CHAPTER 6
Financial Analysis and Feasibility

An MHP scheme will be sustainable only if all of the following conditions are met.

- The scheme is technically feasible,
- socially acceptable, and
- financially viable.

A technically feasible MHP scheme is one in which the head, flow, and locations are such that the scheme can be physically constructed at the selected site. These have been covered in the previous chapters.

AN MHP scheme is socially acceptable and feasible if the community members are capable and prepared to manage it and willing to use and pay for the power produced. This subject has also been dealt with in Chapter 3.

The present chapter covers the third point, financial viability, and deals with all the general financial aspects of MHP schemes. The financial considerations for entrepreneur and community-owned schemes are different. A private entrepreneur-owned scheme needs to generate a return on the investment, as with any other business venture. On the other hand, community owned schemes are usually not profit driven. As long as sufficient income can be generated to meet the annual operation and maintenance expenses and to pay a portion of the community loan, they can be considered financially viable.

6.1 Detailed Cost Estimates

An accurate cost estimate for a proposed MHP scheme is a prerequisite for financial analysis. It is based on the design of the scheme as well as material, labour, and transportation costs. The detailed drawings can be used to determine the excavation quantity, masonry, and concrete work. Similarly the cost of electro-mechanical equipment, including transportation and installation charges, can be obtained from the manufacturers. In this way a detailed cost estimate can be prepared as shown in Annex 6.1.

Once the detailed cost estimate has been prepared, the costs should be tabulated under the major headings (Table 6.1). An allowance should be made for contingencies. This will allow for uncertainties in the cost estimate. If most of the figures, such as labour rates and material costs, are accurate, a contingency of 10 per cent is adequate. Note that if

the scheme is to be constructed more than a year after the cost estimates were made, then the contingency should be increased accordingly to reflect the likely increase in material and labour costs.

Apart from construction costs, there may also be other costs, such as design and supervision costs (for the technicians), as well as management or supervision costs of the entrepreneur or some community member(s) responsible for the coordination of the project. If there are such expenses, they should also be included in the cost estimate.

Table 6.1: Summary of Costs

No	Description	Amount (Rs)
1	Intake	a
2	Headrace	b
3	Settling basin(s)	c
4	Forebay	d
5	Penstock	e
6	Anchor blocks	f
7	Support piers	g
8	Powerhouse and machine foundation	h
9	Electro-mechanical installation in powerhouse including transportation	i
10	Transmission line and poles	j
11	SUBTOTAL	k = a + b + c + d + e + f + g + h + i + j
12	10% contingency	l = k x 0.10
13	TOTAL CONSTRUCTION COST	m = k + l
14	Design, supervision and management costs	n
15	Land costs	P
16	TOTAL PROJECT COST	T = m + n + p

6.2 Financial Analysis

Financial analysis of an MHP scheme can be undertaken once the total cost has been determined. Depending on the type of ownership, the simplified methods discussed below can be used to assess the financial viability of the scheme. It should be noted that the financial analysis discussed below is preliminary and should be used only as an indication of whether the scheme proposed appears to be sufficiently viable financially to start the construction. For larger plants, a more in-depth analysis may be carried out, which is beyond the scope of this publication.

An entrepreneur will probably not install an MHP scheme unless his expected annual profit is higher than the commercial bank interest rate or equal to what he can expect had he invested in another business with equal risk. Therefore, for such schemes a minimum annual profit on investment (POI) of 20 per cent should be used as the criterion for financial viability.

A community-owned scheme is not usually profit driven. Therefore, for such schemes a minimum net annual income of two per cent (preferably 5 per cent) after repayment of any loan installment should be used as the criterion for financial viability.

The minimum annual profit can also be ensured by adjusting the tariff, but note that an unaffordably high tariff rate may result in the rejection of the scheme by the consumers. The consumers will not buy the power produced (for electricity and agro-processing) if they cannot afford the tariff.

If the scheme is eligible for subsidy, this sum should be deducted from the total project cost, since the entrepreneur or community does not have to pay it back. Similarly if contributions in kind are to be made, for example donation of land, labour, or materials, the total equivalent cost of these should be deducted from the total project cost.

The following procedure should be used to determine the financial viability of an MHP scheme.

