SECTION 5
PROJECT IMPLEMENTATION

A number of economic and financial factors affect the implementation of small hydro projects. Financial reporting requirements and environmental considerations are discussed first under the broad heading of institutional considerations. The other major area of concern is the timing and usage of funding, particularly relating to funding the feasibility determination. These topics are discussed in this section.

Institutional Considerations

A large number of permits will be required for the operation of hydroelectric developments. Some of these permits relate to financial information and others can have substantial cost impacts.

Federal Energy Regulatory Commission (FERC). The FERC licensing requirements contained in Title 18 of the Federal Code of Regulations include the disclosure of substantial financial information for all projects within their jurisdiction.

Major Projects. The license application for "major" projects, defined as installations of 2000 horsepower (1500 kW) or greater, must include "Exhibit N," an estimate of the project development costs including: land and land rights; power plant structures and improvements; reservoirs, dams and waterways; waterwheels, turbines and generators; accessory electric equipment; miscellaneous power plant equipment; roads, railroads and bridges; and transmission facilities.

These cost categories are the same as those used in the FERC Uniform System of Accounts excerpts of which are in Exhibit II. The Commission may require that quantities, unit costs and total costs be shown for each of the above items. The Commission may also require the inclusion of indirect construction costs, such as construction equipment and Workmen's Compensation if the work is not to be done by contract. If work is to be done by contract, estimates of indirect cost would include engineering and administrative overhead, construction supervision, legal expenses, taxes, interest on construction funds, and contingencies.

Annual cost estimates may also be required by the FERC. These estimates would include: rate of return or interest; local, state and federal taxes; depreciation; insurance; and operation and maintenance, and administration

In addition, it may be necessary to furnish to the Commission the costs of obtaining an equivalent amount of power from an alternate source of power in terms of dollars per kilowatt-year of capacity and mils per kilowatt-hour of average energy.

Minor Projects. FERC license applications for "minor" projects defined as projects with less than 2000 horsepower (1500kW) of installed capacity are not required to include any of the Exhibit N cost information discussed above.

Completed Cost Statements. For all projects constructed under a FERC license, the licensee must, within one year after the project is ready for service, file a statement of actual project costs with the Commission. This statement would include construction costs, cost of water rights, right-of-way costs and land costs. Similar statements are required annually for any project additions or improvements. Annual operating expenses and revenues shall also be reported to the Commission in accordance with their Uniform System of Accounts. All reports will be evaluated by the Commission and all records are subject to audit.

Securities and Exchange Commission (SEC). The SEC requires issuers of securities making public offerings in interstate commerce or by mail to file registration statements containing financial and other pertinent data about the issuer and the securities being offered. Unless a registration statement is in effect for such securities, it is unlawful to sell the securities in interstate commerce or through the mails. There are certain limited exemptions, such as government securities, nonpublic offerings, and intrastate offerings.

The effectiveness of a registration statement may be rescinded or suspended after a public hearing if the statement contains material mis-statements or omissions, thus barring sale of the securities until the statement is appropriately amended. Registration of securities does not imply approval of the issue by the SEC or that the SEC has found the registration disclosures to be accurate. Persons connected with the public offering may be liable for damages to purchasers of the securities if the disclosures in the registration statement and prospectus are materially defective. Also, antifraud provisions apply generally to the sale of securities, whether registered or not.

The SEC also requires the filing of registration applications, annual reports and other reports prepared for national securities exchanges by the following: companies whose securities are listed upon the exchanges, companies that have assets of $1 million or more and 500 or more shareholders of record, and companies that distributed securities pursuant to a registration statement declared effective by the SEC under the Securities Act of 1933. Such applications and reports must contain financial and other data prescribed by the SEC as necessary or appropriate for the protection of investors and to insure fair dealings. Special provisions provide for regulation by the SEC of the purchase and sale of

securities and assets by companies in electric utility holding company systems.

State-Level Requirements. Most states have given themselves the power to regulate the activities of investor-owned utilities (IOUs). This authority is usually delegated to a public utility commission (PUC) or public service commission (PSC) or board.

A PUC typically is both a court and administrative agency. Some of its powers may be set forth in the state's constitution. It may issue decisions and orders, cite for contempt and subpoena records, and hold hearings on any of the regulated utilities.

Generally, a PUC does not have regulatory power over cities and other public entities, although applicable laws in each state should be ascertained.

The power of a PUC to approve rates also may apply to approval of contracts for the purchase of power. In addition, a state may have another agency to regulate all corporate securities. Such an agency typically would provide control over the marketing of securities to the residents of the state, require disclosure of relevant financial and legal information consider essential in the public offering, maintain safeguards against unscrupulous promotional schemes, and take suitable enforcement action. State laws should be checked for any regulatory powers additional to those prescribed by a PUC. Such additional regulations will probably be minimal.

Environmental Considerations. Federal, state and local governmental environmental and other regulatory agencies require varying degrees of environmental assessment that could result in significant costs and affect the project schedule. The FERC license application requirements for "major" projects (1500 kW or more) include Exhibits W and S, comprehensive environmental and fish and wildlife assessments. "Minor" projects require brief environmental assessments such as a description of the existing environmental setting, impacts due to project construction or operations, mitigation measures, and alternative means of obtaining the power to be produced by the project.

After review of the license application, the FERC may also require that a complete Environmental Impact Statement be prepared in accordance with the National Environmental Policy Act. Such an EIS may also be required where the project involves the use of federal lands or funds.

State and local public agencies may also require the preparation of environmental impact reports for any projects within their jurisdiction. The environmental assessment process will be of particular importance in areas with significant aesthetic, recreational, fish and wildlife, and historical values. All the environmental assessment processes include requirements for public involvement and provisions for legal challenge.

Project Facilities to Mitigate Impacts. Significant costs can result from facilities required to mitigate potential environmental impacts, including:

1. Fish facilities — such as ladders, elevators, screens, bypasses — and collection, handling and storage facilities.
2. Architectural treatment of the powerplant with respect to historical, recreational or aesthetic values of the site.
3. Modification of locations and alignments and possible undergrounding of transmission lines due to aesthetic or other environmental considerations.
4. Special recreational facilities require to compensate for the loss of existing values.

Project Operations. Effects on project operations can include:

1. Minimum-flow requirements for water quality, fisheries, aesthetic and recreational purposes.
2. Restrictions on peaking operations to limit reservoir fluctuations and rapid variations in streamflow due to fisheries and recreational considerations.

Among the federal laws that must be considered in the implementation of any project are:

- National Environmental Policy Act (P.L. 91-190)
- Fish and Wildlife Coordination Act (P.L. 85-624)
- Endangered Species Act (P.L. 93-205)
- Historic Preservation Act (P.L. 89-665)
- Water Pollution Control Act (P.L. 92-500)
- Water Quality Improvement Act (P.L. 91-241)
- Wilderness Act (P.L. 88-577)
- Wild and Scenic Rivers Act (P.L. 90-542)
- Costal Zone Management Act (P.L. 93-612)
- Federal Land Policy and Management Act of 1976 (P.L. 94-579)

In addition, numerous state and local statutes, ordinances, and administrative regulations could impact the economics of project developments.

Timing and Usage of Funds

To avoid significant delays in the implementation of a small hydroelectric project, it is important that the funding required for each task in the process be anticipated in advance and procured in a timely manner. Figure 5-1 illustrates the implementation process for a hypothetical typical project and the cumulative funding requirements.

