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Supplying power to remote villages in Lao PDR. — The role of off-grid decentralised energy options[1]

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ABSTRACT

In Lao PDR, a least developed country in South-East Asia, provision of electricity to remote areas is a high priority for the Government, which has the objective of electrifying 90% of the population (in terms of number of households) by the year 2020. While this objective is commendable and tremendous progress has been made over the past 10 years in terms of rural electrification, some important questions remain unanswered. Currently, grid extension is the main technical option considered. One of the main reasons for this push for grid extension is the assumption that access to the grid means development. However, when analysed closely, the reality from the field is far more complex. Although grid electricity has tremendous potential to provide economic development opportunities in rural areas, it also has some drawbacks. In particular, productive activities fail to develop in many grid connected villages where the demand for electricity remains low even after a few years after having been grid electrified. This paper argues that alternative options to grid extension, e.g. off-grid decentralised renewable energy (DRE), exist, are often more attractive financially and could be promoted more effectively. These technologies can be cheaper than grid extension, even on a like-for-like comparison.[2] DRE technologies also provide opportunities for development, even without driving large productive loads. These opportunities are presented in terms of 1) the flexibility of needs that DRE technologies can satisfy, 2) empowerment of rural communities and 3) decentralised decision making processes. So far, the promotion of DRE in Laos has not always been successful, but this should not be an argument against promoting these options. A close look at recent rural electrification project budgets reveals indeed that grid extension is far more subsidised than DRE, raising concerns about the social equity of such projects.

Introduction

The link between energy access (and electricity access in particular) and development has been widely acknowledged (IEA, International Energy Agency, 2010; World Bank/AUSAID, 2011). Developing countries all aspire to increase the level of access to electricity to their rural population. With a nominal GDP per capita of US$1177 in 2010 (World Bank, 2012), the Lao PDR is considered by the United Nations as one of the Least Developed Countries (LDCs). The Government of Laos is aiming to graduate from LDC status by the year 2020 and one of the targets to achieve this objective is to provide electricity to 90% of Lao households by 2020, with an intermediate target of 70% by 2010.

According to Electricité du Laos (EDL)'s official statistics, this intermediate target was achieved, with an electrification rate of 72.98% at the end of 2010 (EDL, 2010a). This was achieved mainly through extension of the national grid, although it is estimated that in 2008, around 5% of all households had access to electricity via small-scale decentralised renewable energy (DRE) technologies (Nippon Koei, 2010).[3]

The share of households with electricity access has risen rapidly from just 14.6% in 1995 to over 70% in 2010. Considering the Lao PDR's low level of development, its scarce financial resources and relatively low population density, this has been a truly remarkable achievement. However, electrifying the remaining 27% of households poses a different set of challenges. Most of the remaining households are geographically dispersed in rural villages away from large population

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[1] This paper is an adapted and updated version of a paper initially presented at the International Conference: Know your Power, organized by MEE NET on 18–19 January 2012 in Bangkok and available at: http://www.meenet.org/images/power/81329880656_file.pdf.

[2] Comparing the cost of each option supplying the same amount of electricity (in kWh).

[3] However, it is not clear which technologies were included in this 5%. In particular, it is not whether or not pico-hydro, which according to Smits and Bush (2010)'s estimates provide power to 90,000 households, was included.

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centres, and many are situated in mountainous terrain with poor public infrastructure (such as road access).

This raises the question as to whether the delivery models used in the past (i.e. with a heavy bias towards grid extension) are still valid for electrifying the remaining households, or whether they need to be re-considered. In this paper, we argue for the latter and that particularly in remote areas, cheaper and cleaner alternatives to grid extension should be given more consideration.

Grid extensions to remote villages occasionally fail to deliver the promised economic development opportunities and in some circumstances, decentralised renewable energy (DRE) technologies could provide a valuable alternative to grid extension. This would allow for faster and cheaper rural electrification while providing a unique opportunity to empower rural communities.

This paper proposes the use of off-grid DRE technologies as a viable alternative to grid extension based on justification across the following three dimensions:

- Financial limits to grid extension
- Issues with subsidies and equity
- Participatory, community oriented nature of DRE vs. the top down nature of grid extension

Delivery models for rural electrification in the Lao PDR

On-grid delivery models

The main delivery model for rural electrification in the Lao PDR is through grid extension. This model typically works as follows: the Government plans and finances the grid extension (for example, a 22 kV transmission lines and a 230/400 V distribution system) while the end-users (i.e. households) pay for the internal household wiring, metres and a dropline from their house to the low voltage distribution system. The cost of the distribution system is sometimes shared between the Government and the end-users.[4] Once built, the 22 kV transmission and low voltage distribution systems are operated, managed and maintained by the national utility, Electricité du Laos (EDL). Payment for electricity is made on a periodic ongoing basis through metre reading by EDL staff; there is no evidence that pre-paid metres[5] are being used in Lao PDR.

