Ashden India
Renewable Energy Collective

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Briefing paper series on decentralised renewable energy for sustainable energy access

Decentralised Renewable Energy (DRE) Financing: Needs-orientation, Benefits Valuation, and Linkage with Performance are Key

>> Highlights

- It is important for end-user DRE loans to be cheap and flexible.
- High upfront capital subsidies that are difficult to access, deter rather than encourage investors.
- DRE must be integrated in to the Renewable Energy Certificate with a multiplier to reflect its positive features.
- Basic energy vouchers are suggested for lifeline energy consumption.
- A renewable energy incentive deposit that provides generation-based incentives is recommended for above-baseline energy consumption.
- Research is needed to understand the full costs of conventional energy and to estimate and disseminate the real risks associated with DRE.

Energy is a critical input for development and has always been a subject of enormous political interest. Like food, fuels have attracted subsidies and incentives across countries. Be it kerosene for lighting, liquefied petroleum gas (LPG) for cooking, fossil fuels for transport, and electricity and liquid fuels for pumping water, many forms of energy have enjoyed deep and persistent subsidies. The purported motivation for subsidies has been the need to make energy affordable and accessible.

The DRE financing context

Why does decentralised renewable energy (DRE) need financial support? From the end-user perspective, DRE solutions tend to be more expensive than conventional energy. Conventional energy typically benefits from economies of scale and government subsidies, while not reflecting the full costs of its negative impacts and in efficiencies.

DRE does not benefit from economies of scale. While several DRE technologies have transitioned from being demonstration technologies to field-proven viable options, other DRE technologies are in transition. Several mature DRE technologies continue to be hampered by negative views among dominant policy makers predominated by conventional energy mindsets. Under a business-as-usual scenario for conventional fossil-fuel based energy, a somewhat (though not quite) level playing field for DRE has been sought through incentives and support. Thus far, government support for DRE has largely been in the form of upfront capital subsidies meant to increase consumer demand for DRE products. Unfortunately, the subsidies have presented operational challenges, which in some cases have defeated their intent. These capital subsidies on DRE rarely match the extent of subsidies available for fossil fuel-based energy solutions and play an unhealthy role by creating market distortions and opportunities for arbitrage.

DRE financing requirements and characteristics

Differing from other energy financing needs, DRE financing is characterised by (a) small scattered requirements; (b) high risks resulting from low ability to repay loans and a high level of policy uncertainty; (c) the possibility of carbon savings; and (d) over-estimation of risks and under-valuation of savings and benefits. These characteristics have been acknowledged but there remains a need to emphasise within the financial sector the fact that environmental, social, and economic benefits from DRE often far outweigh their financial costs.

Innovating financing for DRE: approaches and examples

Within India and abroad, several approaches have been adopted to respond to the financing needs of DRE at the entrepreneur and end-user levels. The following are examples that have already or could be adapted to DRE in India.

Customisation of finance to suit end-user needs

End-user loans for adoption of DRE are typically small loans provided to dispersed, remote, and low-income end-users. These

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loans need special terms such as flexible repayment plans, waived requirements for margin money and collateral, low interest rates, door-to-door collection of dues, and limited documentation. Micro-enterprises are able to offer some of these special terms, while larger finance companies are often unwilling or unable to modify their requirements. Unfortunately, some micro-enterprises do not have the capacity of larger banks. Involving regional rural banks has been attempted but the results have not always been encouraging.

SELCO's experience of selling over 135,000 solar home systems has shown that access to customised affordable financing can make off-grid DRE available to low-income rural households, typically without grant support.

Aggregation and financial facilitation for situations with high transaction costs

For the financial service provider, the features of DRE – remote locations, scattered customers, small-value transactions, lack of social and physical infrastructure – all increase transaction costs per unit of money lent. Intermediaries or aggregation by user groups have helped overcome this obstacle.

Margin money financing, facilitated through SELCO from funds provided by agencies like the Renewable Energy and Energy Efficiency Partnership (REEEP), has helped to overcome financial barriers to the adoption of solar home systems. A working capital loan to a small entrepreneur to set up a solar rental business is an example of how street vendors were provided access to solar lights. Not only was the financial hurdle of the street vendors overcome, a sustainable enterprise was also created. A local cooperative society that normally provides crop loans was also persuaded to extend financing for solar lighting systems. The higher interest charged by the society (to account for higher transaction costs) was offset by financing through SELCO from REEEP.