The time requirements and costs of the various implementation tasks will vary widely as determined by project magnitude, site conditions, and institutional factors. The implementation process includes the following significant tasks.

Prefeasibility of Reconnaissance Study. A brief prefeasibility study should be conducted to determine if the project appears sufficiently attractive to justify further, more detailed assessment. The guidelines and cost curves contained in this manuel will greatly facilitate this early study. Such a study will normally require two to four weeks to complete and should cost, at most, no more than one-half to one percent of the total project implementation cost. Any political or environmental ramifications that could stop the project should be iden-

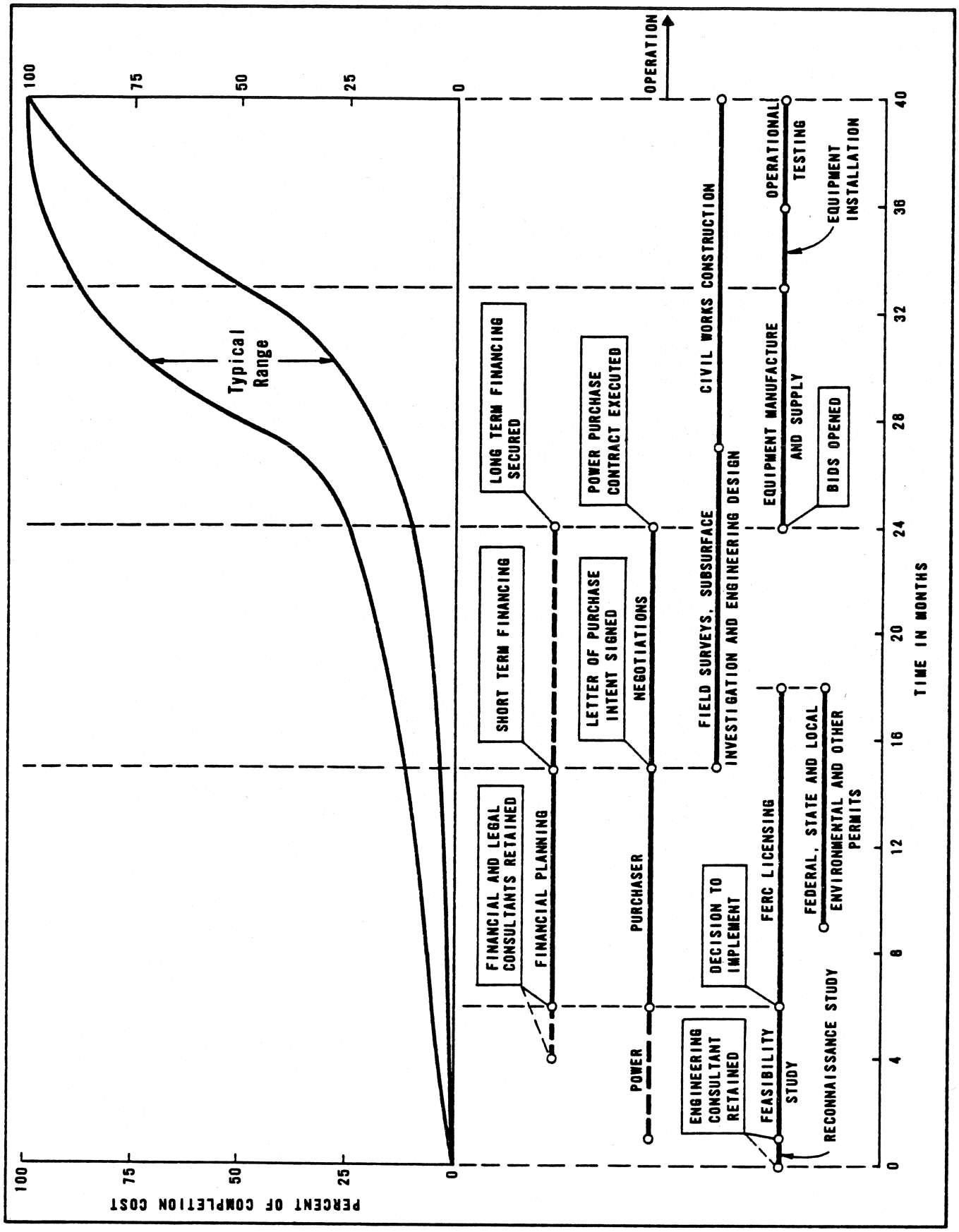

Figure 5-1. Typical project implementation schedule and expenditure pattern.

tified at this time.

Feasibility Studies. Detailed feasibility studies normally require three to six months to complete and should cost no more than two to five percent of the total costs.

Licensing and Permits. Preparation of FERC license application for minor projects of less than 2,000 horsepower of capacity takes two to four weeks, while major project applications will require three to six months for projects of less than 15 MW capacity. The time required to receive a license is in a state of flux. The FERC (Washington, D.C.) should be contacted for particulars.

Time requirements for other federal, state and local permit applications and environmental reports will vary widely depending on the institutional factors involved. These activities could take from four months to one year before all approvals are received. Much of this work can be concurrent with the FERC licensing process.

The cost of the licensing and permit processes should normally be between two and five percent of the project cost; however, for complex or controversial projects it could approach ten percent.

Engineering Design, Construction Supervision and Administration. Project design including site surveys and subsurface investigation will normally require six to 12 months for a typical project, with a possible overlap of two to four months with construction. The total exploration, design, construction supervision and administration can range from six to 12 percent depending on project size and complexity. (Guidelines for such costs are included in the American Society of Civil Engineers' Manual No. 45)

Manufacture, Construction, and Installation. Approximately 12 to 30 months will be required to manufacture and install equipment and construct civil works, depending on the size of the project.

Normally, all contracts include provisions for an advance payment to the contractor of about ten percent of the contract amount. An equipment supply contract normally calls for a payment of 80 percent upon delivery; construction and installation contract costs are normally paid monthly based on the actual work performed, excluding a ten percent retainer. The final ten percent is paid after all work is deemed complete and acceptable by the Owner or Engineer.

Funding Feasibility Studies

Prior to issuance of the FERC license it is unlikely the project sponsor will be able to obtain funds for any purpose from the long-term financing source based on the strength of the project. As indicated in Figure 5-1, the cumulative funds required to this point can amount to a significant fraction of total project cost. In addition, funds spent to demonstrate feasibility are generally subject to total loss if the project is not shown to be viable.

Many project sponsors, particularly public entities, may find it difficult to fund feasibility investigations. Consequently, obtaining these funds can represent a significant barrier to implementing a small hydro project. The next two sections discuss some possibilities in regard to feasibility funding.

Power Purchasers. An interested power purchaser may be induced to advance funds for feasibility studies and other investigations. Because the financial strength of the purchaser will typically be much greater than that of the project sponsor/site owner, such an arrangement may make sense. In the event the project is established to be feasible and is implemented, the advance will be recovered.

The project sponsor may wish to consider this type of arrangement if other funding sources are not available. It is likely that advancing funds for feasibility will enhance the negotiating strength of the potential purchaser. This, in addition to potentially being required to limit the ultimate sale of power to the advancing organization early in the feasibility stage, is a factor the project sponsor must consider prior to approaching a potential purchaser for feasibility funding.

Other Feasibility Funding Sources. A number of other sources of feasibility funding can be explored by the project sponsor/site owner.

