

From the IEI-Asia regional office in Bangalore (India):

Rural energy services: village-based schemes

Electricity

The effort to appropriately provide energy services to people, particularly in rural areas, continues. In south-Asia, about 800 million people live in un-electrified homes. While India's Ministry of Power has projected that all villages will be electrified by the financial year 2006-07, nearly 80,000 villages have yet to be connected to the grid. More importantly, 56% of rural homes do not have electric lighting. With the new Electricity Act (2003) eliminating the earlier licensing requirements on generation and distribution, decentralised schemes have far more scope. But local options must be assessed both in terms of the costs per unit of generation and the extent to which they can meet the energy needs of a village. IEI is looking at both these aspects.

A questionnaire is being drawn up to assess the present and near-term future energy requirements and IEI proposes to use it in village surveys. Correspondingly, the costs per unit of electricity generation from rural sources – crop residues, animal waste, oilseeds, etc. - are being estimated. There are very few successful cases of such village-based options. In each of two villages, Hosahalli and Hanumanthnagar (both in Tumkur district, Karnataka state), electricity is generated from a 20kW woody-biomass-based gasifier system connected to a diesel-engine generator and used for lighting, pumping water and operating a flourmill. In Chalpadi village (Adilabad district in the state of Andhra Pradesh) that has not yet been connected to the state's electricity grid, a 7.5 kVA generator based on a dual fuel system of oil extracted from the seeds of *pongamia pinnata* and diesel, has been used to generate electricity for household lighting. The possibility of other generating systems based on local energy sources and the capacity of such systems to meet the village's energy needs has also to be assessed.

Water

The rural household water-supply situation is analogous to the electricity situation; most villages have at least a well, many have government-sponsored hand-pumps and even more elaborate water-supply schemes using grid-supplied electricity, but very few home-supply systems. The proportion of all rural families with access to drinking water within a distance of 500 meters from their homes has increased from 26.3% in 1981, to 55.9% in 1991, and 80.5% in 2001, but only 28.7% experience the convenience of a source of water at their homes.

IEI had sponsored rural electricity and water supply utilities (REWSUs) in a few villages (of Karnataka state) – each with a biogas-diesel electricity generation plant and village-wide electricity and water supply distribution systems for supply to each household. One of these plants, in the village of Mavinakere (in Hassan district of Karnataka state) is in operation (with some technical/financial support from IEI). The plant is run by people from the village, who pay a monthly tariff and deliver dung from their cattle to the plant in return for water supplied to their homes at times decided by the village committee. IEI is trying to increase the utilisation of this

village system for other energy services; this improved capacity utilisation would help the people in terms of enhanced services and also improve the economic viability of the system.



Figure 1: Biogas plant at Mavinakere village, Hassan district, Karnataka state (India)



Figure 2: Biogas plant at Kalgudi village, Tumkur district, Karnataka state (India)

Clean cooking options: LPG in the near-term

IEI is considering the use of “cleaner” cooking fuels in the domestic sector. Liquefied petroleum gas (LPG, a combination of C_3H_8 and C_4H_{10}) is one of these options because, vis-à-vis biomass used in traditional ways, LPG is more efficient and emits less pollutants per unit of energy service. While modernised bio-fuels would be preferable in the long-term, LPG is being considered as a short/medium term option for domestic use in India.

At present LPG is used by about 17.5% of homes in India. IEI has been studying the requirements for and barriers to families shifting to LPG. Demand scenarios have been projected, based on estimates of an average family’s requirements and selected growth rates of the number of families. Regarding supply and distribution aspects, the problems of getting information have been more acute because of the proposed structural/ownership changes in the India’s petroleum sector. From a survey of LPG programmes in other parts of the world and other cooking-fuel programmes in the country, we have derived a set of factors that would appear to either help or inhibit the successful implementation of LPG programmes. An attempt has been made to adequately address these issues.

Energy efficiency improvement

Over the past decade, IEI has been promoting the improvement of energy efficiency in various sectors. We are now looking at on-line fireside cleansing treatment of heat exchange surfaces in industrial boilers. Large-scale boilers used in power plants, refineries, etc., are fired with heavy fuel oil, coal or refinery gases. Prolonged use of these fuels results in the build up of hard deposits, that are difficult to remove by washing or mechanical cleaning. This in turn results in heavy caulking of the tube surfaces of the boiler and reduces efficiency; it also contributes to SO_2 emissions. However, when injected online periodically in specified doses, a cleansing chemical can reduce the existing deposits, and in time, eliminate them, also

preventing the build-up of new deposits and improving heat transfer and efficiency. IEI is computing the economic feasibility of industries investing in the fireside cleansing treatment.