In another instance, a solar light agent helped reduce transaction costs by aggregating loans and repayments, although additional financing was required to defray other transaction costs incurred by the financer, technology provider, and the entrepreneur.[1] Case studies suggest that in many situations innovative financing can be more effective than upfront capital subsidies on DRE applications such as solar lighting systems.

Aryavart Gramin Bank, a regional rural bank, has specific financing programmes for solar home-lighting systems and solar water heaters. The bank has 651 branches and has an exemplary record with its solar loans. In its scheme, interest is set at commercial rates, the down payment is just 5%, and subsidies are aggregated.

The Self Employed Women's Association (SEWA) provision of revolving funding for home-lighting solutions through self-help groups is another example, and their experience reinforces the fact that the poor can repay loans regularly provided they are given flexible terms aligned to their income.

It has been suggested that special purpose vehicles in the form of master aggregators could consolidate smaller energy enterprises throughout the country. This basic energy service provider (BESP) could become a vehicle for creation and support of last-mile local energy service enterprises as a franchisee. An investment fund and incentive package to create local enterprises could be channelled through BESPs to service last-mile supply chains for DRE applications.

Carbon finance

Carbon financing[2] is not yet been widely accessed by the DRE sector because of stringent documentation requirements and long waiting periods. Among the few examples is Nishant Bioenergy, which has successfully obtained carbon financing for efficient biomass cookstoves and the production of biomass pellets from agricultural waste. The company will provide 4200 cookstoves with financing from Gold Standard Verified Emission Reductions in collaboration with My Climate, Switzerland. Carbon savings result from replacing LPG with what are termed 'earth stoves.'

DRE subsidies: numerous problems thus far

The Ministry of New and Renewable Energy (MNRE) recognises the need for financial support in the DRE sector and offers a range of subsidies for various devices and technologies. There were programmes of interest subvention, by artificially lowering the interest rates for loans, to finance solar photovoltaic and solar water heating applications, but these have been discontinued. Current challenges and concerns are summarised below.

Basic problems with capital subsidies

Capital subsidies are provided to those with greater paying capacities rather than to marginalised end-users. In some instances, the capital subsidy is 'cornered' by enterprises that are far removed from

[1] <http://www.selco-india.com/pdfs/selco_booklet_web.pdf>

[2] This is financing made available to projects that help mitigate climate change.

the intended beneficiaries, allowing subsidy recipients to exploit poor communities.

High upfront capital subsidies (up to 90%) tend to undermine long-term engagement by the beneficiary and efforts to achieve financial sustainability. High capital subsidies also create an opportunity for arbitrage, with goods moving from high to low subsidy zones, or to areas without subsidies.

In addition, there is little information exchange about subsidy programmes because the number of beneficiaries is small and they are widely scattered. Hence, consumer dissatisfaction with hurdles and delays in subsidy disbursements frequently go unreported.

Subsidy disbursement agencies are not always perceived as credible

Accessing subsidies can be a daunting process, resulting in the emergence of middlemen who claim to help applicants but who sometimes over-charge or dupe them. At the same time, managers in subsidy disbursement agencies wield power and can become exploiters rather than service providers. Capital subsidies are typically routed through state nodal agencies, approved channel partners, and regional rural banks operating under National Bank for Agriculture and Rural Development (NABARD), the apex agriculture bank of India.

Subsidies have often discouraged rather than encouraged investors and entrepreneurs. As an example, solar energy businesses and some of the regional rural banks cited reduction in offtake of the number of solar home-lighting systems after the Jawaharlal Nehru National Solar Mission (JNNSM) announced that they would be subsidised.

Modifying subsidies to improve financial bank ability of DRE: a REID approach

Unlike DRE, grid-connected renewable energy appears to have benefitted from subsidies. A favourable climate for grid evacuation (in the form of preferential tariffs and financial incentives) has proved to be effective. More recently under the JNNSM, extensive deployment of mega-watt-scale grid-connected solar systems is proof of how attractive financial incentives can fuel growth. The key driver for this growth is the increase in demonstrated financial bankability of these projects.

