Chapter 11
Economic Returns and End Uses of MMHP Plants

11.1: Background and Objectives

One of the most serious discrepancies in private MMHP plants has been the very low levels of plant capacity use, resulting in quite low plant factors and incomes. This is in spite of the fact that private plants are reported to be performing better than government-managed plants. The latter, reportedly, are only earning around 20-30 per cent of the recurring expenditure.

For some formal private plants in Nepal, plant factors higher than 40 per cent have been reported. Data are not available for the plant factors of informal private MHP plants in Nepal or Pakistan. However, the range is most likely to be from ten to 30 per cent, as demonstrated in the following examples. An isolated MHP plant generating electricity for about four hours per day, at 80 per cent capacity, for 90 per cent of the days, would result in a power factor of 12 per cent. Similarly, an agro-processing MHP plant using 60 per cent of the rated power on average and operating for 10 hours during the day, for 90 per cent of the days, would have a power factor of 22.5 per cent. Both the above working timings would be considered typical, given the circumstances of mountainous rural areas.

Adequate net incomes or profits are necessary for private MMHP plants, whether they are community-based service systems or commercial enterprises owned by entrepreneurs. Otherwise, the programmes are unlikely to be sustainable and would not be supported in the long run by the owners/beneficiaries or promoters/financiers. Even the supposedly non-profit making plants need net savings to cater for unforseen repairs, upgrading of equipment, expenditure on additional distribution lines, repayment of loans and interest, etc. It is, therefore, important to plan for significant net incomes from the MMHP plants. It is not easy to suggest an indicative figure or range for the net incomes, because of so many different factors affecting different locations, especially economic conditions. However, for a commercial MHP plant, 20 per cent would be the minimum expected return on investment, whereas for a community-owned plant, it may be somewhat lower.

The current situation is that isolated electricity-generating plants are not earning any significant income, many in fact are earning less than the expenditure. However, since they are providing a useful service, i.e., electricity for lighting, they are still coveted, especially in Pakistan. The situation regarding agro-processing units, with or without add-on electricity generators, mostly prevalent in Nepal, is more complex. There are many plants that have been reported to be making adequate money for their owners/investors. However, serious problems have also been cited such as loan non-repayment, plants having been closed down, and so on. The installation rate has also drastically declined. It has also been suggested that people in general were not too keen about installing additional agro-processing plants. Of course, there can be many reasons for this apathy, in addition to the lack of adequate income. Therefore, special efforts are needed to promote the idea of MHP plants to have adequate incomes, in order to ensure public demand as well as sustainability.

11.2 Increasing Capacity Utilisation

The most effective solution to increasing the economic returns from MMHP plants is to increase capacity utilisation. The energy that the plant is capable of producing, but which it is not producing and using, is simply wasted. This is especially true for run-of-the-river type MMHP plants which do not have water storage capacities.

Capacity utilisation can be enhanced in two ways. The first is to increase the existing system of use, e.g., by increasing the sale of electricity to additional houses, shops, hotels, etc, especially during off-peak hours. Similarly, for agro-processing units, the amount of business can be increased through ingenious management techniques, better customer relations, and more dependable services. The key to enhancement in this way is competent management of the plant in all respects. The method needed is proper load management, whereby a number of load units could be connected to the prime-mover to optimise the load and get more work done in a short time period.

Some novel tariff systems have also been tried out in Nepal to promote more uniform use of electricity for longer hours, especially during off-peak hours. The simplest form of tariff is to charge consumers on the basis of the level of power connected to them; e.g., NRs 50/month charged for a 50W connection; NRs 100/month charged for a 100W connection, and so on. The rates could vary for larger power levels. The consumer, then, has the liberty to use this power for as long as it is available. In some cases, more complex tariff systems have been employed, having additional components, including an initial connection fee; an energy-based component, and different rates for domestic, commercial, and industrial connections. Power cut-off devices have been used for such connections to prevent people from drawing power in excess of their allocation. Many such current limiting/cut-off devices are available in the market; some of them cost as little as NRs 250 (US$ 5). In some cases, compound meters have also been used to register the energy consumed in two locations: one for a lower power consumption (say 100W), thus qualifying for a lower tariff, and the second registering energy consumed at higher rates, resulting in higher tariffs; which could be up to three times higher than the former. A typical complex tariff system, which is currently being used by the Salleri Chialsa Plant in Nepal, is reproduced in Table 11.1.

Table 11.1: Tariff System for the Salleri Chialsa Plant (1993)

Level	Connection Fee (NRs)*	Admissible Power (kW)		Fixed Rate (Rs/mth)	Exempted (kWh)	Further (kWh)	Price Per Unit (Rs/mth)	Further (kWh)	Price Per Unit (Rs/mth)
1 Domestic	250	0.1 max		50	all	--	--	--	--
2 Domestic	500	0.5 max		200	all	--	--	--	--
3 Domestic	1000	2.0 max		210	55	65	3	all	1.25
4/1 Service	1500	4.0 max		350	70	90	3	all	1.25
4/2 Service	1500	8.0 max		700	75	95	3	all	1.25
		off peak	peak						
5/1 Industries	1500	>10.0	0.1	220	50	all	0.9	--	--
5/2 Industries	1500	>10.0	0.5	300	75	all	0.9	--	--
5/3 Industries	1500	>10.0	2.0	500	120	all	0.9	--	--

