Original research article

Imagining renewable energy: Towards a Social Energy Systems approach to community renewable energy projects in the Global South

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A B S T R A C T

Rural community energy projects in the Global South have too frequently been framed within a top-down technologically-driven framework that limits their ability to provide sustainable solutions to energy poverty and improving livelihoods. This framing is linked to how energy interventions are being imagined and constructed by key actors in the sector, via particular sociotechnical imaginaries through which a set of increasingly universalised energy futures for rural communities is prescribed. Projects are too frequently reverse-engineered through the lens of particular combinations of technologies, financial models and delivery mechanisms, rather than by attending to the particular energy needs/aspirations of individual communities. Assumptions over the association between energy access and livelihood enhancement have also reinforced a technocratic determination of appropriate system scale and a search for universalised 'scaleable' delivery models. There is, however, no necessary causation between scaleability and outcomes – appropriate implementation scales are not purely determined by technical or financial considerations, rather it is the social scale via which optimum forms of local participation and ownership can be achieved. To operationalise this concern for social space we propose a Social Energy Systems (SES) approach that is advanced via exploration of the interactions between three distinct but mutually edifying variants of energy literacy – energy systems literacy, project community literacy and political literacy.

1. Introduction

The emergence of the 'energy trilemma' as a concept[1] and framework for global action has captured the imagination of political elites the world over. The trilemma heralds a new 'energy era' characterised by the need to address simultaneously three key policy drivers: energy security, climate change mitigation and energy access/equity to ensure long-term sustainability of global energy systems [1–4]. Addressing the trilemma is undoubtedly challenging and will require deep structural changes to energy systems such that technology, infrastructure, policy, scientific knowledge and social and cultural practices all become increasingly aligned towards achieving the same goals. With anthropogenic climate change becoming rapidly more evident and poorer Southern communities the most vulnerable to its effects, the focus on renewable energy technologies (RETs) as a suite of instruments with the potential to address all three (ostensibly contradictory) forces constituting the trilemma is becoming more and more acute. In the last two decades, where energy poverty alleviation in particular is concerned, a veritable industry has matured to address the tripartite constituents of appropriate technology, scale and financing that collectively form the substance for energy access for the world's poorest communities.[2]

But the linear, top-down techno-logic that tends to shape the design, development and implementation of RETs the world over encounters numerous obstacles and limitations. Projects implemented without an in-depth understanding of the sociocultural context in which the projects are to be embedded often fail to engage with the ways in which local communities envision their own futures and the role of energy in delivering and sustaining such visions. Watson et al. [[5], p. 2] suggest

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that the academic literature on the barriers affecting the increased use of modern energy services is similarly weak on understanding the social, cultural and political dimensions to such barriers in contrast to that relating to economic and technical barriers. While there is a wealth of empirical evidence to suggest that projects often achieve developmental benefits in terms of health, education, security and social integration to varying degrees, the degree to which RET projects address the poverty of household members and their ability to generate income is less clear. In fact, evidence suggests that they do not [6–8] and in some cases actually impose additional financial burdens. We argue that principally this is because of the way the energy trilemma, and within it notions of energy poverty, have been politically constructed. Imagined in this way, states and transnational organisations (e.g., international development agencies) have prescribed particular energy futures that comprise "collectively imagined forms of social life and social order reflected in the design and fulfilment of nation-specific scientific and/or technological projects" (Jasanoff and Kim [[11], p. 120]). Such 'sociotechnical imaginaries' [11,12] become a means by which energy discourses and practices are not merely described, but structured, materialised, naturalised and reified. They thus come to constitute a mechanism through which energy futures are directed (this connects quite closely to the idea of sustainability pathways central to the approach pioneered by the STEPS Research Centre at the University of Sussex: see Leach et al. [13]). But these top-down accounts of potential futures "run into conflict with actors who have different visions and goals" and ignore important visions of the potential of energy technologies to reconfigure and enhance existing social, cultural and technical practices at the household and community levels [[14], p. 228].

In the case of RETs, this means that to a substantial degree potential solutions to global energy poverty are being reverse-engineered[3] through the lens of supposedly sustainable technologies, financial models, multilevel policies and scalability in technology rather than attending to the particular (current and future) energy needs and aspirations of the communities in question. This is important to the implementation of projects because the empirical record of their perceived success or failure (both from above and below) supports the assertions made by Eaton et al. [[14], p. 228] who, in the specific case of bioenergy, argue that "sociotechnical imaginaries play a crucial role in conflicts over RETs. While the state and interested actors work to convert imagined futures into reality, local actors define and contest the ways bioenergy may or may not contribute to a better future." At this point it is worth noting that sociotechnical imaginaries are not unreal; on the contrary, where RET projects are concerned, energy and development actors, technology types and scales, government policy and regulation, financial models and resources for implementation, and the agendas and actions of implementers can constitute very real obstacles or opportunities for communities to negotiate on their journeys towards imagined energy futures. Nonetheless, such sociotechnical journeys are as are much shaped by the material realities and lived experiences of individuals and communities subjected to resulting policies and applied technical interventions, as they are by the imagined futures and socially constructed experiences of politicians, practitioners and experts.