Title IV of the Public Utility Regulatory Policies Act (Exhibit III) contains important provisions that provide funding for feasibility studies and loans for project costs. The act requires the Secretary of Energy to establish a program to provide loans of up to 90 percent of the cost of feasibility studies and license applications. In the event the project studies is not feasible, the Secretary may forgive loan repayment. Ten million dollars per year has been authorized for this purpose through September 30, 1980. These funds will be an important source of feasibility funding for project sponsors.

Several other potential sources of funding are regional development commissions, state energy agencies, and equipment manufacturers and engineering consultants, contingent upon the use of their equipment or services.

SECTION 6
FINANCIAL FEASIBILITY

General

Financial feasibility may be defined as a project's ability to obtain funds for implementation and repay these funds on a self-liquidating basis. Whether a project is feasible depends on the project's characteristics, the sponsor and purchaser, the requirements of those providing funds, and the overall credit market as it affects the cost of borrowing.

Generally, a project will be financially feasible if it can be shown it is self-liquidating with acceptable risk at realistic interest rates. An "acceptable" level of risk is generally very low. If these capabilities can be demonstrated, funds can usually be obtained.

An important part of establishing financial feasibility is the expected borrowing cost. The cost of capital for debt is the return potential investors require of the debt securities, such as bonds. This cost is generally considered to be the sum of the real interest rate that compensates the lender for surrendering the use of funds, the purchasing-power risk premium that compensates for expected inflation, the business and financial risk, and the marketability risk associated with low-liquidity of a debt security.

All of these factors must be considered in determining financial feasibility since the projects will usually be sensitive to the costs of financing.

Inflation. Inflation has two important effects on the financial feasibility of capital-intensive projects such as small hydroelectric developments.

First, inflation contributes to the cost of capital, since one component of the cost of capital is the long-run expectation of the inflation rate. Therefore, high inflation rates lead to higher costs of borrowing and annual debt service requirements. Note, however, that most financing plans will fully amortize project debt, which means the combination of principal and interest payments will be constant for the financing period.

Second, once a project is financed, inflation will generally enhance the project's net cash receipts as time passes. In capital-intensive projects, debt service will usually be a large portion of annual cash disbursements in the early portion of project life. Since the financing plan generally fixes debt service payments, only a portion of annual costs (operation, maintenance, replacements, etc.) is subject to escalation. However, the total market value of the product will be escalating, thereby increasing the difference between market value and project cost as time passes. This increase is comprised of two components — inflationary price increases and real price increases due to shifts in the supply-demand relationship for energy. The small hydro power marketing agreement should reflect these increases.

The consequences of inflation are that the first few years of operation will be the most difficult financially. It is therefore usually sufficient to show that the project is self-liquidating in its early years to be assured of overall financial feasibility. Financial feasibility is also usually assured if the project can be shown to be feasible assuming no inflation.

Security of the Minimum Revenue Requirement. The project's annual minimum revenue requirement (MRR) is the amount of funds required to pay all costs incurred by the project. The debt service portion will not be escalating, while other costs will. Consequently, the project's MRR can be expected to increase with time. For the project to be feasible, the MRR must be met with a high degree of assurance. Doing so will be a prime consideration when project financing and the power market agreement are arranged.

Funding Sources and Arrangements

A variety of long-term funding sources may be used to finance small hydroelectric developments. Several federal programs may provide funding, in particular the loan program being administered by the Department of Energy described below. In addition, the traditional methods of public entity financing will be important. These sources of financing, along with the methods available to privately owned businesses, will be reviewed here.

Federal Programs. The Department of Energy loan program is the most important federal source of long-term financing available for small hydroelectric development. This program, along with two other potential sources of federal funds, may provide financing for small hydro developments.

Department of Energy Loan Program. Title IV of the Public Utility and Regulatory Policies Act requires the Secretary of Energy to establish a loan program to provide long-term financing for small hydroelectric development. The pertinent sections of the Act (Exhibit III) should be consulted for the complete details of the program.

The loan program will provide funds for up to 75 percent of project costs to be paid off in up to 30 years. The interest rate charged will be the rate used for water resources planning projects at the time the loan is made. One hundred million dollars per year has been authorized through September 30, 1980.

The project sponsor should consider submitting a loan application under this program. While the authorized funding may not satisfy the demand for loans, the program will make an important contribution to small hydro financing.

Economic Development Administration (EDA). The EDA is concerned with communities burdened with too few jobs and too little income. Such areas typically suffer from high unemployment or low family income, and lagging or even declining population growth. They often are too poor to provide public facilities to attract new businesses and new jobs. The EDA has several programs to mitigate these kinds of problems. These include grants to help provide public works and development facilities, loans up to 100 percent to assist in financing public works, loans up to 65 percent for industrial and commercial expansion, guarantees of up to 90 percent of working capital and fixed asset loans, and technical assistance grants for planning. EDA assistance is also provided to redevelopment areas, economic development districts, and economic development regions.

EDA's Public Works and Economic Development Act program provides financial assistance for a variety of public works facilities. However, no financial assistance may be provided for projects involving the generation, transmission, or distribution of electric energy or for projects that would compete with an existing privately owned public utility. This program would appear to specifically exclude any power-related project. However, if the lack of an adequate power supply is a deterrent to community growth or aggravates unemployment, EDA financial assistance might be obtained for enterprises that are either under-employing people or would employ more people. With this assistance, these enterprises would then help to implement a small hydro power project through contracts for electrical service.

Small Reclamation Projects Act. The U.S. Bureau of Reclamation administers this program, which provides loans and grants to state and local entities for water-related projects that otherwise could be constructed under reclamation law, including multipurpose projects. Loan proceeds allocatd to irrigation and drainage are repayable without interest, while in a multipurpose project, the portions allocated to municipal and industrial water and to hydroelectric power are repaid with interest. Grants are made toward costs allocated to flood control and to fish and wildlife and recreation benefits. The maximum loan or grant is $18 million for a project whose costs cannot exceed $27 million (as of 1978). Loans must be repaid within 40 years. This financing program is available only to areas located west of the Mississippi River.

If a small hydro project can be incorporated into an otherwise federally acceptable irrigation project, resulting in a multipurpose project, substantial federal financing assistance may be possible through this Act.

Financing by Public Entities. Most public entities operate on a cost-recovey, non-profit basis. Revenues derived from taxes or commodity sales (e.g. water) or services (e.g. electricity or garbage pickup) are set annually at a level that will cover only debt amortization costs, O&M and replacement costs. Typically, little or no cash reserve is available to finance construction of capital programs even on a modest basis. Consequently, when a sizable capital expenditure program is to be undertaken, the entity is forced to borrow funds to finance it.

The two most common methods of borrowing are (1) issuance of general obligation bonds and (2) issuance of revenue bonds. Within these two types are numerous variations. Therefore, when an issue of bonds is contemplated by the entity, financial and legal bond consultants usually are retained to provide counsel to aid in the sale of such securities. These services are discussed under the heading of the "Financial Consultants in Public Sector Financing."

A successful marketing of bonds requires, among other things, that the proposed issue can be legally marketed by the entity. Sometimes legislation at the state level may be required to permit it to engage in a particular activity, such as the generation and sale of power, and to incur debt in connection with the activity. The financial markets (e.g. Wall Street) must also be in a state of receptiveness towards purchase of the bonds.

General Obligation (G.O.) Bonds. G.O. bonds are unique to the public sector in that their repayment ultimately is secured by the taxing power of the issuing entity. If revenue from the sale of electricity at any time during the payout period of the bonds becomes inadequate to cover the debt amortization, O&M and replacement costs, then the bond-issuing entity is required to impose taxes, increase taxes, or take all other measures necessary to cover such costs.

