. Packaging of

the offering to serve customers with different demand is already a familiar concept. However, ensuring upgrades of the systems to power more equipment is a simpler way of scaling up access to energy. Further scalability of a smaller solar system like the pico home systems needs to be considered during initial installation itself which would enable the consumer to have better access to energy making him a premium consumer. As the demand grows over the years, scalability needs to happen and at an affordable cost to keep the customer interested. This also presents an opportunity to the service provider to scale up his business and retain customers.

Owing to the continuous technological upgrades, where constant innovation to achieve more energy efficient and cost efficient technologies is underway, the business model needs to take into consideration effective service delivery ensuring long-term operations. This means while the shelf life of technology is becoming less, the service provider has to keep customers aware of the advancements and upgrading the offering as and when required.

In a new model being proposed, 'Solar as a Service' the service provider extends his service of installing, operating, maintaining and repairing the off-grid system to also include updating the customer of various advancements and the upgrading the technology on requirement. This facility can be availed by the customer at the start or middle of the service term, for which he would be charged a minimum premium. This model also proposes that the service provider collect and dispose the old technology responsibly, as and when an upgrade takes place.

A robust and forward looking business model is mandatory

Renewable energy market is no more based on just opportunity, subsidy and incentive. The sheer market size and appetite for quality services have brought about a paradigm shift in business thinking, approach and practice. For the businesses to grow and stabilize, it is clear that along with parameters that look at quality, service and sustainability, there is also a need to build internal capacities – leadership, systems and management. Energy markets are not designed with short term tenancy, they are built on long term vision and perspectives to ensure sustained viability and growth.



Financing options for ensuring success of off-grid businesses with Long-term vision

Financing Options for Ensuring success of Off-Grid Businesses with Long-Term Vision

Sustainable and exponentially scalable off-grid models that can affect a significant improvement in today's power-generation-emission scenario would only be viable when there is availability of regular and steady funding. While equity infusions may be easily available from impact investment funds mainstream finance in the form of debt is essential for growth. There are many pilots that have been tested in India, with various financing methods but scale up of off-grid enterprises still seems elusive.

Indian banks have large conventional power portfolios as building infrastructure is promoted both from policy and regulatory fronts, and the risks involved have become familiar with clarity of collateral and cash flows. However, off grid energy businesses are yet to become part of banks' asset portfolios owing to limitations ranging from dependence on a single entrepreneur to limited capital and high cash flow risk in this sector. Despite being cost competitive on a life-cycle basis, the relatively high capital-to-operational cost ratio compared to conventional systems continues to be a key barrier for stand-alone renewable energy systems. Overcoming this requires access to end-user financing that is tailored to the consumers' income, cash flow and current expenditures on energy services (e.g. kerosene or candle lighting, mobile charging).

Breakthrough solutions are much needed today, as funds are amply available for the right business models. Three specific areas of improvement dwelling on right kind of models, readiness to receive debt financing, and mechanism to increase financial access have the potential to propel this sector forward.

Firstly, the capacities of this sector need to be strengthened for it to be considered debt ready. While the social impact of energy access is most important, a business mindset is extremely critical to be able to access mainstream finance. Building capacities of off-grid enterprises to strengthen their business and financial models

would improve the current market dynamics. Underutilized corporate social responsibility funds could be directed towards strengthening capacities, which would fit into the 'environment sustainability' mandate by the Government.

To be able to mainstream debt financing in this sector, the perceived high risk and lack of collateral needs to be addressed since debt financing is conventionally risk averse. Appropriate mitigation methodologies are the absolute need of the hour: the cash flow risk can be mitigated if the business models are dependent on local enterprises serving as captive consumers which can ensure operational expenses and interest payments.

Along with making models more financeable, innovations in financing also are needed. An ecosystem of energy financiers to deliver downstream financing is of crucial importance. This involves dedicated lines of affordable credit for energy enterprises, ideally within rural banks, commercial banks, etc. A broad range of instruments are also required to improve access to financing in the sector. Convertible structures, for instance, can often be effective mechanisms to bridge the financing gap along different stages of business development.

