

Strategies for a Sustainable Future: A Decade of Rural Electrification in South Africa (1991–2000)

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Approximately 66 % of all South African households currently have access to electricity. Over 80 % of urban households and about 46 % of rural households are connected to the national grid. An ambitious rural electrification program has more than doubled the share of electrified households in less than ten years. Does this mean that South Africa is well on its way to addressing energy and development goals for poor rural households?

The answer requires going beyond the statistics to deeper level questions about the impact of electricity on rural people’s livelihoods. Has access to electricity stimulated the growth of small businesses? What impacts does it have on household energy use patterns? Is the use of fuelwood reduced? Does access to electricity decrease household expenditure on fuels? What about the energy use patterns of the majority of rural households, who still do not have access to electricity?

Electricity and development

Access to electricity does not mean that people can or will use it optimally. It serves no purpose to provide access to electricity which the target beneficiaries cannot afford or which does not improve their quality of life. It is also important to assess the status of households that do not have access to electricity. It is estimated that almost two million households in South Africa will not have access to grid electricity by 2012, unless a more aggressive rural electrification programme is undertaken.

In looking for a sustainable approach, there is a principle that is often mentioned, but is much less often taken seriously: *electricity is not a panacea for rural development*. There tends to be too much emphasis on disseminating technologies and playing the “numbers game” in which the number of households with electricity is the most important statistic. The focus instead should be on meeting the needs of rural households in a meaningful and sustainable manner. In this article, particular attention is paid to the new energy service delivery mechanisms provided through the solar concession programme.

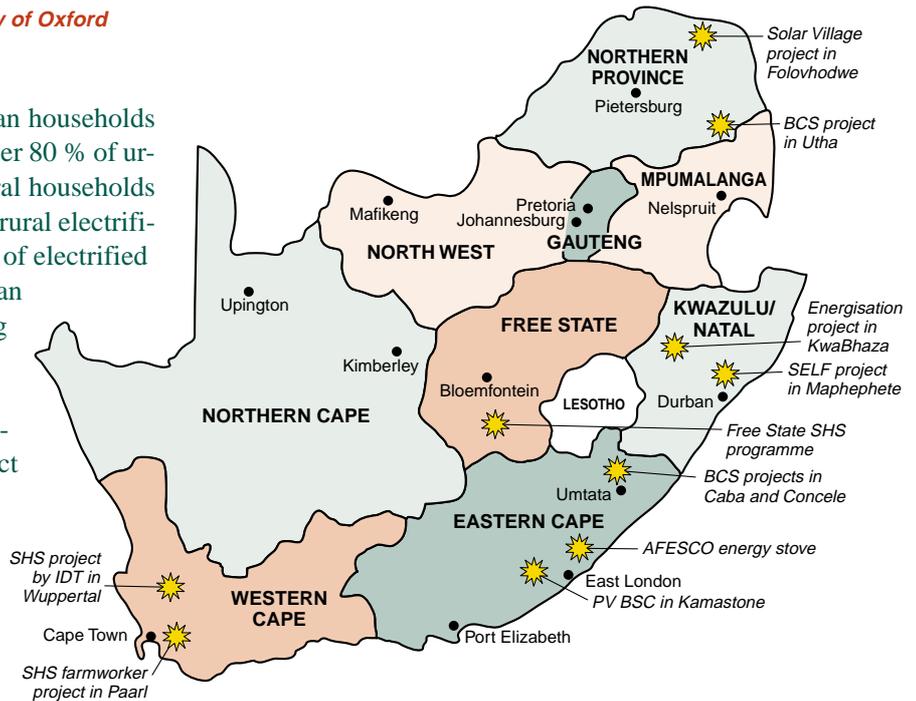


Figure 1: Distribution of some renewable energy projects in South Africa.

Extending the grid

In 1991, South Africa’s state utility, Eskom¹, began a concerted effort to extend grid electricity throughout the country. In 1994, the new African National Congress (ANC) government highlighted its commitment to increase electricity access for the pre-

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viously disadvantaged black population. The goal was to connect 2.5 million homes by the year 2000. This target was exceeded, and the share of electrified households increased from 30 % in 1994 to 66 % by the end of the decade.