This paper examines the often conflicting sociotechnical imaginaries (including the emergence of counter imaginaries) of energy poverty alleviation through the implementation of community solar RETs across the Global South. Given its status as the leading alternative to grid-based rural electrification and the attractor of most World Bank funding for renewable energy, solar is additionally important because of the household/community scale at which it is being deployed. Figures from the REN21 (Renewable Energy Policy Network for the 21st Century)

Global Status Report suggest an increasing proliferation of solar home systems (SHS) programmes with an estimated three million systems now installed in the Global South, including particularly substantial uptake in countries such as Kenya and Bangladesh. Bangladesh, for example, has since 2003 installed over 1.3 million systems, totalling 30,000 monthly sales nationwide [16,17]. Sovacool and Drupady [18] suggest that SHS in particular are a 'vital' and 'cost effective' technology employed by international financial institutions in their efforts to curb global energy poverty. Mala et al. [[19,p. 361] characterise the ubiquitous portrayals of solar as reliable, able to satisfy basic needs, being easy to operate and maintain and providing income-generating possibilities, as views that "have become so pervasive that they are hardly questioned." Building on these success stories, recent years have seen considerable investment in explorations of the potential of small community-scale solar PV (Photo-Voltaic) grids of various dimensions as a next wave of RET development across the South [20–23].

In exploring the burgeoning literature on the deployment of solar technologies at these different scales it is interesting to note the ways in which the purposes, promises and pitfalls of community solar projects are imagined differently by different actors across the whole energy system. Community and household energy projects are a complex amalgamation of science, technology, policy, infrastructure, social and cultural knowledge, practices and norms embedded in and affected by broader national and global political economy processes. Such projects comprise different ways of knowing, performing and imagining (solar) energy in daily life that need to be brought into dialogue with one another to ensure a holistic understanding of how each project can be adapted and implemented to meet each community's energy needs and aspirations. Consequently, we propose the development of a 'Social Energy Systems' (SES) approach to energy projects which we characterise as a framework that establishes connections between different forms of literacy – comprised of an energy systems literacy and project community literacy overlain by a political literacy that is needed to facilitate shared imaginaries across the whole project. This SES approach is indebted to the concepts of sociotechnical transitions [24,25] and approaches that stress the co-production of technology and society[4] [26] in facilitating the process of mutual transformation from one energy system to another [27,28].[5] It is, moreover, predicated on the premise that learning at multiple levels is important for transitioning to sustainable energy futures [24].

Nowhere is this learning at multiple levels more important than in developing contexts where the sociotechnical transitions approach has in recent years begun to be applied [29–31]. A special edition of Environmental Science & Policy introduced by Berkhout et al. [32] focused on developing Asia to explore the wider impacts of sociotechnical innovations developed via niche experiments. Work on energy transitions in sub-Saharan Africa [33,34] has shown that SHS innovation processes are shaped as much by political, social and environmental forces as by powerful economic and institutional interests and any attempts to replicate the success of initiatives will fail unless sufficient attention is paid to the specificities of the local context. Being literate in the energy system, community and political context in which the energy project is being embedded is critical to the perceived success of the transition.

From this sociotechnical transitions perspective, energy systems can be understood as a patchwork of interdependent regimes whose interactions help co-produce and reinforce the conditions necessary to maintain the existing sociotechnical system. Understanding of the different technological, social, cultural, economic, political, regulatory,

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[3] In this case, the authors intend reverse-engineer to mean beginning with a particular RE technology (solar, wind) at a particular scale advanced by the state of development of the technology (Solar Home System, large wind-turbine) and then "analyzing (the) subject system to create representations of the system at a higher level of abstraction" [15].

[4] Sociotechnical imaginaries are closely linked to the concept of co-production and help explain why some visions of social and technical orderings are co-produced in preference to others. However, it is important to clarify that Jasanoff's use of sociotechnical imaginaries is not related to the extensive sociotechnical transitions literature.

[5] These are approaches that have frequently been applied to discussions of Northern energy transitions but much more infrequently to energy transitions in other settings.