Fundamentally, the taxing power of the bond issuing entity undergirds the security of G.O. bonds. If, however, the entity has a mediocre record of financial management of its affairs or already is heavily in debt from prior issues of bonds that have priority to income over subsequent issues, the importance of the taxing power is diminished. In such cases, usually either one of two things occurs, the interest rate on the bonds is increased as a tradeoff to the increased risk inherent, or revenue bonds are issued.

Two principal types of G.O. bonds are issued: self-liquidating and non-self-liquidating. As the name implies, self-liquidating bonds are secured by revenues from the sale of a commodity or service without resorting to taxes to aid in bond payment. However, in cases of emergencies or other unforeseen events, tax revenues may be used. Non-self-liquidating bonds usually are secured largely, if not solely, by revenues from taxes. The credit rating of the entity is enhanced as the ratio of self-liquidating bonds to non-self-liquidating bonds increases, and the resulting interest rate on its borrowed funds tends to decrease.

Inasmuch as G.O. bonds become a legal obligation of all property owners within the entity, approval of the voting electorate must first be obtained. Usually a two-thirds majority vote is required for approval.

Revenue Bonds. Revenue bonds, of which there are several types, are secured only by revenues obtained from the marketing of commodities or services. Such bonds may be of a general revenue type in which first claim is made on all revenues or be more restrictive in that bond payout and security are limited to a single source (e.g. a project). Authorization for issuance of revenue bonds usually is not required by a two-thirds vote, but by a majority vote of the electorate.

Revenue bonds are not secured by the taxing power of the issuing entity. Consequently, a project to be financed by such bonds has to be financially sound and demonstrate in the financial feasibility report supporting the proposed bond issue that the required annual revenues will be forthcoming. If the project revenues are the sole security for the debt service, annual revenues, less operating costs, are usually required to exceed debt service by 25 to 30 percent. Such a margin of safety is required by the bond buyer to provide a cushion, so to speak, against unforeseen adversities that may befall the project and yet assure coverage of annual debt amortization costs.

When revenue bonds are used to finance a small hydro project, the reliability of the rvenues becomes most important. Close scrutiny needs to be given to contracts for the purchase of power from the project. The contract should cover the payout period of the bonds, the credibility of the power purchaser needs to be examined, and any loopholes adverse to the security of the revenue flow need to be dealt with.

Other Forms of Indebtedness. A public entity may find it desirable to issue notes or warrants based upon the advice of financial counsel, the size of the proposed capital expenditure and indebtedness to be incurred, or other factors. These are general obligations of the district, with maturity periods of up to ten years; oftentimes they are purchased by one buyer, such as a bank or insurance company.

Tax Status. Virtually all local public entities' bonds and other forms of debt are tax free. That is, the interest accruing to the bondholder is exempt from federal income taxes and state income taxes in the state in which the bonds are issued. It is customary to obtain a legal opinion from bond counsel prior to the issuance of the debt form as to the tax-exempt status. Such income tax exemption results in very favorable interest rates being obtained on the borrowed money. Assuming they have a good credit rating, non-federal public entities are able to borrow funds at a much lower interest rate than the federal government or private enterprise.

Public entity revenue bonds may become Industrial Development Bonds (IDBs) under certain conditions and will generally lose their taxexempt status. For small hydro developments, the bonds are IDBs if over 25 percent of the output is used by an investor-owned utility. However, the interest paid on IDBs may be exempt from taxation in small hydro developments — for example, when they are used to finance a facility to furnish local electrical energy solely within an area consisting of a city and one contiguous county, or when the facility furnishes water to members of the general public, including an electric utility. Thus, any dam built or modified to provide generation of hydro power to be used by the general public through an electric utility would be eligible for financing by tax-exempt bonds. Certain small issues are also tax exempt. Small issues are issues of $1 million or less, the proceeds of which are used for the aquisition or construction of depreciable property or land, such as a small hydro facility. At the election of the issuer, the $1 million size limit can be raised to $10 million due to amendments to the Internal Revenue Code in the Revenue Act of 1978. This small issue exemption should benefit many small hydro facilities.

If non-public entity participation is involved, it is strongly recommended that the tax status of a proposed revenue bond issue be determined in the early stages of the project proposal.

Some Repayment Provisions. Bond repayment provisions may vary depending on local circumstances and the money market situation. Serial bonds are bonds that mature annually according to the serial number. For example, if 1000 bonds are issued, bonds numbered 1 through 40 would mature and be redeemed the first year, bonds numbered 41 to 80 the second year, and so on.

Term bonds mature and are redeemed at the end of a term or period of years, with only the interest on the bonds paid during the interim. Usually, a sinking fund is built up to pay off the bonds at the end of the term. Consequently, the cash needs of the issuer are similar to what would be required if the project were financed with a fully amortized loan.

Generally, the larger the obligation is, in relation to the financial size of the issuing entity, the longer is the maturity period. The maximum period ranges from 30 to 50 years depending on the statutes that govern the entity. These statutes will vary by state and also by the type of public entity within a state.

Costs. When a bond issue is to be sold, usually it is put out to bid, and other things being equal, the bidder (underwriter) offering the lowest average interest rate will be awarded the bid. If the maturity period of the bonds extends over a considerable period of time, then often the bonds that mature early will bear a different interest rate than later-maturing bonds. The rate may be either higher or lower depending on the supply-demand situation in the financial markets at the time of issue. Usually, however, longer maturing bonds require a higher interest rate.

All or part of a bond issue may be callable before maturity. That is, the issuing entity may wish to call in the bonds ahead of their maturity date and pay off the bondholders. Usually, though, a small bonus must be paid by the issuer to the bondholder. Refunding bonds are similar to callable bonds in that the bonds are called

in and replaced by another bond issue with differne terms (usually lower interest rates) and conditions.

When a bond issue is sold, a covenant or contract between the seller and buyer is executed in which all of the terms and conditions are set forth governing such things as the coupon (interest) rate for each bond during its life and callable and refunding features, if any. A bond may be subsequently resold many times before it matures and is redeemed by the issuer.

Investor-Owned Project Financing. Corporations in the utility business have choices broader even than public entities in funding a capital improvement. Many types of bonds, notes, warrants, preferred stock and common stock may be issued, subject, of course, to state and federal regulatory approval. Original issues may be sold only in states where they comply with the securities laws.

Investor-owned utilities (IOU) may issue various types of bonds that, like a public entity's bonds, are simply promises to pay back to the lender the principal and interest thereon over a specified period of time. The bondholder is the creditor. He has no voting power, but has first claim on the assets of the firm in case of liquidation. However, prior issues of bonds still outstanding have a higher priority claim. Such bonds also may have callable or refunding features and other terms and conditions as set forth in the bond covenant.

IOU bonds are not general obligation bonds because the utility does not have the power to tax. They are more similar to revenue bonds in that the project revenues or other revenues are used to pay off the indebtedness. Also, interest paid on the bonds (or notes and warrants) is subject to federal and state income taxes. Consequently, because of the higher risk and income tax law provisions, the cost of borrowed money is much higher (about 50 percent more) for IOUs than for public entities in the utility business.

An IOU also sells common stock that is evidence of ownership or equity in the firm as contrasted with that of a creditor position. The stockholder has a voting right, and therefore controls corporate policy, and a residual claim on profits after all prior claims have been satisfied. Unlike bonds, dividends are paid if profits have been made and, again, unlike bond interest, these dividends may vary from time to time or even not be paid at all if the financial condition of the firm is poor.