Electricity connections are far scarcer in the former 'homelands' created under the Apartheid system. KwaZulu-Natal, Northern Province and Eastern Cape Province all have average connection rates below 50%, whereas the other provinces range from 50 % to over 75 %. Extending grid electricity to these areas proved to be difficult and expensive, due to the combination of poverty, dispersed settlement patterns, lack of employment opportunities, and mountainous terrain. These areas consequently became the focus of many non-grid renewable energy projects.

Off-grid electrification

The low load demand, the dispersed nature of rural settlements, and the high fixed costs of grid extension makes it unlikely that the grid will reach most areas in the medium term. It has been estimated that approximately 1.8 million households will still not have access to the grid by 2012. With the launch of the solar concession programme in 2000–2001, off-grid electrification strategies have come more into focus. Off-grid strategies could offer a promising route to addressing the inequities in electrification between urban and rural areas.

With support from the government, multinational donors, and in some cases, private investors, a number of off-grid renewable energy pilot projects have been launched in the 1990s. Almost all focus on solar photovoltaics (PVs) for household use, pumping water and electrification of schools and clinics. The projects have been concentrated in KwaZulu-Natal, Eastern Cape and Northern Province, where grid electrification is lowest. A lack of documentation renders comparisons and general conclusions difficult, but a few programmes are profiled below.

Social buildings electrification programme

In 1995, Eskom initiated an off-grid electrification programme for schools with

financial support from the European Union, with the ambitious goal of installing PV systems in 16 400 schools by the end of 2000. This target was not met, due to such factors as vandalism and climatic disruptions (floods) in the Northern Province and surrounding areas in summer 1999. In the same year, a rural electrification programme for clinics was launched, using both grid and non-grid technologies. To date, 1 334 schools and 495 clinics have been electrified. It was expected, however, that the programme would be revived in 2001.

Household solar pilot projects

A number of Solar Home System (SHS) projects were financed with direct subsidies. In 1994, the District Council in Free State Province initiated a SHS project and provided a subsidy of R2000 per system. About 1800 systems were installed at farm workers' homes in this project. However, an evaluation conducted in 1997 showed that 41 % of the users were dissatisfied with the performance of the systems.

The Polovhodwe solar village project in Northern Province, which started in 1998, has equipped 582 households, three schools and eight businesses with PV systems. The Bavarian government contributed 80 % of the R3.5 million invested in this project, while the South African Department of Mineral and Energy (DME) and Siemens Solar met the balance. It was expected that end-users would pay a portion of the system costs. At the time of writing, there has not been a formal evaluation of this project.

In 1998, Eskom implemented a pilot project in KwaBhaza (KwaZulu-Natal province) for provision of SHSs as well as supply of LPG. About 100 systems were installed, with a subsidy of R1700 per system. In the same period, the Eskom-Shell Joint Venture, which forms part of the off-grid concession programme, installed 6000 SHS in the Eastern Cape, with a target of equipping 50000 rural households with SHS within five years.

An SHS pilot project that did not involve subsidies was implemented in Maphephethe in KwaZulu-Natal province – households utilising loans have acquired more than 60 systems. A non-profit organisation (SELF) provided training and support. An evaluation of this project is currently being carried out.

A new approach to energy service delivery

Towards the end of the 1990s, it was recognised that many rural areas would not be connected to the national grid for a long time. At about the same time, rural development and energy provision were given national priority. The DME called for proposals for a new service delivery mechanism to address energy poverty in an integrated manner. The new approach would grant off-grid concessions to private consortia to provide energy services in KwaZulu-Natal, Northern Province and Eastern Cape.

Seven consortia were selected to participate in the DME programme. According to the consortia's proposals, the new approach would promote a mix of fuels, in recognition of the limitations of electricity alone in addressing energy poverty. There is an expectation that in this "fee for service" approach; the utility will charge households an "affordable" fee for services, including maintenance of the systems. To date, three of these concessionaires have started their operations: Shell-Eskom joint venture in the Eastern Cape; BP SA-Emtateni in KwaZulu-Natal (Ingwavuma and Ubombo districts); and Electricité de France-Total, also in KwaZulu-Natal (Tugela Ferry, Nqutu and Nkandla districts).

