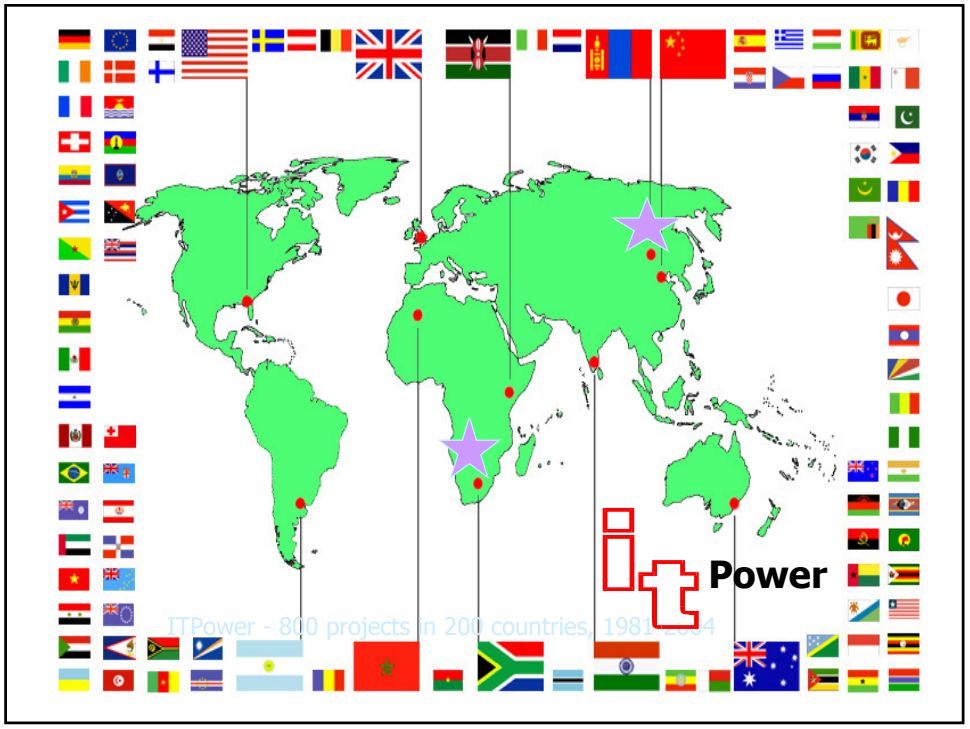

Mongolia - Renewable Energy Development in Small Towns and Rural Areas

(funded by Asian Development Bank)

Bernard McNelis

Power

Mongolia – Gobi Desert from above

Mongolia Solar Home System

Mongolia – Nyon 200kWp
Japan NEDO ('joint demonstrative research project')

Key activities

- Review of previous experiences
- Policy Development
- Resource Assessment
- 2 Pilot Projects
- Review of Markets, Economics and Financing
- Capacity building

Initial Survey

- 12 Soum Centres were visited.
- No plan to extend the grid in the foreseeable future
- Sufficient solar / wind resource
- Power required
- Overall conditions

Pilot 1 – Zereg Soum (Khovd Aimag)

- PV-diesel hybrid system to supply the **whole** of the Soum Centre

Pilot 1 – Zereg Soum (Khovd Aimag)

- 50 households in summer, 200 in winter
- Existing 100 kVA diesel and mini grid
- 6 kW_p PV array; 48 V / 2000 Ah battery
- 3*4.5 kW inverters

System Concept

- Previously, diesel operational only Oct – May, 18.30-22.30 daily
- Now, the PV system provides a **basic** electricity service for 24 hours / day. Diesel operates same hours as before
- Energy efficiency measures (CFLs, grid)
- In winter, additional battery charging from the diesel generator

Markets, Economics, Finance

- Following energy audits, field surveys and reviews now completed recommendations to be made on:
  - Improving affordability
  - Least cost financing
  - Tariff's
  - Use of subsidy
  - Operation & Maintenance financing
  - Large Scale uptake, Large scale projects, System Scale

Approach

- The aim of the pilot projects was to provide a **basic** electrical service
- 24/7 electricity for most important loads
- Starting point is therefore **NOT** the load profile for the diesel generator
- For comparison – 50 * 50 W_p SHS
- How much is 'enough'?

