Small-scale village electrification; an NGO perspective

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Paul Bryce, President of APACE; Assoc. Professor, Univ. of Technology Sydney[i]
Donnella Bryce, Program Director of APACE

This paper examines traditional mechanisms for Overseas Development Assistance (ODA) in the sector of rural village electrification, and the preconceptions that underlay these mechanisms. Some specific consequences 'on-the-ground' are examined. The reticence of many donors to commit further investment in the sector is understandable and may be explained by these results, but an understanding of the mechanisms may lead to an alternative approach.

Electricity is the most versatile of energy forms; indeed there is arguably no route to sustainable development in its absence. It does not automatically provide development paths, a fact that is implied later in this paper. Nevertheless electricity does represent a tool capable of economic, educational, health and other sectoral enhancements that are ingredients for controlling one's developmental destiny. In rural areas in particular, electricity has an important additional role as a vehicle for information flow, enabling a community to take part in affairs beyond its village confines, and making national political and social cohesion a meaningful concept.

Notwithstanding the need and benefits, electricity is not available for the vast majority of rural communities, and access is not improving at any significant rate. More people are without electricity with each passing year. Its highly uneven distribution represents a significant divide within and between nations.[ii]

The UNDP's Initiative for Sustainable Energy (UNDP, 1997) concludes that 'current approaches to energy are thus not sustainable and will, in fact, make energy a barrier to socio-economic development'. The document also notes that the 'conventional approach to developmental assistance, based on significant use of ex-patriots, is becoming increasingly more expensive. A new, more cost-effective approach… is needed."

Planned redirections towards new and renewable technologies and local capacity building (for example, UNDP,1997) have general merit, but some of the disappointing results of past efforts will remain unless a change in underlying presumptions is also included in new strategies. A new field-tested paradigm addressing past disappointments is presented here for the specific context of Melanesia, but may also be relevant in other similar contexts.

The challenges for rural energy supply:

The energy sector as a whole is in crisis. Whereas much can be attempted on the demand side in nations with adequate supply, nearly half the world's population have no affordable access to commercial energy services. Conservation and efficiency are academic notions in most rural settings of developing nations. Less than 20% of such villages have nominal access to

electricity and perhaps no more than a few percent have actual and consistent access (Reddy and Goldemberg, 1990).

Recently, some donors and other stakeholders have looked to new renewable technologies, and new financial arrangements involving the private sector, as a way around the dilemma. The notion that renewable technologies alone have an answer to rural needs, through their decentralised character, leads usually to debate on relative costs of some of these technological 'solutions'. The debate diverts serious attention from the managerial and institutional frameworks that remain central to any effort in this area.

Encouraging the use of private capital, in credit schemes, loan guarantees and B.O.O.T. and B.O.T. arrangements, may have application in urban and peri-urban areas in nations enjoying a moderately developed market base and middle class. It is seldom a solution for rural village contexts, particularly in contexts for which poverty-directed ODA is most relevant. In short, such arrangements become increasingly less attractive as the poverty-alleviation need increases.

'Natural' urban population drift has also become a reason for procrastination on the difficulties of rural energy supply. The serious side-effects of rapid urbanisation has diverted attention from the rural sector, although rural populations do continue to increase in absolute terms. As well, the institutional frameworks that exist in urban areas, at least in some form, tend to encourage urban-based ODA. Economic restructuring focuses further attention to urban institutions, and may be said to reduce the importance of the rural, informal sector. Nevertheless in many regions, and notably many of the small island developing nations of the Pacific, there is little prospect of a sustainable physical, social and political environment for economic restructuring without attention to the rural sector. Of the 90% of PNG citizens dwelling in rural areas, 3 out of 4 live in absolute poverty compared to 1 in 10 within urban areas (Flanaghan, 1997). In the Solomon Islands, the rural dweller accounts for 86% of the population. No more than 500 jobs are created each year in the formal urban sector, for an annual cohort of 6000-7500 school leavers (Bank of Hawaii, 1994). In such situations rural and urban problems are inseparable. A suitable approach to affordable electricity, that can enable a meaningful social, political and economic participation of rural citizenry, needs to be adopted.