Lessons learned

It should be underscored here that the new energy service delivery approach is a response to lessons learned about addressing the rural energy 'crisis' in South Africa. Three particular lessons from previous approaches to rural electrification

¹ Eskom is responsible for electricity generation and transmission. Distribution is the joint responsibility of Eskom and over 400 municipalities. Negotiations are currently underway to transform the electricity distribution industry and establish Regional Electricity Distributors.

² Although the programme is widely referred to as the "solar concessions programme," it includes and in some cases emphasises other non-grid options.

are worth re-emphasising. First, access to electricity does not necessarily translate into use. Many low-income households (urban and rural) can only afford electricity (and/or electric appliances) for important but low-intensity services such as lighting. Provision of grid electricity to these households may prove to be uneconomical and unsustainable in the long term. Therefore, the focus of the new approach is to provide an array of energy carriers and services,² as well as addressing questions of operation and maintenance of the systems.

Second, governments alone cannot address the energy poverty issues. The need to involve the private sector and create public-private partnerships in service provision is widely recognised in this programme. The South African government has created an enabling policy environment intended to make this public-private partnership flourish.

Third, the approach is meant to provide energy services in a cost effective and affordable manner to rural households with little disposable income. Consequently, the mix of energy carriers, energy services, and delivery mechanisms will need to be tailored to these income levels.

Will the concessions programme work?

Two key factors can be mentioned in terms of increasing the likelihood of success of the new programme. The first factor is insuring people's participation in programme planning and implementation. Participation is not just about informing people – it is also about the process of building local capacity (see Box). A number of questions must be asked. Are ordinary people aware of the programme and its implications (especially that they may not have access to grid electricity for some years)? To what extent have they participated in planning? Are local authorities sufficiently knowledgeable to translate the process to their constituents? What should be their role? Should it be passive (acting as a bridge for information) or as part of the negotiations?

Participation cannot simply be a buzzword. It is well established that some types of participatory results are coun-

terproductive. Examples abound of development projects creating schisms within communities (e.g. between women and men, between authorities and citizens). In many situations, some community interest groups tend to benefit at the expense of others, usually women, uneducated or powerless. It is not clear yet how the new concessions programme will address such concerns.

The second key factor is that the provision of so-called "affordable" energy means nothing to the rural poor if they do not have sufficient disposal income. There is a need to transform the energy needs of these communities into effective and articulated demand. It also follows that the willingness to pay for services is not the same as ability to pay for services. People need money to be able to purchase the energy services, and this must be compared with attainment of such services without cash (e.g. collecting firewood). For people to be able to pay for services, they need to be involved in some form of employment or income-generating activities. It is hoped that this new delivery mechanism will not just

provide energy in an "affordable" and accessible manner, but will also provide a springboard for income-generating activities that will assist people in paying for the service. This will go a long way in contributing to sustainable energy development.

In conclusion, it is worth remembering words of a woman in a rural district in Northern Province. Commenting on the role of outsiders, she said:

"We are tired of seeing you people (NGOs/researchers/outside) come in here and promise us things, raise our hopes and then leave. We want you to show us the way so that we can do things ourselves". ■

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Development is not simply a question of undertaking projects, not of achieving objectives specified in narrow economic terms. Development is also a process, by which is meant the creation of social products such as upgraded local leadership, a culture of enterprise and innovative action, or the enhanced capacity of people to act

in concert, purposefully and effectively so as to cope with threats and opportunities they face (Kearny B, GE Boyle and JA Walsh 1994. *European Union Leader 1 Initiative in Ireland: Evaluation and recommendations. Department of Agriculture, Food & Forestry, Dublin.*)

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Renewable Energy for Sustainable Agriculture and Rural Development in Honduras

Bert van der Plas, Gustavo Best, Bart van Campen (FAO) and Reinerio Zepeda (SERNA)

In theory, energy – and especially renewable energy – has great potential to contribute to sustainable agriculture and rural development. In practice, however, institutional factors often prevent the integration of the energy and agricultural sectors. Rural electrification and renewable energy projects are generally developed within the power sector, without involving other sectors, and are usually supply-oriented. On the other hand, agricultural and rural development projects often do not properly address the energy requirements, which are viewed as a “black box” to be provided by others.