A relatively new delivery model that has been observed in a few of the Northern Provinces is for private companies to build 22 kV transmission lines and low voltage distribution lines at their own cost and then transfer them over to EdL for operation and maintenance. The companies are then reimbursed for their investment by the Government over a period of time, usually 5 to 7 years.[6] This model should be studied in more detail to reach more definitive conclusions, but informal discussions indicated that these investments can be risky and unprofitable for the private companies involved. They are risky because once the investment is made and the transmission and distribution lines are installed, the company is completely reliant on the government to be reimbursed.[7]

Off-grid delivery models

The main off-grid delivery model in the Lao PDR, in terms of scale, is the off-grid component of the Rural Electrification Programme of the World Bank. So far, this programme has mainly promoted standard size solar home systems (SHS) under a rent-to-buy model, whereby end-users pay a small fee upfront and then an ongoing monthly fee over 5 to 10 years, after which point the system is considered theirs. The end-users' fees cover some of the programme implementation costs, but are mainly paid to a Rural Electrification Fund (REF), which is supposed to promote the use of renewable energy in rural areas. However, to date, the REF has not proven to be an effective tool to promote off-grid rural electrification since there are no mechanisms and/or regulations to allocate capital from the fund to project developers.[8]

In the past, micro-hydropower was a popular off-grid technology. According to EdL, 31 micro-hydro facilities were built in the eighties and nineties, mainly funded by the Overseas Development Assistance (ODA) grants (EdL, 2006). However, most of these facilities have ceased working or are providing unreliable services compared to what should be expected from this technology (Deutsche Gesellshaft fur Sonnenenergie, DGS, 2005).

Other efforts in off-grid electrification include a JICA pilot project to promote SHS in the early nineties, a commercial SHS rental system developed by Sunlabob (a local private company), two village scale solar PV projects in Ban Hoaung Se (funded by NEDO/METI) and Ban Phakeo (funded by FONDEM) and a battery charging station project implemented by the company Grenzone (funded by GOH Foundation from Singapore). Additionally, other NGOs or development projects install small-scale renewable energy technologies to serve specific purposes, e.g. solar pumps for irrigation, solar lights for non-formal education, solar fridges for vaccination storage, etc. These are usually 100% funded by projects and are ad hoc in nature.

Lastly, an interesting and often overlooked delivery model for off-grid technologies in the Lao PDR is the purely market driven promotion of pico-hydro turbines described in details in Smits and Bush (2010).

Financing rural electrification projects

The Government's programme for rural electrification (both on-grid and off-grid) is mainly financed by multilateral and bilateral loans and grants. The Asian Development Bank (ADB) and the World Bank (WB) have traditionally been the main sources of funding for grid extension projects in rural areas. Over the period 1987–2010, ADB and WB provided US$398.76 m in grants to the Lao Government for grid extension programmes. As a comparison, during the same period of time, the two multilateral development banks provided US$4.68 m for off-grid projects (or just 1.17% of total rural electrification grants). In recent years, countries such as China and India have played an increasing role in financing rural electrification programmes through grant and loans attached to the condition that construction material and services are purchased from the donor country (World Bank, 2010).

What becomes apparent when reviewing the rural electrification sector in the Lao PDR is that grid extension is given far more precedence over the promotion of off-grid DRE technologies. In this

[4] Interview with EDL Xieng Khuang, 6 May 2010.

[5] Where villagers "recharge" in a similar fashion as mobile phones top up cards.

[6] Several discussions with Government Officials, most notably with representatives of Provincial Authorities of Xieng Khuang Province in February 2011 and 2012 and with a representative of the Ministry of Energy and Mines on 19 January 2012.

[7] Author's interview with one of the companies involved in this model which prefers not to be named (18 February 2011).

[8] This assertion is based on the authors' experience and numerous discussions with rural electrification actors in the country. Also World Bank/AUSAID (2011) notes: "Subsidy funds for a scaled-up off-grid programme can be sourced from a properly designed and capitalized Rural Electrification Fund and disbursement mechanism." This means that such a mechanism does not exist yet.