Adequate mechanisms for financing off-grid projects need to be explored that can effectively mobilize and deliver the necessary financial resources to the far reaches of rural enterprises and communities. Public financing will continue to play an important role in de-risking investments and leveraging private capital – a necessity for the desired scale-up of the sector. Development finance institutions, among other actors can support capacity building for local financial institutions to build trust in the sector and lower risk perceptions. It is also crucial in leveraging commercial and private capital. Use of instruments such as publicly backed guarantees helps de-risk investments and encourages financiers to participate in the sector. Risk guarantees can be drawn from grants and used as revolving guarantees to be leveraged in case of stress to create headway in steady funding for clean energy. Insurance schemes in case there is lack of enough incident sunlight for solar systems or water for small hydel projects could be looked at, as the yield is directly proportional to the resources available. Similar to crop insurance, off-grid insurance would not only cover the end-user, but also provide additional cash flows to the off-grid enterprise in the form of premium payments.

An IRENA report identifies one of the key challenges for scaling up stand-alone solutions as the availability of end-user financing for households and rural enterprises. In East Africa, where mobile banking is commonplace, off-grid projects

tend to be more sustainable because people have the mechanisms to pay for energy services. A serious shortcoming of a completely grant-based approach directed at consumers is that it lacks long-term sustainability.

In India, a slightly varied approach is followed, but with remarkably different outcomes. The off-grid market is promoted by channeling finance to the banks, so that the banks can lend to consumers to buy the products. This however has not sufficiently scaled up as many consumers are not comfortable with the financial services to take loans. Further investigation suggests that financial inclusion is a first barrier causing the failure of this model. Banks have been trying to provide access to finance not just by opening bank accounts for the underserved, but also by extending other financial services as debit cards, overdraft facilities and credit facilities. A behavioural change in the rural markets to accept banks as trust institutions is currently underway, and the involvement of banks in developmental programs would be fruitful once this change is affected.

The other barrier is with the approach itself, as it assumes that the energy poor are willing to increase liabilities to purchase an unknown technology. Even when an end-user has utilized the loan facilities to purchase a system, he has additional monetary obligations to pay off the loan, and also pay for the repair/maintenance and the kerosene, in case the system breaks. He in the end would have to pay twice.

End-user financing makes more sense through the off-grid enterprise itself. Establishing EMI schemes for system price, installation and maintenance would be a right payment model in a country like India. The additional business cost involved with manual payment collections can be avoided through payment solutions supported by mobile technology. Innovative tie-ups with rural banks or micro finance institutions can bring down these costs, and make it more affordable to the public. And an added guarantee from the off-grid company that, if and when the system stops working, the end-user can hold off payments till the company either replaces/repairs the systems.

Another big barrier in financing off-grid entrepreneurs is the lack of a secondary market for the assets generated by the financial institutions. Extending the concept of bonds to the renewable energy market, banks can create an opportunity for common people to invest in renewable energy. Rural renewable energy bonds can be floated in the debt market, providing an opportunity to smaller retail investors interested in positive impact projects. If the bonds can be affordably priced, there will be a bigger customer base to target and since the quantum of risk is lower there

is a better chance of finding more buyers. This would definitely improve the financing opportunities available to the off-grid power generation.

Altering risk perceptions is critical in increasing to access finance

Clear and stable policy and regulatory framework is necessary to attract financing to any sector. In case of off-grid market, there is also a need to alter the existing risk perceptions of investors and financiers. For this to happen, there is a need for a concerted effort from all stakeholders – governments, investors, financing institutions and entrepreneurs – so that measures are put in place to mitigate risks. Every sector, including the parent, large scale renewable energy is prone to risks which are handled and mitigated appropriately by financial institutions. Nevertheless, for off-grid energy business to access finance, financial institutions need to come out with robust and pragmatic plans – addressing both internal and external factors - to spell out the measures that will minimize impact of those risks.



Supreme Role of Policy and Regulation In Creating and Ensuring Market for Off-Grid Businesses

Supreme Role of Policy and Regulation in Creating and Ensuring Market for Off-Grid Businesses

The most important role in achieving rural development is played by timely policy measures. Public policy forms the backbone in ringing change by advocating customer behavior changes so as to drive acceptance of products, incentivizing private enterprise to innovate superior models and drive financial institutions to consider the market investment ready.

Currently, with the 175 GW target of Renewable energy target, India has started off its renewable energy journey, but the nuances of making this narrative a reality are to be considered carefully. The carved out 40GW of rooftop solar from the total solar power target is a great vision, but ensuring the effective execution is the game changer. Currently, many Government schemes encourage off-grid power development. Solar Energy Corporation of India (SECI) focuses on Solar off grid generating systems, solar home lighting systems and various other forms of solar based heating/cooling/thermal applications in domestic, commercial and industrial segments. MNRE sanctions 30% capital subsidy for 25 MW rooftop solar capacity under the Central Financial Assistance (CFA) scheme. This scheme covers systems with capacity between 3kWp to 100kWp and covers Government Educational Institutions, Hospitals, community centers, Anganwadis, Panchayat Ghars, State/Central Government Buildings, Municipal Corporation Buildings, Police Stations, Police Posts, vocational training centers, Government hostels etc. depending on requirement, and has an allocated budget of INR 475 crores.

