CASE STUDY OF A SUCCESSFUL NATIONAL ENERGY PROGRAMME/STRATEGY

RURAL ELECTRIFICATION FROM RENEWABLE ENERGY AND OTHER SOURCES

1. The problem or issue addressed:
In common with other new technology, new rural electrification systems face a number of barriers which are preventing them from being used to their full economic potential. Such barriers include, but are not necessarily confined to:

- lack of knowledge of the technology on the part of potential decision makers/users;
- market distortions arising from conflicting government policies
  -eg. subsidised energy prices used to deliver basic services to the most needy; tariffs on imports to facilitate local industry development;
- lack of adequately trained personnel to service the equipment;
- lack of support infrastructure (eg. repair facilities/spare parts) to service the equipment;
- lack of standards relating to product design, quality and installation;
- lack of access to finance at rates comparable to conventional energy options; and
- lack of social acceptance by users.

However, new rural electrification technologies often encounter more severe barriers than conventional energy supply options. The situation is particularly acute for many emerging renewable energy technologies (eg. solar-based electricity) when they are used in small scale applications in remote areas, as an alternative to a centralised electricity supply.

Furthermore, this market is often associated with the provision of basic health and educational services to the least financially independent communities. Development assistance provided for the installation of these systems is limited and often not available for their on-going maintenance.

2. Name of the programme:
The activities outlined in this case study encompass a broad range of policy initiatives.

3. Timeframe: ___ years Year started: _____

4. Status: X Ongoing ☐ Completed in year _____

5. Main objectives:
Over the past two decades, Australian governments and business have taken several initiatives to address impediments to the introduction of new rural electrification technologies which deliver economic, social and environmental benefits.

In 2004, the Australian Government issued an energy policy statement, entitled "Securing Australia's Energy Future". To achieve energy prosperity, security and sustainability, the Australian Government has put in place policies to:

a. attract investment in the efficient discovery and development of our energy resources for the benefit of all Australians
b. deliver a prosperous economy while protecting the environment and playing an active role in global efforts to reduce greenhouse emissions

c. encourage development of cleaner, more efficient technologies to underpin Australia's energy future
d. develop effective and efficient energy markets that deliver competitively priced energy, where and when it is needed into the future
e. minimise disruptions to energy supplies and respond quickly and effectively when disruptions occur
f. establish an efficient energy tax base, restricting fuel excise to end use and applying resource rent taxes to offshore projects
g. ensure Australia uses its energy wisely.

The following case study is an example of how Australia is giving effect to its energy policy goals, particularly in relation to elements (b), (c) and (e).

6. Lead institution:

Australian Government Department of Industry, Tourism and Resources in conjunction with the Australian Greenhouse Office.

7. Other implementation arrangements and stakeholders involved:

8. The results achieved:

Australian federal and state governments have undertaken several initiatives which have facilitated the adoption of new rural electrification technology including demonstration projects, measures to address cross-subsidies for rural electricity, promotional activity and measures to encourage electricity utility involvement, including reform of the electricity industry. Several lessons have been learnt from these initiatives.

First, it is essential that there is adequate training for designers and installers of alternative rural electrification technologies. Second, where cross-subsidies remain for social reasons, it is important that these cross-subsidies are delivered in a form which does not disadvantage alternative technologies. Third, ensuring that these technologies are financed and maintained on a similar basis to conventional rural electricity options should go a long way to facilitating widespread adoption of alternative rural electrification technologies.

Details of specific initiatives are outlined below.

<u>Demonstration Projects</u>

A pioneer in the use of new rural electrification technology in Australia is the telecommunications industry which has been using solar photovoltaic cells in commercial applications for 30 years. In the early 1980s, Australian Government support was provided to the industry to establish a solar cell module indoor test facility and four outdoor testing sites in different climatic zones. The results obtained from these test facilities provided the industry with the confidence to embark on a major program in the mid 1980s which involved the provision of a solar-powered, microwave based, telephone service to 10,000 households in remote areas of Australia.

In the mid 1980s, Australian federal and state government support was also provided to demonstrate renewable energy power supply systems (using solar and/or wind energy) suitable for use by rural households not connected to an electricity grid. These systems typically provide electricity for lighting, entertainment and refrigeration. As noted above, there are now over 8,000 rural households throughout Australia which use renewable energy power supply systems. These systems typically incorporate a petrol or diesel generator which is used during periods of prolonged cloudy and/or windless weather.