Financial incentives such as accelerated depreciation and generation-based incentives for 25 years have attracted commercial investment in these green projects. The Central Electricity Regulatory Commission also set mandatory renewable energy purchase quotas for power utilities, and viability gap funding was recently introduced to scale up solar grid-connected plants. A robust financial ecosystem, albeit with some gaps, has been created for renewable energy projects to increase their contribution to grid-connected electricity.

To improve financial viability and bankability of DRE projects, it would be important to recast subsidies – essentially to shift from one-time capital subsidies to results-based subsidies. The results could be based on financial criteria or units of generation. The key aspect of the shift is to spread the incentive over a period of time and to link subsidy payment to verified continued performance. An additional budget amount of between 3% and 5% of the total project cost will need to be allocated for programme management and modification as required.

It is suggested to amend the initial capital subsidy to a back-end subsidy spread over 60 months of system operation. This could be linked to timely repayment of the loan and continuous operation of the system (monitored using a GPRS- or SMS-based tracking system). As an added benefit, continuous monitoring using electronic and/or physical verification methods will provide usage data for technical improvements, and an audit trail to move the sector operations towards technical and financial soundness.

It is also proposed to shift subsidies from a fixed percentage of capital cost to an absolute value. Currently, subsidies are fixed as a percentage of invoice value ranging from 30% to 90% of the capital cost. Using a fixed percentage, consumers and suppliers have a tendency to maximise the incentive by setting a higher invoice value. An absolute value (for example, Rs 75 per W_p rather than 40% of the capital cost) would give the consumer leverage in negotiating for the lowest possible cost.

The proposed instrument will be in the form of an interest-bearing fixed deposit in the name of the beneficiary. This Renewable Energy Incentive Deposit (REID) will release incentives periodically (monthly, seasonally, or annually), tailored to the consumer's needs. REID should be available through widespread financial channels such as scheduled commercial banks, rural banks, cooperative banks, post offices, housing finance companies, and/or micro-finance organisations. REID would be a non-recourse instrument where neither the bank nor the borrower have any entitlements other than periodic incentive outflow to the beneficiary based on evidence of continuous and proper usage of a renewable energy device.

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Tailoring to suit special needs

A more flexible instrument will better meet local needs. When a customer applies for a loan, REID will be adjusted against the repayment of the equated monthly installments. The deposit amount along with the interest will be adjusted against the loan dues of the consumer. The flexibility of the loan amount, repayment, and tenure would be left to the discretion of the customer and the local bank manager. Building loan portfolios could then be aligned with local needs and income flows such as seasonal payments linked to the harvest.

Basic energy voucher for 'unserved' households: a precursor to effective implementation of REID

The JNNSM has a target of bringing solar lighting to 28 million homes that now use kerosene for lighting. Currently, 165 million households in India use firewood, cowdung cake or coal for cooking, and 74 million households rely on kerosene lighting. Despite rapid electrification in recent years, India is still at least 10 years away from 100% electrification of all the homes. DRE could fast-track rural connectivity to modern energy by providing a financial tool for purchasing energy products and services. A combination of basic energy vouchers (BEVs) for users and investment in the supply chain through the basic energy service providers (BESP) could achieve last-mile connectivity to basic DRE services.

It is recommended that 'under-served' and 'unserved' households be differentiated. The latter are those that are not connected to modern energy services, including the electricity grid. Unserved households may be given an instrument like a BEV with a pre-fixed value. A user could redeem this voucher by purchasing the desired DRE system or service. Beyond the basic energy service, the household could then be given incentives for using DRE similar to other households. Each under-served household would be eligible for an incentive for using DRE. This annual incentive would be based on calculations of payback duration and return on investment for particular equipment.

Empowered by the BEV, an end-user could go to a local franchisee of BESP to cash the voucher to access a DRE product or an energy service. If the user intended to enhance a product or service beyond the minimum value of the BEV, a local energy franchisee would link the user to a local bank to get an additional incentive in the form of REID. A user could buy an efficient cookstove and a solar lighting kit with a BEV, and then use REID to acquire a solar kit to power a television. The local energy franchisee could be a fixed or mobile energy shop or a micro-grid operator, offering only products, a service, or a combination of products and services along with linkages to financial products like REID.