The traditional paradigm:

There are a number of presumptions built into technical development assistance projects, and in particular village electrification projects. They are listed below, as generalities that apply in varying degrees to different programs and different national contexts. These are set out as caricatures, rather than judgements of any particular program in the sector.

Presumption 1: 'Village development is a technical matter':

Investment of ODA in the sector is increasingly recognised in the literature as serving a people-centred developmental objective, since financial analysis seldom finds such investment justified. Paradoxically, the developmental objective, at least at village level, remains unacknowledged in detailed project design. The indicators chosen for appraising, managing, implementing and evaluating and reporting on specific programs or projects are technical in

nature, rarely concerned with the translation process to people-centred development outcomes.

Initial assessment of a rural village electrification program, for example, is generally conducted by a team chosen for their technical training. Given a positive prognosis from this appraisal, prefeasibility studies often proceed to rank preferred sites for village electrification, using a weighted function of quantifiable technical and financial parameters. If decentralised renewable technologies are considered, the parameters would involve the potential of the energy source, such as the head and flow of water from available rivers, or the insolation available. If existing and projected demand for electricity at the site is estimated, the figures will normally derive from quantitative models presuming a formal economy, and will accordingly be very small or difficult to estimate. [These small figures are often self-fulfilling prophesies, for reasons discussed under Presumption 3.] If on-site estimates are considered, the field team will again be chosen for their technical measurement abilities.

Following these studies, projects proceed through detailed design, specification, tendering and construction in a similar technical vein. Accordingly, reporting in the literature of completed projects will often focus upon machinery choices and technical performance. Training aspects may be mentioned, focussing on the nature and extent of technical training associated with post-project requirements only. Such training is normally conducted for, and within, an institution remote from the village; in accordance with Presumption 3. In contrast, most failures of rural power schemes are attributed to local non-technical factors. The operation can be a (technical) success while the patient dies.

During each of these project phases, there is seldom meaningful contact with the target recipients, nor the context of their needs. The institutional strengthening that must accompany any infrastructural project is seen to be focussed elsewhere, in accordance with Presumption 2. A process of rural participatory appraisal, if considered, does not include village recipients in technical or management roles that may enable local strengthening.

In short the power supply industry, and its management methods, are based on specialised technology and support structures; the rural developing world is not.

Presumption 2: 'Village development is a First-World matter'

Developing nations generally find themselves particularly short of the technical expertise perceived in Presumption 1 as central to this developmental exercise. Technical expertise in the electricity sector is already over-extended by the challenges of maintaining the existing urban infrastructure. Trained people have an urban career path that follows their University engineering training, in which electricity system design and equipment choices are tied closely to the contexts of First-World institutional management and social structures.

Almost by definition, those regions in which ODA is most justified will be the most deficient in such technical expertise. Accordingly, overseas consultants are often relied upon to make assessments of a program, and here the mismatch of background and training with a rural people-centred objective is perhaps even more acute. The overseas technical consultant is generally chosen to have the maximum level of preconceived knowledge of power system construction and management learnt and applied in a foreign social, cultural and economic context. If such consultants also have exposure to developing country situations, their

experiences are likely to be in previous appraisal and design roles where the Presumption 1 has already been formed and reinforced.

Later feasibility and design stages are often provided by ODA-subsidised energy advisers, and dependence upon such overseas expertise will intensify as new and renewable technology projects become more frequent.

The tendering process (of Presumption 1) favours implementation by overseas-affiliated contractors. They bring experience gained in a context where equipment, technical infrastructure and educational structures are quite different to those found in local villages. A 'First World' methodology is 'planted' within an exotic physical, cultural and economic environment.

These methodologies have not 'taken root', with the response that the UNDP, for example, sees building indigenous capacities as a clear priority (UNDP, 1997). Nevertheless, such capacity building is still seen to involve translating and strengthening the first-world model of well-trained expertise within central institutions, a model that we argue will not directly address the challenge of sustainable rural village electrification.

