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World Development Vol. 35, No. 1, pp. 144–162, 2007

0305-750X/$ - see front matter

doi:10.1016/j.worlddev.2006.10.001

Connective Power: Solar Electrification and Social Change in Kenya

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Summary. — Market-based rural electrification with solar energy is increasingly common in developing countries. This article revolves around three main claims about solar electrification in Kenya's unsubsidized market: (1) The benefits of solar electrification are captured primarily by the rural middle class. (2) Solar electricity plays a modest role in supporting economically productive and education-related activities, but "connective" applications such as television, radio, and cellular telephone charging often receive a higher priority. (3) Solar electrification is more closely tied to increased television use, the expansion of markets, more rural–urban communication, and other processes that increase rural–urban connectivity than to poverty alleviation, sustainable development, or the appropriate technology movement.

Key words — solar energy, rural development, Africa, Kenya

1. INTRODUCTION

Solar electrification has emerged as a leading alternative to grid-based rural electrification in many developing countries. This may seem like a victory for appropriate technology advocates, but my research in Kenya indicates that solar electrification is, at best, only loosely linked to Schumacher's classic "small is beautiful" vision of building small scale, locally self-reliant alternatives to global capitalism (1973). Instead, the social uses of solar electricity in Kenya are more closely tied to increased rural TV use, expansion of consumer goods markets, more rural–urban communication, and other processes that increase social and economic interconnection between rural people and their counterparts in national and international urban centers.

These interconnections are facilitated when rural Kenyans, in most cases from the rural middle class, use solar electricity to power "connective" appliances, including televisions, radios, and cellular telephones. Connective applications are especially prevalent in households with the small solar photovoltaic (PV) systems (<25 W) that are most common in unsubsidized solar markets like the one in Kenya. Thus, while solar PV is commonly framed as an element in efforts to promote sustainable development through the delivery of *lighting* services to unelectrified areas, evidence from Kenya indicates that the development implications of solar electrification are closely linked

* It is a pleasure to thank the many people and institutions who have supported me in my research. This work would not have been possible without the expert and tireless efforts of Maina Mumbi and Henry Watitwa. I am indebted to Mark Hankins for his insights, hospitality, and friendship over the past six years. I thank my advisors and colleagues in the Energy and Resources Group at the University of California, Berkeley, and elsewhere. I am especially grateful to Daniel Kammen, Gillian Hart, Michael Watts, Isha Ray, Rebecca Ghanadan, Shannon Graham, Kamal Kapadia, and Richard Duke, as well as four anonymous reviewers. I thank Thomas Jayne and James Nyoro of the Tegemeo Project, Mbiri Gikonyo of the Kamfor Company, Ltd., and George Waititu of the Steadman Research Group for providing me with access to survey data from their respective organizations. This work was supported financially by the Energy Foundation, the Link Energy Fellowship, the Rocca Fellowship for African Studies, and the EPA-STAR Fellowship. Final revision accepted: June 19, 2006.

to its role in enabling the use of "connective" devices. This article provides an assessment of the social significance of rural electrification with solar energy. Kenya, which has one of the largest per capita markets for solar PV technology among developing countries, provides an excellent setting for this analysis.

2. SOLAR PV AND DISCOURSES OF DECENTRALIZED DEVELOPMENT

International donor support for rural electrification with solar energy began in the late 1970s, and grew especially rapidly in the years following the 1992 UN Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil. Since then, the Global Environment Facility (GEF) and the World Bank together have leveraged over $2 billion in support of solar electrification (International Resources Group, 2003). In recent years, the fraction of GEF and World Bank funding for renewable energy projects that has been allocated to solar PV has become so large that the advocates of other renewable energy technologies have started to complain [1] (e.g., Inverson, 1996; Karekezi & Kithyoma, 2002; Villavicencio, 2002). The enthusiasm for solar electrification is not, of course, limited to mainstream institutions like the World Bank and the GEF. Environmental groups such as Greenpeace, the World Watch Institute, and many others are also strong advocates (e.g., Dunn, 2000; Greenpeace, 2001).

The increase in donor support for solar electrification is widely associated with concerns about the environment—and especially global climate change—as well as rural poverty in developing countries. However, a growing number of analyses indicate that the carbon mitigation potential of rural electrification with solar PV in developing countries is expensive compared to alternative mitigation approaches (Jacobson, 2004; Kammen & Pacca, 2004; Kaufmann, 2000; Villavicencio, 2002). Many solar policy makers and advocates acknowledge this, and draw on neo-populist [2] "basic needs" style arguments about poverty alleviation and rural development to justify international support for solar electrification [3] (e.g., Greenpeace, 2001; Kaufmann, 2000; Ybema, Cloin, Nieuwenhout, Hunt, & Kaufman, 2000). Singh and his colleagues at the Renewable Energy Policy Project (REPP), a Washington, DC-based policy research group, captured this perspective succinctly in regard to household solar electrification:

> Installing a solar home system (SHS) in a developing country is not the cheapest way to reduce carbon emissions today. And yet people frequently mention SHS as an important tool in the global effort to combat climate change. Should people think of solar as a prime climate change mitigation strategy? You would say "no" if you are solely concerned about keeping the cost per ton of greenhouse gas (GHG) emissions as low as possible... You would say "yes" if you are concerned with pollution control as well as alleviating the inordinate amount of poverty in rural regions. The "co-benefits" to climate change mitigation, ..., are too great ... SHSs can play a role in promoting economic and social development in the developing world while protecting the environment (Singh, Campbell, Roberts, & Serchuk, 2000).

While concerns about the environment and rural development are central to discourses about the need for solar electrification, market-oriented approaches have emerged as the primary vehicle for disseminating solar PV systems in developing countries. The single largest trend in international solar policy circles over the past decade has been to shift solar dissemination strategies from heavily subsidized donor projects to private market-based approaches that seek to achieve—or at least move toward—"full cost recovery" (Covell & Hansen, 1995; Martinot, Chaurey, Lew, Moreira, & Wamukonya, 2002; van der Plas & Hankins, 1998).

Solar photovoltaic technology emerged as an important tool for rural electrification at a time when neo-liberal policies dominated mainstream development thinking. In the late 1980s and 1990s, a period that some have called the age of "market triumphalism" (Peet & Watts, 1993), mainstream development policies emphasized economic liberalization, privatization, and market-based approaches to service provision (Kapur, Lewis, & Webb, 1997). In the energy sector, donor financing for state-owned electricity infrastructure was reduced, while efforts to support liberalization, reforms, and private sector participation expanded. In this context, public support for grid-based rural electrification was sharply curtailed in many countries (Dubash, 2003; Karekezi, Kimani, Mutiga, & Amenya, 2004). Thus, market-based solar electrification grew at a time when publicly financed rural electrification schemes were in decline.

Solar PV, a small-scale technology that can be used to provide decentralized electrical service to individual homes or businesses, is particularly compatible with market-based distribution. This