FAO and Rural Energy

As part of the follow-up to the 1992 Earth Summit in Rio de Janeiro, the Food and Agriculture Organization of the United Nations (FAO) was designated task manager of Chapter 14 of *Agenda 21 – Sustainable Agriculture and Rural Development*. The main objective is to increase food production and food security, without harming natural resources. The work within this task emphasizes the importance of rural energy to obtain increased productivity and enhanced income generation.

FAO collaborates in Honduras with national institutions in the process of integrating projects of renewable energy with rural development goals. The starting point for the work is the demand for energy services within the rural communities.

Energy in Honduras

Honduras is the second largest country in Central America, with a population of 6 million, of which 65 % live in rural areas. Total installed power generation capacity was 600 MW in 1999, with hydropower accounting for 56 % and the remainder fossil-fuel plants. The national utility, ENEE (*Empresa Nacional de Energía Eléctrica*), owns 350 MW, while five private thermal generators have capacity of 250 MW. ENEE is also in charge of transmission and distribution. A key public institution that interacts with ENEE is the Energy Cab-



Agricultural project field discussion

Photo: FAO-Honduras

net (*Gabinete Energético*), made up by several ministries, and responsible for energy policy. The Secretary of Natural Resources and Environment (SERNA) is responsible for the implementation of energy policies and regulations through the “*Dirección General de Energía*.” The National Energy Commission (CNE) has regulatory responsibility for the electricity sector, including tariff setting.

Energy policy studies suggest significant renewable energy potential for power generation, including hydro (3,600 to 5,000 MW), wind (40 MW), geothermal (120 MW), and bioenergy (140 MW). The agro-industrial sector has excellent potential for “biomass-to-energy” projects, including bagasse co-generation, energy production in the palm oil industry, and forest-based projects, which can be connected to the national grid.

More than 7,000 communities are located in rural areas where grid extension may not be cost-effective due to low and dispersed demand. In such areas, sites for small and mini-hydro (less than 10 MW) and micro-hydro (less than 100 kW) have been identified, with some projects having reached the investment stage. These investments often fit well with the spatial distribution of electricity demand for major end-users, such as that of the 5,000 small coffee processing facilities.

There are several commercial and NGO groups that have acted as catalysts in creating rural consumer awareness, providing technical assistance and training, and helping to establish micro-entities that sell and finance solar home systems.

Energy in the South of Lempira

Lempira is an area of Honduras with one of the highest rates of poverty. In 1994, the FAO launched a project on rural Development in the south of Lempira in the management and rational use of natural resources. The project is financed by the Dutch Government and carried out by the FAO and the Secretariat of Agriculture and Livestock. Since energy is tied to many aspects of FAO’s rural development activities, the project was designed to integrate key energy issues.

In 1998 a Participative Energy Demand Assessment study was conducted in cooperation with SERNA and ENEE in 4 selected communities of Lempira to gain better insight in energy demand and people’s priorities. This study formed the basis for a series of small demonstration projects and other activities.

The studies showed that residents invest more money and time on energy than expected: an average of 1,000 lps¹ per year for illumination (candles and kerosene wick lamps); and 1,700 lps for fire-

wood. Among the priorities expressed by the population, energy was always ranked between first and fifth place, mainly for illumination. In the community meetings, eight small projects were prioritised: PV-systems for homes (2) and communal use (2); forest management (2); a small-scale hydro-project and a biodigester. The communities had been informed that they would have to invest part of the costs for implementation of the projects.

Based upon this prioritisation, various community demonstration projects were developed. Nine solar systems for community buildings and four solar lanterns were installed in communities where adult education activities are part of FAO's assistance. Two small-scale hydro projects and a forest management/agro-forestry plan were also implemented. A detailed study on the woodfuel demand and sources was done as part of a national study. In all the projects a participative methodology for planning and design was used. An evaluation of the projects was carried out in 1999, and some of the findings are summarised below.