Training and Standards

One of the early lessons to arise from the use of new rural electrification systems was the need to ensure that there was adequate training for designers and installers of these systems. In the 1990s, the former Solar Energy Industries Association of Australia (now the Business Council for Sustainable Energy) established training courses for the design and installations of stand alone renewable energy power supply systems with support from the Australian Government. This training program was used to establish an accreditation scheme which provides a means of ensuring that designers and installers have a minimum level of competence in the design and installation of these systems. This accreditation program is now administered by the Business Council for Sustainable Energy (BCSE). Since 1999, the Australian Government has worked with national industry training bodies and with Technical and Further Education (TAFE) to fund the development of course material for technician training to be conducted at TAFE colleges.. Australian standards have also been developed for the design and installation of these systems.

Innovative Renewable Energy Technology in Remote Areas

Hybrid technologies, such as wind/diesel and solar/diesel have been increasingly and successfully installed in remote areas over the last five years, particularly in larger applications. Australian Government funding under the Renewable Energy Commercialisation Programme provided assistance to develop these world-leading technologies so that renewable energy sources could be more effectively integrated with the existing diesel capability. Renewable energy is now increasing penetration into remote mini-grids and thus reducing diesel consumption.

- In the remote town of Denham in Western Australia, advanced wind/diesel control technology is used to maximise the use of available wind energy in the diesel mini-grid. The technology, using low load diesels and computerised controls, smoothes out wind energy fluctuations by improving the interaction between the wind turbine and diesel generator components. The technology proved so successful, maintaining the quality of electricity supply and ensuring that significantly more wind power could be utilised, that it was implemented in a number of new wind developments in other remote towns in Western Australia.

- The Integrated Wood Processing demonstration plant at Narrogin in the Western Australia wheatbelt is designed to process native mallee trees to produce renewable electricity, activated carbon and eucalyptus oil. This innovative project has multiple benefits: encouraging mallee tree planting for renewable energy generation; reducing greenhouse gas emissions; reducing dryland salinity, and enhancing regional development. At full

production, the plant will use two million trees to produce 7.5 gigawatt hours of renewable electricity, and will be suitable for strengthening rural grids.

Diesel Replacement in Remote Areas

The Australian Government has sought creative solutions to improve energy supplies in remote areas. With funding of more than AU$200 million, over 4500 remote clean power generation projects have been implemented throughout regional and remote areas of the Australia. The long-term benefits of these projects include reduced greenhouse gas emissions, reduction in diesel use, effective and reliable electricity supplies in remote areas, improved living standards and a boost to the development of the renewable energy industry. Examples of work under the Renewable Remote Power Programme include:

- Bushlight is the Indigenous Renewable Energy Services programme. It provides design, information and education services to help maintain renewable energy power systems and liaise with energy service networks. Operating in the Northern Territory, Western Australia, Queensland and South Australia, Bushlight has helped Indigenous communities understand their power system, know how to look after it and develop a sense of ownership. Around 40 Bushlight renewable energy systems have been installed since 2002, bringing multiple benefits to indigenous communities, such as reliable energy sources, improved health and technical know-how.

- The latest concentrating dish photovoltaic technology is being installed and connected to existing diesel-powered mini-grids in three remote Indigenous communities. Using highly efficient "triple junction" cells, the mirrored dishes concentrate solar power by up to 500 times; the power they produce will reduce diesel consumption and increase system efficiency using the peak-lopping principle. Economic and environmental savings for the communities are significant; it is estimated they will reduce diesel consumption by over 477,000 litres and greenhouse gas emissions by 1300 tonnes each year. Two of the communities will also use waste heat from the cooling systems of the receivers to increase evaporation from adjacent sewage ponds and reduce the risk of sewage pond overflow during the rainy season.

Electricity Market Reform

A major impediment to the use of alternative rural electrification technologies has been the existence of cross-subsidies in electricity prices in rural areas. Over the years, governments have established a variety of schemes which have been designed to give a similar level of government financial assistance for the installation of an off-grid renewable energy power supply system as for connection to the electricity grid.

Interest in new approaches to rural electrification has been sparked by the reform of the electricity supply industry in Australia. Over the past decade market reforms to the electricity market have facilitated private sector investment and delivered significant benefits, adding AU$1.5 billion to the economy as a whole. However substantial work remains to be done in a range of areas, including through opportunities to economise on infrastructure development through decentralised energy systems (see Australian case study on Energy Market Reform).