* This amount is automatically transformed into company shares

Table 11.2: Compatibility of Some End Uses with Electricity

End Use	Advantages	Drawbacks
1. Cooking, domestic heating	- clean operation - no health hazards - biomass saving	- low voltage devices take longer to cook - very expensive - cooking clashes with peak load
2. Lift irrigation	- clean and appropriate	- expensive - irrigation time same as low water availability
3. Rural industries • paper making • timber processing • agro-produce drying (tobacco, cardamom) • ice-cream making • village workshop (welding, drilling, grinding) • noodle making • bakery • commercial ironing • milk chilling	- utilisation/value-adding of local raw materials - electricity and motive power useable - local employment generation and economic growth	- expensive - limited power capacity and seasonal fluctuations - unreliable supply
4. Battery charging	- extended outreach of electricity	- high investment - problematic transportation
5. Business (tourist lodges, eateries, shops)	- improved atmosphere - enhanced business - utilisation for cooking/heating	- limited power capacity - some contribution to peak load - unreliable supply

11.3: Diversification of End Uses

Many different end uses can be identified and developed to increase the power use from a given plant, especially during the off-peak period, e.g., during the day time. Applications such as agro-processing and wood-working (sawing, turning, planing, etc) are already being practised, either directly coupled to the turbine shaft or, to a lesser extent, through electricity supply. A number of other end uses have also been identified and attempted. Obviously, the end uses that can bring about economic returns are preferable to other non-economic ones such as cooking. Some of these end uses are described in Table 11.2, along with their positive aspects and limitations.

11.4: Other Inputs and Prerequisites

It has become increasingly clear that the advent of electricity alone does not automatically bring about economic benefits to a community. Other considerable inputs are also needed to promote industrial or income-generating activities in a given area. Some localities, such as roadside bazaars or tourist routes, might well require less motivation and inputs to use electricity for commercial activities, such as a refrigerators for beverages, ice-cream making, commercial ironing, etc; but, for other areas, it could be more difficult to adopt other end uses. Adoption of end uses also depends considerably upon the economic status of the people in a given area. The village of Barpak described earlier, for example, is not located on a main road or tourist route. Still, the majority of the community is fairly well off and can afford electricity and host other industrial activities. This points to an unfortunate fact that the poorest of the communities usually do not benefit significantly from such programmes. Here again, in order to ensure that the poor also benefit, at least from electricity for lighting, more inputs are needed, especially additional funding and wisely-developed support methodologies. Funding is needed for awareness-raising/motivation campaigns; for providing loans and subsidies to promote newer devices such as low wattage cooking equipment, equipment for noodle/breadmaking, etc; and also for R & D, field testing, and so on.

11.4.1: Research and Development

It is obvious that only good products and equipment will be successfully promoted and accepted/adopted by the target group. In many cases, a product has to be modified to fit/suit the local situation. Experience has shown, unfortunately, that technical aspects of product development are not adequately looked after. R & D efforts need to be undertaken within the country to develop or adapt a product. For this purpose, adequate institutional development/strengthening is also necessary.

11.4.2: Tariff Systems

Novel tariff systems have played a significant role in increasing use of plants for longer hours of the day. The tariff systems can be improved further to suit other situations and conditions. The obvious conclusion here is that fixed energy (kWh) based tariffs are not suitable for MHP plants. In designing tariffs, two important aspects must also be kept in mind; i.e., adequate net incomes from the plants and capacity of the people to pay.

11.4.3: Reliability of Supply

This aspect has also been discussed in detail elsewhere in this document. It is necessary to reiterate here that the quality and reliability of electricity supplies from private MHP plants are not adequate at present. To some extent, the same is also true for agro-processing units directly coupled to MHP turbines in Nepal. It is necessary to improve the performance and reliability of these plants through improvement of equipment and installation practices, training of managers and operators, and enhancing economic returns. Adequate emoluments for operators are also a necessary ingredient for successful operation of the plants, so that they have a worthwhile stake in the well-being of the plant.

11.4.4: Customer Relations

Customer relations can be variously defined as good behaviour as well as speedy, reliable, and fair service to customers. This applies to both electricity consumers and clients for agro-processing services. If the service is unreliable and/or the behaviour to customers not good, they will seek other alternatives. It has also been reported, in Nepal, that consumers have not paid electricity bills because supplies were unreliable or of poor quality.

11.4.5: Backstopping and Training

Many cases of deficiency in terms of management have been reported in Nepal. Therefore, a visit from a professional of an implementing agency to monitor the performance of the plant and to provide some advice regarding various management aspects could be a big help to owner-managers. Simultaneously, suitable training programmes for managers and operators would contribute significantly towards improved operations and economic returns.

11.4.6: Repair Facilities

One of the serious problems faced by plant owners is the lack of repair facilities in the vicinity of their plants. They sometimes have to travel for days to reach the original manufacturer to get something repaired; and he may not be sympathetic enough to get the repairs done speedily, since repairs are not big business. One suggestion has been to help establish/strengthen repair workshops in appropriate locations to cater for the needs of these plants and to train local technicians from such workshops in repair practices. Alternatively, manufacturers could set up a service station in such locations to help the owners organise repairs. Generally speaking, the cost/benefit calculations for such establishments, based on financial considerations alone, may not be so favourable. Nevertheless, the need is clearly there, and such workshops will almost certainly lead to sustainability of MHP in remote areas.