PILOT KEY ISSUES

- Energy Efficiency
- Expectations of need (kWp)
- Metering
- Tariff
- Maintenance fund
- Maintenance skills
- Sustainability

Tariffs

- In order to make the system work, users must use energy sparingly
- Dual tariff system used to reduce demand during 'PV hours'
- Diesel tariff: 160 – 170 Tg/kWh
- PV tariff: considerably higher
- Possibly a combined tariff with a fixed monthly service charge

Energy Committee

- It was suggested that an Energy Committee is set up to deal with matters relating to the energy system

Repair / Replacement Fund

- At least 30% of the income from the sale of PV electricity should be saved for future repairs / parts needed.

Training

- Training in the operation of the system was provided for two operators and for two persons responsible for the power system within the local government.
- Local people were trained in very basic electrical installation skills (there is no trained electrician)

Problems Encountered

- PV system – various snags outstanding
- Mini grid was in poor condition - losses
- Wiring is in poor condition – safety, lack of switches
- Overload / short circuit causes inverters to trip
- Users need to change their ways – learn to conserve energy

Problems with the Mini Grid

Poor connections

Poor insulation

Condition of Wiring

- Very poor, unreliable connections
- Safety concerns
- Lack of switches

Pilot 2 – Darvi Soum (Gobi-Altai)

- Wind-diesel hybrid system to supply only the hospital
- Existing 100 kVA diesel and mini grid
- 1 kW wind turbine
- Battery (48 V / 1000 Ah)
- Inverter (4.5 kW)

Conclusions (1)

- It is possible to supply a whole Soum centre with a small PV system
- Requires co-operation from the users
- Energy efficiency is essential
- Consumption-based tariff can be used to encourage energy efficiency and energy saving

Conclusions (2)

- Using existing mini grid is sensible
- Effort required to upgrade existing infrastructure must not be underestimated
- Replication of the schemes demonstrated may be possible without (or with reduced) external aid

PV installation project in 1,000 schools in rural areas of South Africa

(funded by European Union)

Bernard McNelis

Background

- EU Project:
  - Electrification of 1000 rural schools
  - 880 Wp of PV per school
  - Lights and audiovisual equipment
- Context:
  - Part of larger electrification programme of 16,400 schools
  - Previous phases electrified 1,400 schools

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IEA-PVSDC Workshop, Vientiane, Laos 8-9 April 2005

Project Management Intervention

- Technical problems identified by TAU
- Resolved in liaison with all stakeholders
- Additional improvements / upgrades agreed and implemented

Technical Issues

BEFORE	AFTER
No LVD	LVD
Batteries stored outside	Adequate battery storage
No battery recharging	Regular recharging
No user interface	Status indicator unit
Incomplete security measures	Security frame (mod.); steel box (inv./reg.)

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Quality Control Issues

- Functionality Testing
- Commissioning
- User manual and video
- Technical manual
- Maintenance procedures
- Capacity building

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Sustainability Issues

- Intervention in the installation programme allowed a number of key process issues to be dealt with in more detail
  - Security
  - Maintenance
  - Community involvement
- This is expected to lead to greater sustainability of the project

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Security Action Plan

- Schools / communities responsible for security measures:
  - Fences, Burglar bars, Night watchman
- Community Police Forums established
- Awareness raised within stakeholders

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Community Involvement and Extension Worker Programme

- Key link between beneficiaries and implementation agency
- Play very important communication role
- Training and support
- Encouraging use / building ownership
- Reporting (e.g. security measures)
- Key link schools - DoE (long-term)

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ne, Laos 8-9 April 2005

Technical Audit

- Audit was seen as a process
- Blueprint schools - at least one per installer
- Training of installers and commissioning officers
- Final audit visits - there were still problems
- Altogether, TAU visited 194 schools

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Problems encountered

- Serious defects (loose MJB, regulator not calibrated, strings not connected)
- Minor snags (MJB lids not fixed, labelling, poor welding)
- Security, theft / vandalism (part of array vandalised, security frame causing shading, etc)

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Maintenance Strategy

- Past programmes - no maintenance; DoE left responsible
- Maintenance awareness campaign
- Costing / budget
- Identify role players / scenarios
- Assess capacity / capacity building

Conclusions

- Quality of installations improved greatly during the internal review
- Some problems were still outstanding at the end of the TAU contract
- Remedial work as part of first maintenance call
- Security continues to be an important issue, although module theft was curbed very effectively

Conclusions

- There is a requirement for ongoing maintenance
- Community interest is vital - for day-to-day maintenance, security, usefulness of systems
- Future programmes - Detailed procedures are required, including checks that procedures are followed