Solar Energy

The community solar-PV projects were well received, and some participants indicated an interest in paying more for a system with more capacity. The evaluation suggested that small low-cost projects have a big impact in remote communities, especially if they are accompanied with programs of education and

community organization. An average annual income increase of 545 lps was observed in the community programs of adult education for each year of study. Gender analysis revealed gains for female participants in such areas as health, civil participation and improved performance of their children at school. The classes would have been difficult to hold without electricity for lighting and radio cassette recorders. Several communities took advantage of the opportunity to move or to create their community store in the same building to have this communal service at night.

The projects also led to promotion of solar energy, and many people indicated an interest in buying a Solar Home System (SHS), especially under a credit opportunity. Although the technology and its implementation are mature in Honduras, several barriers prevent their introduction on a large scale, such as high investment costs, financing problems (lack of credit), lack of promotion and instruction, and lack of infrastructure (installation, maintenance, sale of spare parts). There appears to be potential in Honduras to overcome these barriers.

Small-scale Hydropower

The reviewed hydro-projects, which had been implemented with locally manufactured technology, revealed some technical problems. Although small turbines are well adapted for local production in many respects, there remain quality issues that must be addressed if wide-scale imple-



Photo: FAO-Honduras

Provided with solar systems, the school functions also as a community center

mentation is desirable. Small-scale hydro is valuable in remote, unelectrified areas, especially in combination with small-scale irrigation or dispersed but stable electricity demand, such as in coffee-growing areas.

Rural Energy Strategies

The process of participative energy demand studies, demonstration projects and evaluations, has been implemented in close cooperation with SERNA and other national institutions. SERNA has shown interest in supporting the creation of a sustainable market of distribution, installation, maintenance and service of renewable energy systems in Honduras in collaboration with FAO. Potential synergies have been identified when the barriers for the creation of this market are addressed simultaneously from diverse sectors like education, rural electrification and agriculture. Both institutions have decided to dedicate time and personnel to elaborate proposals and strategies in more detail. ■

¹ lps. = lempiras; approximately 15,3 lps./US\$ (2001)

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Photo: FAO-Honduras

Community discussion on rural energy options

Swedish Rural Energy Cooperation in Vietnam

by Anders Arvidson, SEI; Göran Haag, Embassy of Sweden, Hanoi, Vietnam; and Mirjam Palm, Sida

Sweden's energy cooperation with Vietnam currently focuses on rural energy, or increased energy access to un-served and under-served populations. This follows two decades of energy cooperation where Sweden's support to the Vietnamese energy sector has focused on conventional energy infrastructure such as hydropower, transmission, upgrading of electricity distribution networks in urban areas and capacity building in electricity distribution utilities.

Vietnam and Sweden have initiated the preparations of a programme on rural energy. As part of the identification of priority areas, roles and responsibilities within such a programme, a three-day logical framework analysis (LFA) workshop was held in Danang, Vietnam in late March 2001. An essential objective of the workshop was to identify and prioritise problem areas upon which pos-

sible interventions are to be based. This article brings out some of the discussions related to identified problems that were raised in this seminar.

