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Reforming capital subsidy scheme to finance energy transition for the below poverty line communities in rural India

Prabhakar Yadav [a,*], Peter J. Davies [a], Sabah Abdullah [b]

[a] Department of Environmental Sciences, Macquarie University, NSW 2109, Australia
[b] School of Economics, University of Queensland, St Lucia Campus, Brisbane, QLD 4072, Australia

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ABSTRACT

India's rural poor are caught in a downward energy poverty cycle with either a lack of access to modern energy sources or reliable grid electricity supply. Overcoming these barriers will require strategies that account for extremely low levels of income, lack of access to finance, poor awareness of alternative energy technologies and deficient post-installation service on solar home systems (SHSs). Our study is novel in examining reasons accounting for the slow adoption of SHSs in rural areas from the perspective of a rural (Grameen) bank. We reveal current government energy policies especially SHS subsidy scheme, largely exclude those below the poverty line. This self-induced socioeconomic barrier, in turn, limits the involvement of the banking sector who report additional barriers including higher lending costs and financial risks coupled with internally restrictive lending practices. We propose a revised framework the Rural Energy Transformation through Pro-Poor Subsidy to support an SHS capital subsidy scheme which specifically includes below poverty line households, and incorporates an electronic subsidy disbursement mechanism designed to improve efficiency and effective delivery between five key actors. These include the National Bank for Agriculture and Rural Development, the Regional Rural Banks and suppliers deploying and maintaining subsidised SHS and the rural households. The framework would establish a contractual partnership between banks and suppliers, and at a policy level would require the government to mandate banks to lend at low margins and offer dedicated subsidy benefits to low-income populations to enable a rural energy transformation.

Introduction

Energy poverty within rural India remains an economic, environmental, and social problem. Previous attempts to resolve this by extending centralised grid electricity have offered inadequate relief (Palit & Bandyopadhyay, 2015). An alternative and complementary approach is providing decentralised renewable energy solutions that can also complement national carbon emission targets. India currently produces 70% of its electricity through fossil fuels (IEA, 2015). In 2015, it pledged to reduce the emissions intensity of its GDP by 33% to 35% from the 2005 level, and install 40% of non-fossil fuels based capacity in the power sector by 2030. In spite of the past limitations of a centralised electricity grid system, the national government in 2015 announced its '24x7 - Power for All' policy that seeks to provide comprehensive access and reliable electricity to all by 2019, primarily through a centralised and grid supported infrastructure (GoI, 2015; MoP Government of India, 2015). India in particular, faces compounding challenges to provide accessible electricity that it is affordable, reliable, and financially viable to its 276 million people living below poverty line (BPL) who earn less than the US $1.25 per capita per day (representing 23.6% of the total population) (Gangopadhyay, Ramaswami, & Wadhwa, 2005; World Bank, 2015).

Technologically, researchers have argued that photovoltaic (PV) solutions have emerged as a better alternative to grid extension in remote or rural areas given the high cost of grid infrastructure and declining cost of solar panels (Kamalapur & Udaykumar, 2011; Mainali & Silveira, 2012; Nouni, Mullick, & Kandpal, 2008; Zhang, 2014). Solar PV solutions have been able to provide satisfactory services to the rural poor and raise their income and quality of life (Sharif & Mithila, 2013). At the household level, solar home systems (SHSs), including solar lighting or pico systems are the most economical and sustainable

Abbreviations: BPL, Below Poverty Line; BUPGB, Baroda Uttar Pradesh Gramin Bank; CASE, Commission for Additional Sources of Energy; CDM, Clean Development Mechanism; FYPs, Five-Year Plans; GoI, Government of India; HH(s), Household(s); ICT, Information and Communications Technology; IT, Information Technology; JNNSM, Jawaharlal Nehru National Solar Mission; JGL, Joint-liability group; MFIs, Microfinance Institutions; MLP, Multi-Level Perspective; MNES, Ministry of Non-conventional Energy Sources; MNRE, Ministry of New and Renewable Energy; MoP, Ministry of Power; NABARD, National Bank for Agriculture and Rural Development; NGO, Non-Governmental Organisation; RRB, Regional Rural Bank; NAPCC, National Action Plan on Climate Change; PV, Photovoltaic; RESCO, Renewable Energy Service Company; SHS, Solar Home System; SHG, Self-Help Group; SELCO, Solar Electric Light Company; TT, Technological Transitions; UIDAI, Unique Identification Authority of India.