One recent Australian Government initiative related to decentralised electricity supply is provision of AU$75 million to support 'solar cities' trials. These trials are a key component of the energy policy statement issued by the Australian Government in 2004. The trials will test innovative approaches to energy markets that deliver more effective price signals to energy users and demonstrate how decentralised energy systems can deliver savings through reduced distribution and peak generation needs.

Access to Finance

Another major impediment to the adoption of stand alone power supply systems is access to finance. Many rural consumers want the electricity provided by stand-alone electricity generation systems to be supplied on a similar basis to that provided from a centralised electricity supply. In particular, they prefer not to be responsible for the upfront financing of the power supply system or for the maintenance of the system. In Australia, this approach has been adopted by one electricity utility.

9. The relationship of the programme to internationally agreed goals and targets:

The range of initiatives outlined in this case study give effect to paragraph 9 of the Johannesburg Plan of Implementation and more specifically paragraph 9(a) which calls for action at all levels to "improve access to reliable, economically viable, socially acceptable and environmentally sound energy services and resources, taking into account national specificities and circumstances through various means such as enhanced rural electrification and decentralized energy systems".

The lessons that Australia has learnt from the successful deployment of renewable energy technologies in locations remote from infrastructure support is of relevance to many developing countries. However the specific approaches to dealing with the impediments to alternative approaches to rural electrification will inevitably need to vary from country to country, taking into consideration national circumstances. Australia has considerable experience in rural electrification, and in particular the use of innovative renewable energy technologies to strengthen rural electricity supplies to bring about multiple benefits to rural communities and the environment.

Since the late 1990s, the Australian renewable energy industry has been providing training to other countries in the design and installation of renewable energy power supplies. The training has been based on training courses in Australia, but modified to suit the local conditions existing in the country in question. To help ensure that the training activities deliver wide-ranging and long-term benefits, the courses are now focussed on a 'train the trainer' approach.

For example, an Australian company has conducted Solar Home Systems training in Sri Lanka for senior technicians from local solar companies as well as some independent trainers from training institutes. This training was supported by the World Bank and the Australian aid agency, AusAID. The World Bank has been involved in establishment of procedures for financing the installation of Solar Home Systems in Sri Lanka on a self-sustaining basis. By coordinating training activities with financial packages, this activity is concurrently addressing two of the major impediments to the deployment of this technology.

The Australian renewable energy industry has also been a major participant in the Institute for Sustainable Power (ISP). The Institute is a non-national, non-profit organisation which has been established to coordinate, develop and maintain international standards for the evaluation and qualification of trainers and training programs for renewable energy. In developing international standards for training in the design and installation of stand alone photovoltaic power supply systems, the ISP has used Australian training activities as the basis for these standards.

Australia is also participating in several multilateral forums which are providing an opportunity to share experiences on addressing impediments to the use of renewable energy technologies in rural electrification and/or undertake collaborative projects which aim to address these impediments. They include the APEC Expert Group on Renewable Energy Technologies and the Renewable Energy and Energy Efficiency Partnership (REEEP) and International Energy Implementing Agreement on Photovoltaic Power Systems. REEEP is a registered UN Partnership for Sustainable Development, whilst the activities of the APEC Expert Group are a component of the registered partnership entitled *Fostering Regional Energy Cooperation in APEC: Energy for Sustainable Development*.

Further information:

Commonwealth of Australia (2004). Securing Australia's Energy Future
http://www.pmc.gov.au/publications/energy_future/index.htm

Business Council for Sustainable Energy (2004). The Australian photovoltaic industry roadmap.
http://www.bcse.org.au/default.asp?id=74&articleid=226

Business Council for Sustainable Energy. Training & standards
http://www.bcse.org.au/default.asp?id=192

Global Sustainable Energy Solutions. Training activities. http://www.users.bigpond.com/gses/

Australian Greenhouse Office. Renewable Energy
http://www.greenhouse.gov.au/renewable/index.html

Australian Greenhouse Office. Solar cities http://www.greenhouse.gov.au/solarcities/index.html

International Energy Agency. http://www.iea.org/

UN Department of Economic and Social Affairs. Partnerships for Sustainable Development.
http://webapps01.un.org/dsd/partnerships/public/browse.do