Preferred stock may be issued. Such stocks are in an intermediate position between bonds and common stock. They have a lower priority on corporate assets than the bondholder but higher than the common stockholder. The dividend rate is fixed, as in the bond interest rate. The priority on assets and earnings is below that of the bondholder, but higher than the common stockholder. And usually there is no voting privilege.

Dividends paid on common and preferred stock are taxable income (unless the dividend paid is a return of capital due to poor earnings).

IOUs try to maintain a balance between bonds and stock in their financing. Inasmuch as IOUs are regulated as to their rates and require approval of public regulatory agencies to issue bonds and stocks in return for being given a franchise or monopoly position for a given area, their securities do not fluctuate much in price, and their dividends are relatively secure.

Establishing Financial Feasibility

Cost of service is the term commonly used for the cost of producing electrical energy at the point of ownership transfer. In the case of small hydroelectric development, this will typically be the annual costs of delivering power to the high voltage side of the step-up transformer divided by the annual energy production.

If the cost of service is less than the value of the energy produced, it should be possible to negotiate a marketing agreement that allows the project to be implemented while providing the needed security in debt service payments. This is because both parties can financially benefit from the project, which is the essential requisite for entering into relationships. Because inflation will generally increase the value of energy faster than the cost of services, it will usually be sufficient to show that the cost of service is favorable within the first few years of project operation.

Occasionally it may be desirable to calculate the levelized cost of service from small hydro for comparison with alternate utility production costs. This technique is outlined.

Cost of Service Calculations. This section briefly describes how cost of service is calculated and presents an example of the cost of service for average energy production throughout the life of a project.

The lump-sum capital-cost estimate is used to establish the completed project cost. The method illustrated in Table 4-1 is applicable. The cost of capital used in calculating annual debt service is also used in construction financing unless some circumstances particular to the project indicate otherwise. With the completed cost estimate and the cost of financing specified, the annual debt service can be calculated.

The debt service payments plus other escalating and constant annual costs are then summed to estimate total annual cost through the project financing period. Total annual cost divided by average annual energy production yields the expected cost of service.

A brief example of a municipal utility project is presented to illustrate the method. Assume:

(1) completed cost equals $6,000,000

(2) annual O&M in the first year of operation equals $135,000

(3) cost of financing from Figure 6-1 is approximately 6 percent

(4) 30-year financing period

Then the capital recovery factor is CRF = .07265 and

annual debt service is approximately $435,900.

Table 6-1 shows the results of the cost-of-service calculations.

Over the 30-year financing period used in this example, the cost of service approximately doubles. Over this same period, the value of energy — which was close to the original cost of services and escalated at the same rate as O&M — increased by a factor of about *five*. This example illustrates how inflation will generally enhance the project's long-run annual value.

Occasionally, it may be desirable to convert the escalating cost of service into a levelized cost. This can be accomplished by discounting and summing the cost of service stream to the first year of operation and then calculating the constant annual cost, which is equivalent to the summed costs. Since the procedure would only be used to compare the cost of the hydro project to an alternative available to the power purchaser, the appropriate interest rate to use in these calculations is the weighted average cost of capital to the power purchaser. If the levelized cost of the hydro plant is less than the cost of the power purchaser's alternatives, it should be possible to negotiate a marketing agreement that allows project implementation.

Sensitivity Analysis. Frequently, some form of sensitivity analysis should be performed to provide additional information for the decision makers. This is particularly true when some parameter is not known with certainty or will be fixed at some time in the future.

A good example of an uncertain parameter that might be the subject of a sensitivity analysis is the cost of financing. At the completion of the feasibility study, the actual financing may not be obtained for one or even two years even if the sponsor decides to implement the project in a timely manner. As an examination of Figure 6-1 shows, over this period the cost of financing can range a full two and one-half percentage points. For this reason, the project sponsor may need a sensitivity analysis of the effect the financing cost has on the cost of service.

The results of this analysis will allow the implementation decision to be made with more complete knowledge.

To illustrate, the example from the preceding section was used to perform this sensitivity analysis. Completed cost was assumed to be constant at the $6,000,000 figure, and the interest rate was varied over the five to eight percent range after examining Figure 6-1. The impact on the cost of service in the first year of operation is shown in Figure 6-2. If the value of power from this project is 2.5¢/kwh, the sensitivity analysis shows a definite risk in going ahead with the project, even though the current interest rate yields reasonably favorable results. The utility of the analysis is evident.

Other project parameters that may be desirable to investigate include initial value of the project's energy, completed cost, operation and maintenance costs, and escalation rates.

Coverage of Revenue Requirements. The project's minimum revenue requirement must be assured with a high degree of certainty for the project to be able to attract funds for implementation. Discussed below are several ways the necessary level of security can be obtained.

Marketing Arrangements. Most small hydro projects are expected to obtain revenue security through a power contract executed with the ultimate power purchaser. For the power contract to be an effective device to secure debt service on the long-term project financing, several conditions must be met.

1. The contract must require payments sufficient to cover debt service in *all events*. This requirement is necessary to transfer *force majeure* and other risks to the power purchaser and away from the holders of project debt.

2. The capability of the power purchaser to give this assurance must be proven. In the case of large IOU's where the state-level PUC approves of the power contract, the assurance will generally be present.

3. The power contract should generally be in force for the length of the financing period.

Sponsor Guarantees. If security for the project debt service is not present in the marketing agreement, the financial integrity of the project sponsor may be used as security. If the sponsor is a public entity, issuing general obligation bonds effectively secures the debt service with the overall integrity of the project sponsor.

In a similar manner, a private sponsor can guarantee debt service. One method is pledging specific real assets, in addition to the project itself, as security. Large corporations are frequently able to issue bonds or otherwise borrow funds not specifically secured by real assets but relying on the general credit worthiness of the borrower.

In the typical small hydro project, sponsor guarantees are not expected to be the source of security.

Power Production as Security. Conventional projects financed with revenue bonds are sometimes secured by the projected revenues generated by selling the project's output. The rule of thumb often used to determine if the expected revenue from the project is adequate is to calculate the excess of revenues over operating expenses and debt service. If this excess exceeds 25 to 30 percent of annual debt service, as a general rule the project can be financed.

If small hydro output is sold on a per kWh basis, the situation is similar to the conventional project. However, because power production will vary based on the flow conditions, the rule of thumb applied to average production may be inadequate to determine if the project is sound.