Rural energy services delivery

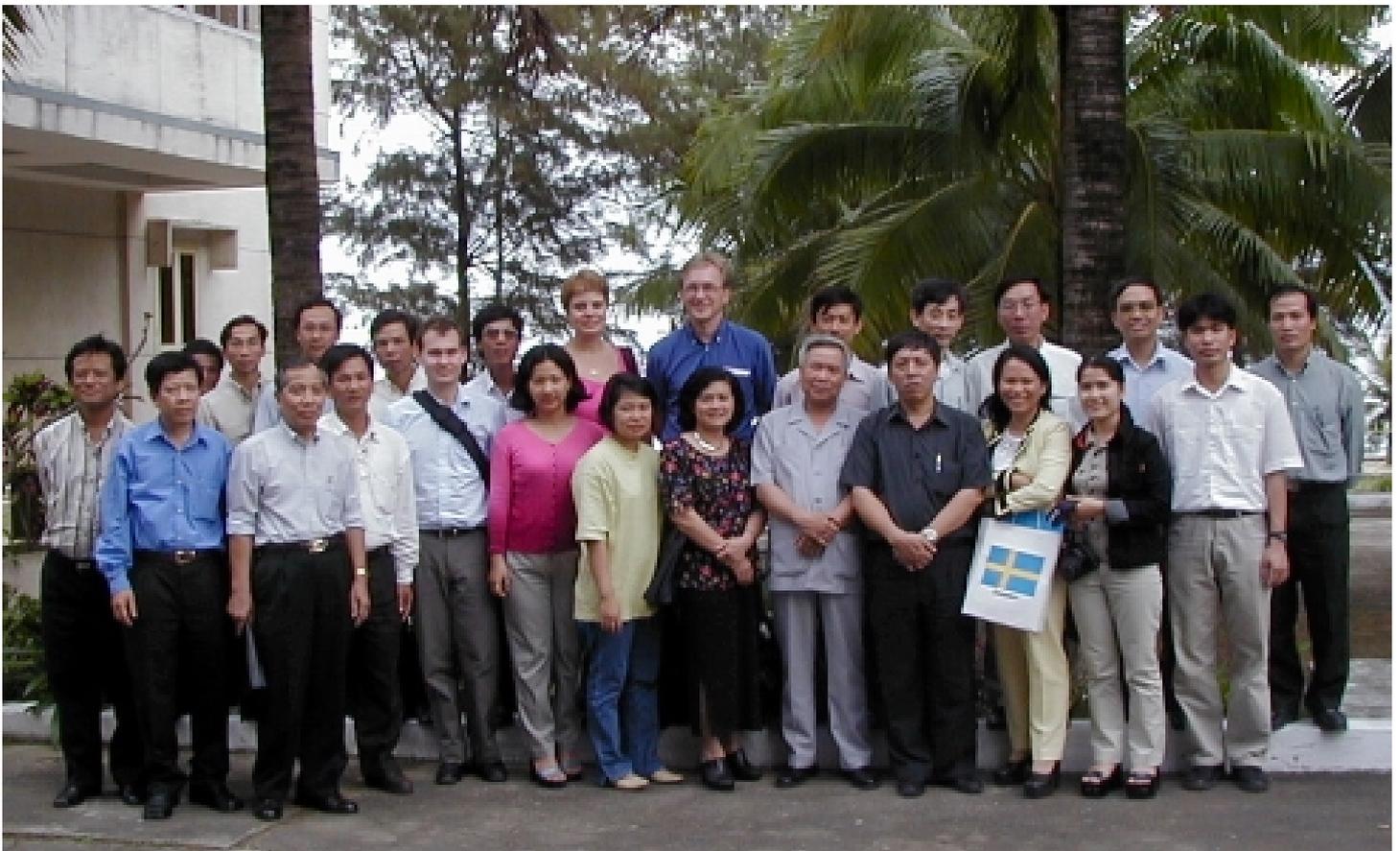
There are several preconditions to rural energy delivery that are difficult or impossible to change, such as spatial or demographic conditions. Where people live in scattered settlements far away from markets, energy service delivery costs are generally higher. Potential energy service providers are reluctant to invest in such areas due to the risks and the transaction costs involved.

At the same time, the residents generally have a small and limited cash income, resulting from a lack of formal economic activities, thereby making it difficult to be able to pay cash for energy services. Of course, the situation is not static, and

improved energy services could contribute to increased income generation opportunities and thereby play a role in addressing rural poverty. Nevertheless, rural areas are not considered the most attractive from a business perspective in the eyes of energy service providers.

The LFA workshop

The workshop followed the LFA methodology where initially the basic concept was discussed and agreed upon as: *Access to options for rural energy services, which are reliable, affordable, appropriate and sustainable*. Then the stakeholders – beneficiaries, implementers, financiers and decision makers – were identified and discussed. Following the stakeholder identification, the workshop set out to identify the problems. Policies, delivery mechanisms and the exploitation of off-grid alternatives were identified to



About 25 participants representing the Ministry of Industry, Electricity of Vietnam, the Power Companies, rural farmers, Vietnam Women's Association, Institute of Energy, Danang Women's Unit, Danang Power Supply department, a representative of the World Bank, and representatives of the Swedish Embassy and Sida participated in the workshop

be the most important to tackle in relation to the identified goals and the different stakeholders.