- First determine the principal sum (total investment) that the entrepreneur or community needs to invest as follows.

$$P = T - S - C$$

where
P is the principal sum
T is the total project cost and
S is the subsidy received
C is the monetary equivalent of contributions in kind

- Calculate the total annual income from the scheme. This can include income from the sales of both electricity and power for agro-processing.
- Estimate the total annual expenditure of the scheme. Depending on site specific conditions, such annual expenditure will be different for different schemes. It should include any payment made to keep the plant operating. Table 6.2 below presents an example of the annual expenditure that can be expected in an MHP scheme.

Table 6.2: Annual Expenditure		
No	**Description**	**Amount (Rs)**
1	Salaries for operators and manager	a
2	Annual scheme maintenance cost (use 2% of total project cost if no other information is available.)	b
3	Interest on loan	c
4	Other expenditure (travel, communications, etc.)	d
5	Total annual expenditure	e = a+b+c+d

It is recommended that studies of existing MHP schemes be carried out to estimate the actual percentage of the total project cost required for annual maintenance. In the absence of such data, two per cent of the total project cost is recommended to be taken for the annual maintenance cost as shown in Table 6.2.

- Even with regular maintenance, electro-mechanical units, such as the turbine and the generator, will have to be replaced completely once their useful life is over. Setting aside a certain percentage of the total project cost each year will provide sufficient funds for replacement of such equipment in the future. It is recommended that studies also be conducted on existing schemes to determine the average percentage of the project cost required for this. In the absence of such information, three per cent % of the total project cost is recommended to be set aside for replacement of such major parts.
- The annual profit can now be calculated as follows.
  - Annual profit = Annual income - Annual expenditure - Replacement fund
  - For entrepreneur schemes; if the annual profit is 20 per cent or higher of the principal, the scheme can be considered financially viable. If it is less than 20 per cent, reject the scheme.
  - For community schemes; if the annual profit is at least two per cent % of the principal, accept the scheme as financially viable. If it is less than two per cent, reject the scheme.

The example below illustrates the above methodology.

Example 6.1

An entrepreneur is considering whether he should install an MHP scheme. The installed capacity is 15kW and the total project cost is Rs 1,020,000. The expected subsidy from the government is Rs 306,000 and he plans to draw a loan of Rs 500,000 from the bank at an annual interest rate of 16 per cent.

The entrepreneur's monthly income is estimated to be as follows.

1. 60W bulbs x 100 @ Rs 75 per bulb/month
2. 40W bulbs x 150 @ Rs 50 per bulb/month
3. 25W bulbs x 120 @ Rs 35 per bulb/month
4. Income from agro-processing Rs 9,000/month (average)

The entrepreneur's monthly expenses on salaries are as follow.

1. Salary to operators: Rs 2,000/month
2. Salary to the manager: Rs 2,500/month

Determine whether the scheme is financially viable.

FINANCIAL ANALYSIS

A. Principal

Principal (P) = Total project cost - Subsidy
Or, P = Rs 1,020,000 - Rs 306,000 = Rs 714,000

B. Annual income

Sales of electricity

1. 60W bulbs:100 bulbs x Rs 75 per bulb/month x 12 months = Rs 90,000
2. 40W bulbs:150 bulbs x Rs 50 per bulb/month x 12 months = Rs 90,000
3. 25W bulbs:120 bulbs x Rs 35 per bulb/month x 12 months = Rs 50,400
4. Agro-processing: Rs 9,000/month x 12 month = Rs108,000

Total annual income = Rs 338,400.

C. Annual expenditure

Annual expenditure

No	Description	Amount (Rs)
1	Salaries for operators and manager: Rs (2,000 + 2,500)/month x 12	54,000
2	Annual scheme maintenance cost: assume 2% of total project cost Rs 0.02 x 1,020,000	20,400
3	Interest on loan: Rs 0.16 x 500,000	80,000
4	Total annual expenditure	154,400

D. Replacement fund

Set three per cent of the total project cost for replacement fund:

= 0.03 x 1,020,000

= Rs 30,600

E. Annual profit

Annual profit = Annual income - Annual expenditure - Replacement fund

= 338,400 - 154,400 - 30,600

= Rs 153,400

% Annual profit = (annual profit/principal) x 100

= (153,400/714,000) x 100

Annual profit = 21.5%

Therefore, this scheme is financially viable for the entrepreneur. Note that, as the entrepreneur pays part of the loan component annually, the profit will increase since the interest on the loan will decrease.

With the same conditions, this scheme would also be viable as a community-owned scheme since the acceptable profit margin is lower. The community may decide to lower the tariff rates so that the annual profit is about five per cent.