The risk of a revenue deficit from low-flow conditions

TABLE 6-1. Cost of Service Calculation

*** COST OF SERVICE CALCULATIONS ***

(ANNUAL ESCALATION OF 6.0 % PER YEAR)

YEAR OF OPERATION	BOND AMORTIZATION	OPERATION & MAINTANENCE	TOTAL ANNUAL COST	AVERAGE ANNUAL ENERGY PRODUCTION (MILLIONS OF KWH)	COST OF SERVICE (CENTS/KWH)	VALUE OF ENERGY (CENTS/KWH)
1	$435,900	$135,000	$570,900	22.500	2.537	2.500
2	435,900	143,100	579,000	22.500	2.573	2.650
3	435,900	151,686	587,586	22.500	2.611	2.809
4	435,900	160,787	596,687	22.500	2.651	2.977
5	435,900	170,434	606,334	22.500	2.694	3.156
6	435,900	180,660	616,560	22.500	2.740	3.345
7	435,900	191,500	627,400	22.500	2.788	3.546
8	435,900	202,990	638,890	22.500	2.839	3.759
9	435,900	215,169	651,069	22.500	2.893	3.984
10	435,900	228,079	663,979	22.500	2.951	4.223
11	435,900	241,764	677,664	22.500	3.011	4.477
12	435,900	256,270	692,170	22.500	3.076	4.745
13	435,900	271,646	707,546	22.500	3.144	5.030
14	435,900	287,945	723,845	22.500	3.217	5.332
15	435,900	305,222	741,122	22.500	3.293	5.652
16	435,900	323,535	759,435	22.500	3.375	5.991
17	435,900	342,947	778,847	22.500	3.461	6.350
18	435,900	363,524	799,424	22.500	3.552	6.731
19	435,900	385,335	821,235	22.500	3.649	7.135
20	435,900	408,455	844,355	22.500	3.752	7.563
21	435,900	432,963	868,863	22.500	3.861	8.017
22	435,900	458,941	894,841	22.500	3.977	8.498
23	435,900	486,477	922,377	22.500	4.099	9.008
24	435,900	515,666	951,566	22.500	4.229	9.549
25	435,900	546,606	982,506	22.500	4.366	10.122
26	435,900	579,402	1,015,302	22.500	4.512	10.729
27	435,900	614,166	1,050,066	22.500	4.666	11.373
28	435,900	651,016	1,086,916	22.500	4.830	12.055
29	435,900	690,077	1,125,977	22.500	5.004	12.779
30	435,900	731,482	1,167,382	22.500	5.188	13.545

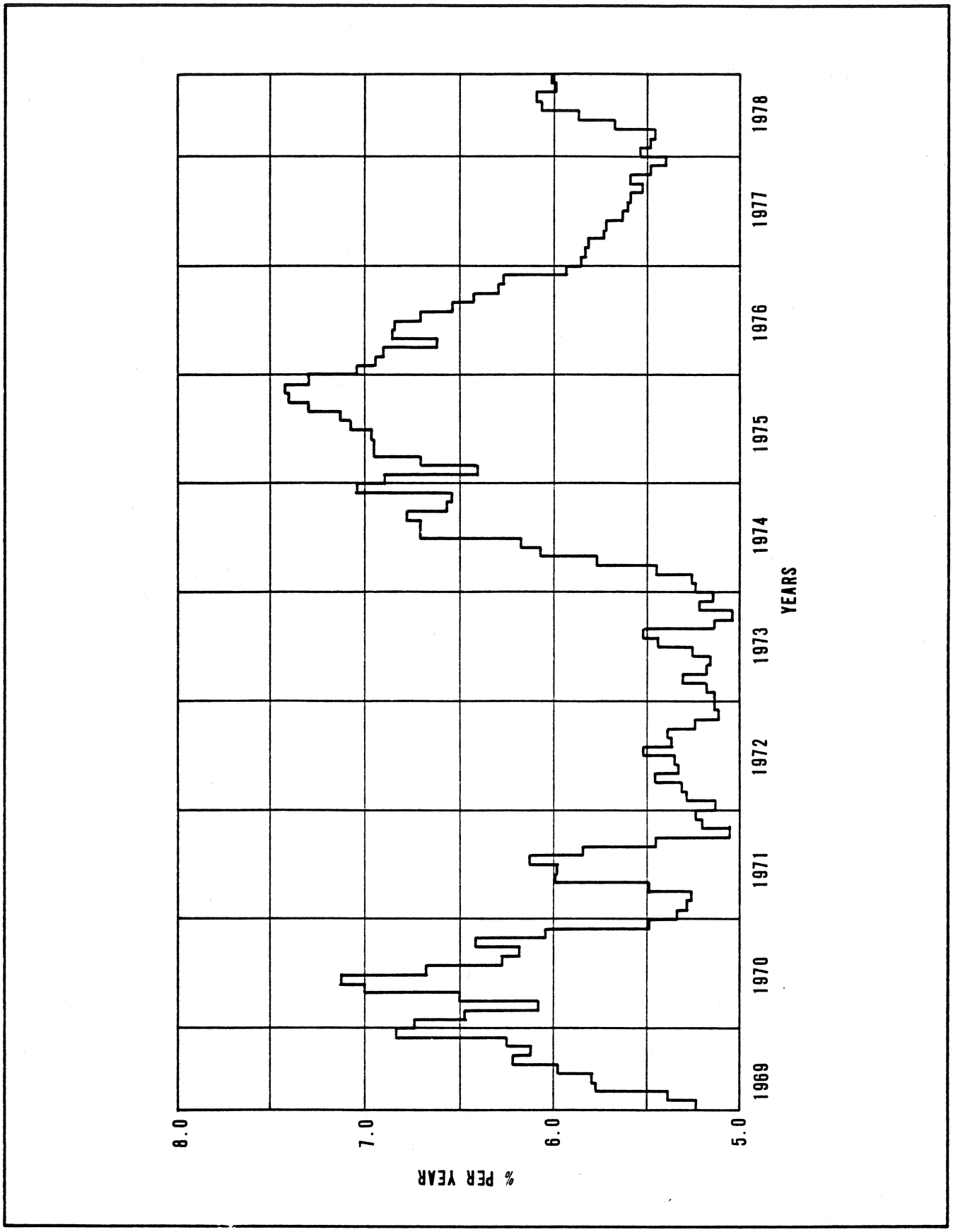

Figure 6-1. Municipal bond yield averages for general obligation bonds. Source: Moody's Bond Record.