The most important 'institution' to be strengthened must relate to local development, centred on the consuming community. Such an institution has most need, most motivation to focus on the underlying project objective, and is least distracted by competing contractual agreements and career paths.

Presumption 3: 'Village development is an urban matter'

Presumption 2 notes that the choice of expertise for appraisal, and indeed for program design, draws on a small selection of urban-based individuals, commonly with a lifetime of experience concentrated on technical and economic decisions as they pertain to a formal economy. In-country expertise may possibly be found within the Governmental Ministry or private sector of a major city, where the few technically-trained graduates have found rapid career advancement outside their rural origins.

Their training and experience of decision-making within the electricity 'industry' in urban centres reinforces assumptions that are not optimal for a rural village setting. Some are cited below:

- Decisions for urban electricity supply are adequately conducted without reference to specific consumer groups; their requirements are statistically predictable. The social context does not significantly impinge upon design and management; it is a delivery system only.
- Existing and projected demand can be quantified, operation and maintenance costs can be estimated, and competing energy technologies can be compared 'on paper'.
- The consumer, the designer and constructor, and the system operator are separate entities.
- The environment potentially affected by the power system, and the environment most relevant to beneficiaries, are separate.
- A power scheme ends with the generation system, or at most the transmission line. Existing cash-flow and power demand will support connection fees and a usage-based tariff system.

- Dwelling and building construction conforms to presumptions in electricity wiring standards developed in the First World.
- The cultural beliefs, the skills base and the local physical resources of clients are generally not a consideration.
- The land for power station and transmission facilities is either Government-owned or available for title purchase.
- There is no need for consumer training nor awareness programs, since separate mechanisms are available for safety licensing, operation and maintenance of the system, and for awareness of the developmental potential of electricity usage.

In short the power supply industry, and its thinking patterns, are centralised; rural people are not. None of the above assumptions were valid in rural energy projects conducted by the authors.

The consequences:

There are a range of endemic factors that lead to the Presumptions 1,2 and 3, not least of which is the isolation of recipients. Indeed, the very needs of rural village residents for poverty-alleviation and developmental programs stem largely from their position at the far end of a well-meaning but imperfect institutional pipeline of information and capacity-building. Their aspirations and their capacities are difficult to reach within cultural and organisational frameworks developed rationally from the opposite, donor-based end. The preconceptions of value-free technology, centralised management and context-free development that underlay these 3 Presumptions tend to be a natural result of ODA processes.

In short, it may be that the goal of sustainable human development at rural village level becomes, in practical application, divorced from the process of implementing village electrification programs. It may be this process that underlies shortcomings in results of rural village electrification programs, that have led to such persistent criticism in the literature.

Specific effects that the author has observed, particularly within the context of the Pacific Island developing states, may be summarised as follows:

1. Local communities are left with
    - a “Catch 22” of initially unaffordable costs for connection fees and usage tariffs;
    - rules that preclude connection to most forms of customary dwelling, based on wiring practices suitable for urban areas;
    - few, if any, skills derived from the project;
    - few, if any, direct employment opportunities;
    - little understanding of locally-appropriate possibilities for electricity-based development, since local involvement and discussion has been minimised by the management process, and the developmental objective has been largely lost in technical challenges of providing infrastructure for a harsh, remote site;
    - a lack of community cohesion to pool skills and capital for applications of the power, exacerbated by outside environmental and social disruptions from the construction phase;
    - internal social strains arising from the impact of an exotic technology, and in all probability the alienation of traditional land and resource holdings.

2. The host Government or Electricity Authority is left with
   - legal disputes arising from land alienation, and possibly displaced persons;
   - recurrent maintenance, repair and security costs at a remote site;
   - minimal revenue from tariffs, as the subsistence economy is presented with no obvious means to exploit the available electricity;
   - low plant utilisation factor, leading to reduced motivation for expansion or replication;
   - disappointing lack of local cooperation and communication regarding minor operation and maintenance tasks, and possibly security problems, arising from many of the above factors;
   - no development of local infrastructure to support service personnel;
   - imported machinery fabricated by exotic production techniques that cannot been replicated in-country;
   - minimal employment generation, even in urban areas, given the imported machinery;
   - added social costs, arising from continuing population drift to urban areas, perhaps exacerbated by the displacement of people and deterioration of local community cohesion.