* Corresponding author.
E-mail addresses: prabhakar.yadav@hdr.mq.edu.au, (P. Yadav), peter.davies@mq.edu.au, (P.J. Davies), s.abdullah@uq.edu.au. (S. Abdullah).

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energy solution to meet the energy demand in remote and rural areas (Borah, Palit, & Mahapatra, 2014; Chaurey & Kandpal, 2010; Choragudi, 2013; George & MacGill, 2016; Glemarec, 2012; Rai, 2004; Wijayatunga & Attalage, 2005). Still, poorest households in rural areas are not the major adopters of SHSs (van der Vleuten, Stam, & van der Plas, 2007).

Rural BPL households spend their limited income on kerosene for lighting. This expenditure represents a large cumulative potential market for alternative energy systems. Despite this potential market, the rural BPL sector has been largely ignored by the private sector who have rather focused their products and services to those who earn above the US $1000 annually, which is two times higher than the annual income of BPL households (Friebe, Flotow, & Täube, 2013). Another key problem in increasing SHS uptake among BPL rural households is their low and unsteady income making difficult for the solar industry to engage with this potential customer segment (Adib, Gagelmann, Koschatzky, Preiser, & Walter, 2001; The Climate Group, 2015; UNCDF and UNDP, 2012). As a result, there remain no explicit financial provisions for lending to the low-income market in the absence of credit record and material collateral (Adib et al., 2001). Hence, financial institutions including rural banks are reluctant and typically have internal risk-based lending policies that limit offer loans to this market.

In 2015, 240 million people in rural India did not have access to electricity from the centralised grid (IEA, 2015). The majority of these people live in either un-electrified households located in grid-connected villages, unelectrified hamlets of electrified villages or un-electrified households located in isolated and remote areas (Palit, 2016). Many are caught in a downward energy-poverty spiral as a consequence of their limited ability to pay for clean energy (like solar PV system), poor access to finance, inadequate awareness of technology, and in turn an inability to modernise their employment opportunities that require direct or indirect access to energy (Komatsu, Kaneko, & Ghosh, 2011; Palit, 2015; Palit, 2016; Rebane & Barham, 2011). Poor households are forced to use inefficient and polluting fuel sources like kerosene for lighting, which presents number of health hazards and cause various diseases, especially among women and children (Bai, Khazaei, van Eeden, & Laher, 2007; Baker & Alstone, 2011; Koirala, Modi, Mathur, & Kafl, 2011; Lam, Smith, Gauthier, & Bates, 2012; Mills, 2005; Mills, 2016). Rural BPL households face a complex web of financial, policy, technological, institutional, and societal challenges (Table 1) that hinders their transition towards a more sustainable energy future. The deployment of SHSs to BPL households remains limited, despite ongoing government support and high solar energy potential in India (749 GWp), (IEA, 2002; NISE, 2014; Srinivas, 2018).