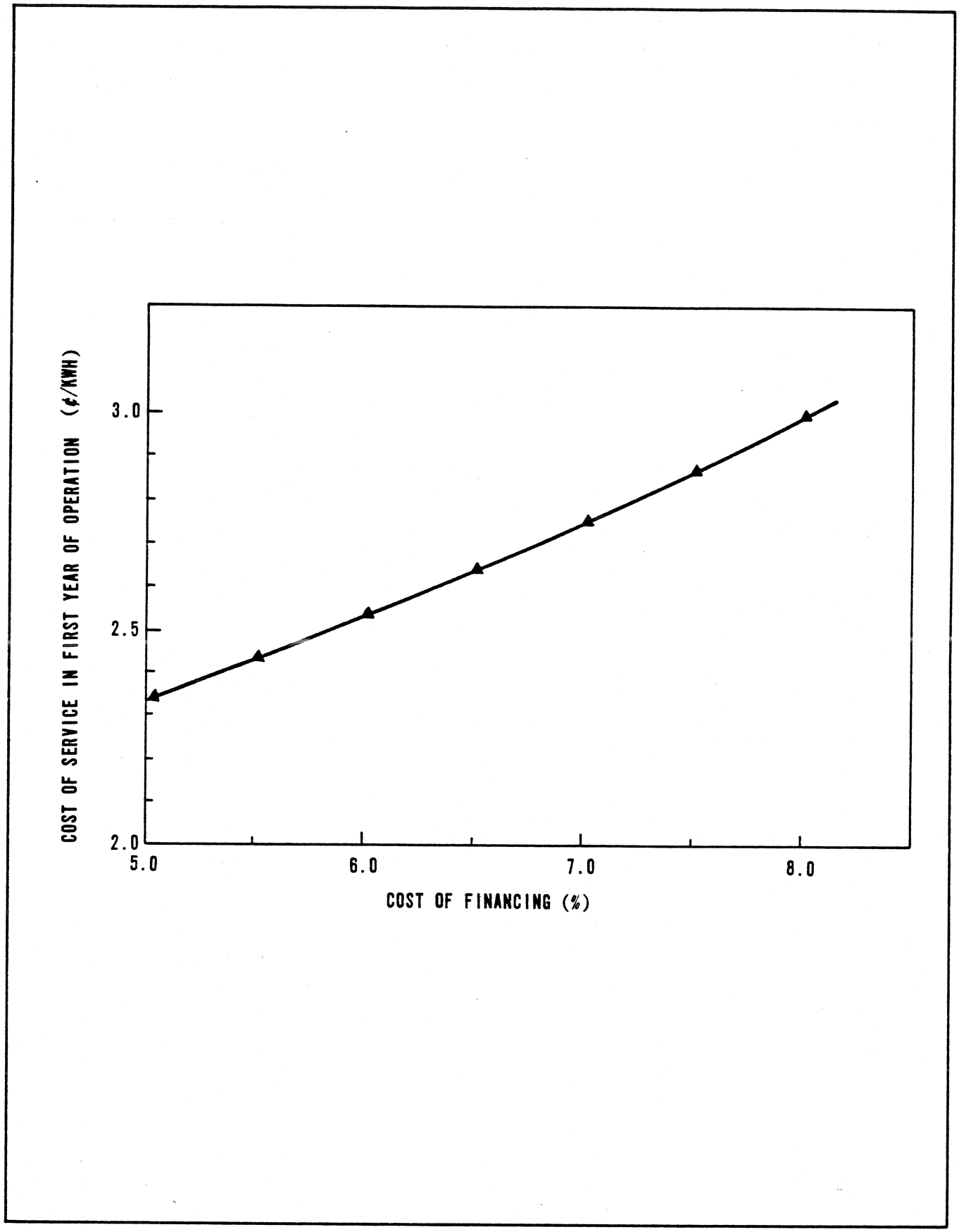

Figure 6-2. Example of financial sensitivity analysis.

can be calculated in a reasonable manner. The procedure is to first calculate the minimum revenue requirement to meet all costs. Then, using the expected per kWh price, the annual production necessary to meet these requirements can be calculated. Finally, an annual energy production histogram (as shown in Figure 3-3) can be used to calculate the risk of a revenue deficit. The risk would be measured by the proportion of the time annual energy production is less than the minimum requirement.

As a general rule, there can be no risk of a revenue deficit from low flow if the project is to be acceptable to the bond purchasers.

Financial Consultants in Public Sector Financing

Bond financing of a capital improvement project requires the services of the finance, legal, accounting and engineering professions. Each contributes to a process that requires development of a financing plan and its subsequent implementation through the preparation of bond sale documents, creation of a marketing program and finally the bond sale. While the issuer's staff, the auditors and consulting engineers all provide essential information for the documents required to market bonds, the financial advisor, drawing on the legal expertise of bond counsel, is responsible for creating and preparing the market for the securities being issued to raise the required capital.

Financial advisory or bond counsulting services are provided by several different types of organizations, including investment banking firms, commercial banks, and independent consulting firms. These differ from one another in their activities in addition to bond consulting. Investment banking firms underwrite (buy for subsequent resale) and distribute all types of securities, while commercial banks underwrite and distribute only U.S. government and general obligation bonds, as they are prohibited by federal law from underwriting most types of revenue bonds. Independent consultants do not underwrite or distribute securities. Consequently, an investment banking firm may have more experience in hydroelectric revenue bond financing than the other two, and it also could act as investment banker in the event the bonds are sold by negotiation rather than competitive bid.

Tax Status. When the small hydro project is constituted by a municipal or other publicly owned utility, the common practice is to finance the project with tax-exempt electric revenue bonds.

The tax-exempt nature of these securities is of major importance and is the reason their interest rates are substantially lower than corporate securities.

When a municipality or other public entity is building a generating facility that will be used by an investor-owned utility, the bonds may be deemed to be industrial development bonds, and as a result there may be a loss of the federal income tax exemption. The terms of the power sales contract must be drafted to avoid creating an industrial development bond as defined by federal law and Internal Revenue Service regulations and rulings. In simple terms, the exemption is preserved if less than 25 percent of the capacity is used by an investor-owned utility or if the utility's system serves no more than two counties.

Recent changes to the Internal Revenue Code contained in the Revenue Act of 1978 may increase the ability of a project sponsor to retain tax-exempt status even if more than 25 percent of the capacity is used by an IOU. Funds used to finance portions of the water-related facilities may be tax exempt due to these changes. In addition, increases in size limits of certain exempt small issues may allow the powerhouse to be financed with tax-exempt securities.

The financial advisor and legal counsel consider these matters in recommending terms for the power sales contract. This is generally done during the planning stage.

Financial Advisor's Role. The role, in detail, that a financial advisor plays in financing a project is described below for each stage in the process: financial planning, document preparation, market development and bond marketing.

Development of a Financing Plan. The development of the financing plan should be based, among other things, upon (1) the engineering studies on the construction program of the proposed project for which financing is required, including the estimates of construction and acquisition costs and the schedule of drawdown of construction funds, (2) studies on the economic and financial feasibility of such a program, (3) studies on the future revenue base of the client to support its existing indebtedness and proposed future indebtedness to be incurred in connection with the construction program for the project, and (4) the existing corporate, statutory, financial and legal structure of the client as it pertains to the project. This financing plan, which must be drafted in complete concert with the appropriate members of the client's staff and its legal and engineering consultants, should cover, among other things, the following areas:

1. The results of a complete review of the client's existing financial and legal structure as it pertains to the project, and more particularly the provisions incorporated into the bond resolutions of the client.
2. The contemplated amount of bonds or other forms of indebtedness necessary to be issued to finance the immediate as well as anticipated future capital requirements of the project. The amount should include the costs of construction, land acquisition, funded interest during the construction period, appropriate amounts for reserves, contingencies and fees, financing costs, etc. This area should also encompass suggestions and recommendations on a shorter medium-term financing program to be implemented prior to or in conjunction with the long-term financing program. This evaluation of alternative financing concepts should include a

review of legal constraints, market conditions, timing of capital requirements, comparative cost of money, and impact on the client's credit standing.

3. The proposed financial structure and the suggested security provisions covering the proposed revenue bonds of the client to be issued to finance the project.

4. The establishment of maturity schedules for the revenue bond issue and subsequent issues or shorter medium-term notes to be issued to finance the project, and the establishment of appropriate redemption provisions for the initial issue of the bonds. This should also encompass a complete review of the benefits or detractions of term bonds versus serial bonds, or a combination of serial and term bonds, for the purpose of developing, among other things, the most favorable cost of money.

5. The provisions of a financial nature to be incorporated, where applicable, into any participation agreement, power sales agreements, and any other agreement necessary to implement the improvement and construction program of the client in regard to the project. Such contracts are very important to the successful sale of the revenue bond issue for small hydro projects due to the fact that the security and quality of the issue is frequently based on not only the strength of the client but also on the strength of the other participants involved.

6. The financial provisions, in depth, to be incorporated into the bond resolution under which the revenue bonds to finance the project will be issued and will be secured. These provisions must be carefully developed in order to provide the project sponsor with the maximum degree of flexibility and an acceptable financial and legal structure to sophisticated institutional investors throughout the United States. These provisions should address:

—The establishment of a specific construction fund or funds, the methods of disposition and investment of the moneys in said fund or funds, and the disposition of any surplus money therein.