Policies

Several government policies have been issued relating to the energy and electricity sub-sectors. Although several policies exist, the participants to the workshop felt that there is a lack of harmonisation of policies and regulations and that at some levels, these are missing. For example, Electricity of Vietnam (EVN) has a policy that is considered appropriate. However, at the local commune and district levels, policies regarding ownership, responsibilities and management are weak. Policies, guidelines and capacity building in management of local grids are needed. Furthermore, voices for a more effective and clear national strategy/ action plan for how to increase access to energy services were raised. In this context the lack of a strategy and the role that renewables can play was also raised. This also relates to the unclear understanding of government plans and possibilities to subsidise rural energy service delivery resulting in inactivity from the side of the beneficiaries as well as potential implementers/suppliers. It was also felt that many of the procedures needed to get through the government system are bureaucratic and time consuming. It was also felt that cooperation between different government institutions was weak.

Management capacity at local levels/Delivery Mechanisms

At the moment about 6 000 out of a total of about 9 000 communes are electrified in Vietnam (which means that at least the centre of the communes has an electricity supply). In most of these cases the Peoples Committee buys electricity in bulk from the regional Power Company. The local authority or the households have done all the investments in the low-voltage networks. Mainly due to poor quality in these networks, it has been suggested that the rural distribution networks be taken over by the Power Companies. This would require personnel reinforcement of about 30 000 staff. In addition, the cost of buying the local distribution networks from the local authorities makes the whole scheme seem unrealistic.



However, alternative solutions are being examined. EVN has recently carried out a study of different management models in Vietnam and abroad and is preparing a plan to suggest different alternative management models of the rural distribution networks. It is widely recognised in Vietnam that a stronger local capacity to manage rural energy supply is needed. However, at the moment there is limited human resources at local level and low competence in running profitable businesses within energy service delivery business.

Another issue that does come forward as a problem is the available power. As more households are connected the need for increased generation capacity will have to be considered.

Context of the Swedish Support

The objectives of Swedish assistance to the rural energy sector in Vietnam is to support rural energy policy development. The ambition is to complement already ongoing and planned activities in the area of rural energy. The Swedish funds should be used in strategic and catalytic ways. The approach will be a combination of bilateral projects and co-financing/parallel financing through other donor agencies e.g. the World Bank, Asia Development Bank, UNDP and others. The aim is also to seek to incorporate renewable energy components in Sida's Rural Development programme.

Emerging areas

The areas that are emerging as the most probable candidates for Sida support are development of models for local management of rural grids and capacity building in relation to such, potential to use biomass for electricity generation, credit for expansion of rural grids and support to rural energy policy development. ■

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The concept

Access to options for rural energy services, which are reliable, affordable, appropriate and sustainable.

The five focal areas of Swedish development cooperation in Vietnam

Main objectives

- Democracy and human rights
- Poverty alleviation

Specific objectives

- Development of democracy
- Continued economic, social and administrative reform
- Targeted activities in poor areas
- Support for environment
- Energy cooperation

The Stockholm Environment Institute (SEI) is an international research institute focusing on local, regional and global issues related to environment and development.

The scientific and administrative work of the Institute is co-ordinated by SEI's headquarters in Stockholm, Sweden, with centres in Boston (USA), York (UK), and Tallinn (Estonia).

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ENERGIA – International Network on Women and Sustainable Energy

ENERGIA is an International Network on Women and Sustainable Energy, founded in 1995 to create an institutional base for galvanising action to strengthen the role of women in the energy sector. Energia is open to both men and women from the South and North interested in promoting its goal to “engender” energy and “empower” women, through the promotion of information exchange, training, research, advocacy and action aimed at sustainable energy development that is equitable for all. ENERGIAs approach is to seek to identify needed activities and actions through its membership, and then to encourage, and if possible assist, members and their institutions to undertake decentralised initiatives. Energia News is the principle vehicle for this approach.

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