Despite the energy-poverty spiral faced by BPL households, there have been some attempts to address the structural challenges. For example, Ministry of New and Renewable Energy's (MNRE, n.d.) capital subsidy scheme for standalone solar products under a partnership with National Bank for Agriculture and Rural Development (NABARD)[1] offers subsidy benefits through the banking system that links solar vendors with households (MNRE, 2016). While partially successful the scheme was insufficient to meet actual demand for SHS (Annexure VI)[2] and there was no provision for the inclusion of below poverty line (BPL) households. Subsidy management system is also inefficient due to the involvement of multiple actors, often associated with financial leakages and delays due to time-consuming approval process, triggering uncertainty among service provider and customer which adversely impact the interest and uptake of SHSs within potential customers (Bhattacharyya, 2006; Jha & Jain, 2012; REWG-SELCO, 2012). Rural customers opting SHS often face a greater challenge with a lack of longer-term maintenance support which undermines the benefits of the technology and ultimately the traction needed for an energy transformation (Pode, 2013; Terrado, Cabraal, & Mukherjee, 2008). These barriers call for a simpler process of credit access to ensure inclusion of low-income households and comprehensive service and maintenance framework for sustainable adoption of clean energy in rural areas (Martinot, Cabaal, & Mathur, 2001).

Rural banks are specialised in dealing with the rural households and, may provide the best and an immediate pathway to overcome the inherent barriers to break the downward energy-poverty spiral in rural India. Rural banks form part of India's socio-financial structure, are able to disseminate information to local communities and could play a major role in directly supporting SHS deployment to the BPL community (Ashden, 2008; Harish, Iychettira, Raghavan, & Kandlikar, 2013; Painuly & Usher, 2006; UNEP, 2007). While rural banks have been successful in financing SHSs at a smaller scales, their programs have neither been expanded to larger scales nor have they been focused on BPL households (with the exception of a few cases) (Ashden, 2008; Martinot et al., 2001; MNRE, 2016; UNEP, 2007).

Here, we present a framework that may reform the current subsidy scheme (IT-enabled, transparent and efficient subsidy disbursement structure) and support government policies in favour of rural BPL households to access subsidy support and low-cost financing through existing state-run rural banks to supply SHS under a contractual agreement (See revised framework for SHS adoption under results and discuss) between rural banks and private solar suppliers. This approach builds on and enhances existing pathway that links government, financiers, suppliers, and maintainers of technical solutions with BPL households. At the broader scale, this framework may also provide a blueprint

Table 1
Barriers to solar home system (SHS) deployment in rural areas in India and in developing countries.

Category	Barriers to SHS deployment in rural areas
Financial	Availability of capital
	Lack of financing
	High-interest rates
	High transactions cost
	Limited access to affordable credit
	High first cost and affordability
	Lack of successful business models
	No link with income generation
Policy	Lack of policy and legal framework
	Improper use of subsidies
	Issues in clarity of policy
	Lack of financial incentives
	Lack of strong implementation/enforcement of policies
	Donor dependency
	Unrealistic political commitments
Technical	Limited product availability and logistical problems
	Technical limitations (efficiency and capacity)
	Improper maintenance
Institutional	Low institutional quality and Inadequate planning capacity
	Poor organisational capacity and lack of technical knowledge
	Limited private sector involvement
	Lack of an established rural market
	Lack of business financing and skills
	Inadequate market infrastructure, sales and service networks
	Limited ability to train adequate number of technicians
	Bias and unwillingness to adopt of off-grid electricity among power utilities
Societal and cultural	Misperception regarding the technology
	Missing link to existing social structures and values
	Poor consideration of gender in energy issues
	Poor local participation
	Unrealistic expectations
	Aid dependency

Compiled based on (Friebe et al., 2013; Glemarec, 2012; Kapoor et al., 2014; Martinot et al., 2001; Palit, 2013; Sovacool, 2012; Sovacool et al., 2011; Timilsina, Kurdgelashvili, & Narbel, 2012; Urmee et al., 2009; Wamukonya, 2007; Wong, 2012).

[1] NABARD is a refinancing institution responsible for policy, planning, and operations of credit for agriculture and other economic activities in rural areas. More details on NABARD at https://www.nabard.org/english/Home.aspx.

[2] MNRE lighting scheme 2016 at https://www.nabard.org/pdf/LIGHTING-2016-Circular-Bilangual-operational-guidelines.pdf.