Along with supporting deployment of rooftop solar atop public buildings, the Government also needs to commit to the off-grid renewable energy sector by addressing the administrative challenges facing the private sector, by initiating programs that contribute to the development of a market. **An execution strategy to achieve the laid out decentralized renewable energy targets is much needed, supported by stable policies, providing targeted support, rethinking subsidy mechanisms for fossil fuels and fostering innovation.**

One of the key challenges faced in the off-grid renewable energy arena arises due to the Government subsidies for kerosene, which make it difficult for off-grid renewables to displace kerosene despite being more cost-effective on a life-cycle basis. In addition, the promise of grid extension often inhibits investment in electrification through off-grid solutions. Added to this is the unclear stance of the Government as to what happens to the off-grid /mini-grid systems, when the grid actually does come to the off-grid electricity fed zones. Several approaches for integration exist, but it is vital to ensure that business risks for the private sector are reduced while safety and the quality of supply are maintained.

To encourage the private sector involvement in mini-grid deployment, Government needs to establish a techno-legal framework to allow participation, tariff structures, standard quality benchmarks that are cost-reflective, support for developers in identifying villages (that are not expected to be served by the national grid in the short to medium term), and a regulatory framework to support integration of mini-grids with main grids. A clear roadmap of integrating or absorbing the off-grid systems, and a clear buy-out structure needs to be put in place to encourage entrepreneurs to consider this as serious business.

Another striking challenge posed in rooftop solar market especially, is the possibility of incident sunlight decreasing, when neighboring structures are built taller, post the installation of rooftop solar mechanisms. A major push to the rooftop sector would be to pioneer a 'Right to Light' movement. In the UK, there is a law, where citizens are directed to pay compensatory damages if they block/restrict the amount of sunlight that their neighbors have been familiar with. Compensation that is in tune to the energy lost due to recent activities can be sought under this law. Local authorities ensure fairness in its implementation. Similarly, a law/directive to this effect, if introduced, can ensure 'Right to Light' where solar rooftops can be prevented from becoming defunct.

In underdeveloped rural areas, when there may not be even enterprises that are ready to utilize the energy, this is when a collaborative development model would come in handy.

Towards an enabling policy environment for DRE growth in India

Decentralized, off grid energy access systems should not be viewed as a grid undermining factor. Rather, decentralized energy can act as a great catalyst, bridge and complement the electricity grid in the country. What is required for this to

happen is a stable and clear policy and regulatory framework that will address key concerns related to grid compatibility, feed-in tariff, power purchase agreements, swift legal and judiciary intervention, guarantee mechanism and apolitical approach to energy access market. With a clear, pragmatic and forward looking policy, India can be that inspiring example for the world to follow.



Off-Grid Revolution: Potential to Bolster The Rural Economy

Off-Grid Revolution: Potential to Bolster The Rural Economy

Off-grid energy businesses are expected to create a huge market opportunity for greater levels of clean energy investment in India, and addresses climate change effectively. This would not only help generate clean energy but also reduce fossil fuel imports as India is poised to move to a double digit growth trajectory.

The associated industry of solar cell manufacturing, power storage and transmission equipment technology cycles are contracting, and finance needs to evolve accordingly to provide a definitive boost. A short term financing approach focuses only on current technologies which have shorter shelf life and expects higher returns. Alternatively, investors now need to finance businesses not products, adopting a long term approach, as it is the adaptability of business to environment and technologies that form the pillars of success.

Along with lighting up rural households, off-grids can also increase productivity, improve the quality of life, and create livelihood opportunities for small scale entrepreneurs. Heavy dependence on kerosene and diesel for illumination and irrigation is reduced, and rural services get a lifeline through solar water pumps, ATMs and telecom towers. The communities would receive dual benefits, better energy access and improved quality of life.

With such multidimensional benefits that can be achieved through the off-grid sector, coupled with the demand in India, large scale adoption would need combined efforts from entrepreneurs, financiers, policy makers and regulators, through ensuring technology disruption, sharing and transfer, innovative and locally customized business models, availability of affordable finance and stable policy regime.