Using REID features to address specific priorities

It is proposed that the REID scheme be provided with additional features to promote high quality and reliable DRE. For instance, a standard or quality mark or registration could be a prerequisite for devices to participate in the programme. Higher subsidies could be provided for systems with higher efficiency and for smaller systems likely to be taken up by the poorest households. The subsidies will have to consider the lifecycle costs of systems, including batteries, replacement of parts, and feedstocks (as required). A mechanism to address consumer grievances would also be required.

Region-specific incentives for renewables need to factor in local resource endowments. States with lower solar radiation should be allowed more lucrative versions of the subsidy (as is the practice in Australia and Germany), to facilitate the diffusion of solar technologies across the country. An alternative is to prioritise renewable energy technologies for various locations based on resource endowment, and then provide incentives in line with these regional or state-specific renewable energy priorities.

Making REID self-financing

While initially the REID could be created out of MNRE's subsidy pool and/or transfers from the National Clean Energy Fund, it is proposed that the Fund would eventually be financed through linkages with the renewable energy certificates or carbon markets, corporate social responsibility funds, and transfers of fossil fuel subsidies on LPG or kerosene. Distinct from grid-connected renewable energy, DRE has added benefits of saving on losses in the transmission network and reduced dependence on utilities. To reflect this, the integration of DRE into a renewable energy certificate is recommended with a suitable multiplier.

Towards financial viability: fee-for-service model and tariffsetting

For provision of basic energy services, a fee-for-service model could be a good option. This model is already used by multi-utility centres, (typically solar-powered) that provide services such as mobile charging for a fee. This model has the potential to create renewable energy entrepreneurs and could be based on either a master energy distributor or a directly appointed local energy entrepreneur.

For DRE microgrids, it is essential to focus on an appropriate tariff design,

keeping in mind that the difference between a consumer's ability to pay and a commercially viable tariff will have to be bridged through adequate policy or financing instruments. Several approaches have been suggested, including a mix of grants and debt financing for facilitating connection fees, as well as smart meters and prepaid systems for operation fees.

Understanding and monetising the relative benefits of DRE

Markets exist for DRE and the basis for these markets often lie in the spending by households, enterprises, and farmers on fossil fuels or for electricity replacements and back-ups. Cash flow from avoided costs of kerosene for lighting can be tapped for solar lights. This point was made succinctly in a recent *International Off-Grid Renewable Energy Conference (IOREC)* where participants emphasised that stand-alone renewable energy systems are cost-competitive with conventional kerosene lamps on a life-cycle basis. For a solar home system, the payback is usually between 1 and 5 years (depending on the system size). The major obstacle to large-scale diffusion of stand-alone renewable energy systems is the high initial cost relative to kerosene lamps. Innovative financing schemes allow rural electrification programmes and businesses to address this obstacle by offering debt financing, or a mixture of debt financing and grants to rural households, as indicated in some examples given above.

In the case of cooking energy, the benefits of adopting alternative clean fuels are not as clear because there are many parts of India where traditional cooking fuels are still gathered at no cost. There is, however, effort expended in gathering traditional biomass and its energy efficiency is very low. These features are not monetised and are difficult to translate into market data in the minds of the consumer. As part of policy analysis and reform, there is an urgent need for research to accurately estimate the full benefits of DRE resulting from its low-carbon decentralised nature as well as its contribution to energy independence.

It is ironic that DRE-based electricity projects are often seen as threatened by the conventional grid. It would be useful to know that the full cost of conventional electricity can go up to Rs 50 or even Rs 75 per kWh in some locations. Furthermore, there is no valuation or penalisation for the lack of quality and reliability of grid power. If such information is factored in, the case for DRE becomes stronger.

What is of crucial importance is for financers and policy makers to fully understand the benefits of DRE as well as the actual (as opposed to perceived) risks and bankability of projects. A cadre of DRE champions will clearly be necessary in the interrelated areas of policy-making and financing.