An alternative paradigm:

There are long-standing examples of successful village electrification projects in the Solomon Islands, in which the debilitating residual characteristics listed above have not arisen (Bygrave, 1997). Indeed, remarkable social and economic development has followed such projects (Krajenbrink, 1984; Holden and Gammage, 1991; Offord,1995, Waddell, 1997). In essence, their common characteristic is a 'Village First' project management cycle. Institutional support runs through several levels, but major effort must occur at local level, and begins with day 1 of the appraisal process in which village recipients begin attaining ownership of the development process that is the objective of rural energy supply. The process may be separated into phases as follows:

1. A village request precedes a process of self-appraisal, based upon indicators of social cohesion, community goals, managerial and other capabilities and an information sharing regarding costs and responsibilities.
   Lesson 1: The developmental objective must be formulated and owned at village level.
2. An awareness workshop builds upon initial appraisal information, focussing upon appreciation of the technology, its implications and potential uses, and local resource investments necessary for a process where project effort is locally-focussed. A local technical appraisal, mirroring that found in conventional approaches, accompanies the workshop allowing preliminary feasibility results to be shared and possible difficulties discussed relative to local capacities.
   Lesson 2: Institutional strengthening begins early, and locally.
3. Feasibility design draws upon the results of the above processes, in which costs are weighed against (qualitative) indicators concerned with the likelihood of sustainable human development. Technical parameters influence potential costs and become a limiting factor in the magnitude of developmental potential. These parameters are influenced by social, environmental conditions as well as local resources, and are subservient to the major

questions of likely linkages between energy supply and human development.
Lesson 3: The technical design is within a local developmental context.

4. Project funding is based upon contribution-sharing, in which village communities are a significant stakeholder. A contract is drawn up to delineate respective responsibilities of donor, implementing agency and village community.
5. Implementation follows a design-and-construct methodology that allows some local decision-making and avoids costly processes of remote specification, tendering, contractual management and cost-over runs from unanticipated local difficulties.
Lesson 4: Local objectives are matched by local responsibilities.
6. On-site local training-by-doing, encouraged by previous phases. Off-site training for key women and men in operation, maintenance, project management, load utilisation, electricity safety.
7. A participatory follow-up phase of evaluation, based upon developmental indicators set by local priorities in phases 1 and 2.
Lesson 5: Evaluation is concerned with objectives and outcomes, rather than time-bound outputs.

The 'village first' model requires patiently-developed partnerships, but it is not a speculative, academic model. The approach has been adopted and proven in the field in differing technical and social contexts, over many years. Results are 'on-the-ground', with higher levels of local cohesion leading to endogenous maintenance and indeed improvements to infrastructure as well as locally-initiated developmental effects. There have been reductions in population drift to urban areas, schools locally constructed and increased attendance rates, improved health facilities and several local industries established.

Summary:

UNDP's Initiative for Sustainable Energy (UNDP, 1997), while observing the lack of sustainability of present mechanisms for energy supply, also proffers four planks to activity programmes in the future:

- capacity building
- encouragement of institutional and legal frameworks
- encouraging a leapfrogging to new and renewable technologies
- linkages between energy and developmental goals.

- The alternative 'Village First' project cycle for rural electrification discussed above addresses each of these facets in a fashion that provides the means for its appropriation to specific cultures, and has been demonstrated to be cost-effective.

The challenge may be seen in the words of a past achiever, quoted here out of context:

"The world that we have created, as a result of the thinking we have done so far, creates problems that cannot be solved at the same level at which we created them."

..... Albert Einstein

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[i] APACE is an NGO specialising in rural village electrification in the Pacific and parts of SE Asia. It can be contacted at APACE@UTS.edu.au; c/o University of Technology Sydney, PO Box 123, Broadway 2007, Sydney, Australia.

[ii] This corrosive effect on North/South relations, from the general failure to address energy needs at the poorest levels of global society, was evident from personal discussions and observations at the recent Rio + 5 Earth Summit.