—The establishment, if deemed appropriate and in concert with the existing resolutions of the client, of specific funds within such bond resolution to cover (1) operation and maintenance expenditures, including necessary provision for working funds, (2) the payment of interest on and principal of bonds when due, and reserves therefore, (3) necessary reserves for extraordinary renewals and replacements, depreciation, public liability claims, etc., and (4) purchase of new or replacement equipment.

—The proposed covenants or revisions thereto governing the issuance of additional revenue bonds.

—The establishment of such additional covenants regarding rates, consulting engineers, audits, annual reports, etc., as may be deemed appropriate or necessary.

7. The timing of issuance of the bonds or the drawdown of note or loan funds that should be based in part upon the anticipated drawdown of construction funds, as well as the anticipated construction or acquisition contractual obligations of the project.

8. In collaboration with the bond counsel or general counsel to the client, the provisions of a financial nature to comply with such rules and regulations of the Securities and Exchange Commission, the Internal Revenue Service and any other federal agency that may have a bearing on the financing and construction program of the project.

9. To the extent deemed necessary for the development of the financial plan, financial analysis of pertinent data furnished by the client, its engineers, or other consultants on sources and estimated amounts of revenues, and other funds that might reasonably be expected to be available to the client to aid in financing the construction, acquisition, operation and maintenance of the project or the payment of principal and interest on its prospective future revenue bonds.

10. In conjunction with the financial plan, the financial advisor would perform any additional financial analysis and attend any hearings, to the extent necessary and proper, in matters required by administrative, judicial, legislative and other government bodies that would be necessary to the successful completion of the revenue bond issue.

Development of All Necessary Documentation. Upon completion and acceptance by the client of the principles incorporated within the plan for financing the project, the duties and responsibilities of the financial advisors should encompass the coordination of work with the attorneys of the client, including bond counsel, regarding the financial and security provisions to be contained in the instruments authorizing and securing the bonds.

In addition, in collaboration with the client's financial staff, its legal counsel and its engineering consultants, the financial advisors will prepare all necessary underwriting documents and the "Official Statement." The Official Statement includes the:

1. Amount and title of the bond issue, with maturities, interest rates, call feature, paying agents, registrability features, approving attorneys, etc.

2. History and description of the client and the source of its authorization to issue bonds.

3. Full disclosure of the purpose of the bond issue and description of the project to be financed.

4. Feasibility studies.

5. Detailed disclosure of historical operating records of the client.

6. Description of the revenues or other moneys, if any, pledged to the payment of the bonds.

7. Full disclosure as to use and application of the bond proceeds.

8. Summaries of the authorizing bond resolution, trust indenture, power sales agreement, and any lease and related proceedings.

Market Development for Revenue Bonds. One of the major functions of the financial advisors is the

development of a market for the revenue bonds to finance the project prior to the actual sale. This is probably one of the more difficult functions to successfully accomplish in view of, among other things, the constant competitive pressures within the national money market from bond issues of federal agencies, corporations and municipalities, and municipal agencies. Some of the specific tasks the financial advisor would perform for the client in preparing and developing a market for its proposed bonds would include:

1. Develop an extremely broad and comprehensive nationwide mailing list of all institutional investors who have or could have an interest in the financing programs of the client. Through this mailing list, all pertinent documents and additional information that is deemed useful and appropriate would be disseminated.

2. Assist the client in developing a presentation and making the presentations concerning its financial and legal structure and the security aspects of the bonds to finance the project to the appropriate rating and credit agencies.

3. Assist the client in arranging and conducting such tours by representatives of institutional investors of the physical properties and operations of the client as are deemed appropriate or advisable.

4. Assist the client in conducting information or due diligence meetings in major financial centers as is deemed appropriate or necessary. This function is very important for the success of the financing of the project at hand as well as the future financing programs of the client through the medium of his revenue bonds. Since 5,000 commercial and savings banks and fire and casualty insurance companies constitute the institutional market for municipal securities, this broad market must be effectively developed on behalf of the client and the project in order to insure to the greatest extent practicable the lowest cost of money.

5. Arrange on behalf of the client special meetings with major institutional investors throughout the United States to fully inform such institutions on all aspects of the client and his construction and financing program.

Marketing the Bonds. The fourth major function of the financial advisor is the formal marketing or sale of the client's bond issue. This should be accomplished when the market has been developed and conditions in general are opportune. In implementing the sale of bonds, some of the more important steps would include the following:

1. Determine the most appropriate method of sale of the bonds, whether private placement with institutional investors or public offering on a competitive or negotiated basis. The major factors affecting this discussion are the statutory rights and power of the client, the condition of the market, the availability of funds with institutional buyers and an evaluation and comparison of the possible interest costs under either financing method.

2. Within the financial requirements, recommend the most appropriate issue structure to insure the broadest possible market acceptance. This would contemplate utilizing serial bonds, term bonds or a combination of both.

3. Assist in the preparation of the official notice of sale, if appropriate, or any public announcement regarding the sale of notes or bonds.

4. Determine, again within financial requirements, the most appropriate time to market the bond issue. While it is admittedly impossible to precisely predict bond markets, the advisor should follow and analyze money market trends, the future supply of new debt issues, secondary market activity and buying patterns of investors — all important considerations in scheduling a sale date.

5. Attend any sales of notes or bonds and assist the client in the analysis of the bids. The purpose is to determine the accuracy and appropriateness of all proposals that may be submitted.

6. Advise and assist the client in arranging for printing, execution and signing and delivery of the bonds after the bond sale.

Cost of Issuing Bonds. The table below shows a range for the costs of issuing bonds. The financial advisor's fees are established by con- tract following discussions with the issuer. The remaining expenses are normally provided for out of the gross spread, which is the difference between what the issuer is paid for the bonds and the price at which they are sold to the public.

	Percent of Issue
Financial advisor	0.3% — 0.5%
Expenses	0.2 — 0.4
Underwriter's fee	0.2 — 0.4
Salesman's takedown	1.0 — 2.0
Total Financial	1.7% — 3.3%

Additional to these financial costs are other financially related fees paid to legal counsel, bond counsel and auditors.

SECTION 7
SUMMARY AND COST GUIDELINES

Summary

Small hydroelectric development is an important renewable electric resource in the United States. The Public Utility Regulatory Policies Act of 1978, part of the national energy plan, contains specific provisions that may enhance small hydro development. The Act has required the FERC to prescribe rules for wheeling and purchasing small hydro output by electric utilities. It also contains important provisions that authorize funding for both construction and feasibility studies.

The feasibility stage is a period of major risk for the project sponsor, since all funds spent during this time are subject to total loss if the project is not viable. In many cases the sponsor will be unwilling or unable to take this risk, and the project will not be able to proceed. The feasibility funding provided in the Act should help, in many cases, to reduce the sponsor's risk to acceptable levels. The project sponsor can also minimize the potential financial loss by avoiding intermediary feasibility studies that do not allow the implementation decision to be reached.

Small hydro projects are capital-intensive, and consequently debt service comprises a major portion of cash disbursements, particularly in the project's early years. Because of this, project feasibility is sensitive to the cost of financing. The public sector, with its low-cost capital, will find small hydroelectric development more attractive than private promoters. Continuing escalation in the value of energy may reduce the importance of low-cost capital.

However, under current law, debt securities issued by a public sponsor may lose their tax-exempt status, depending on the disposition of the project's power output. If a public project sponsor intends to sell the power output to investor-owned utilities, the tax status of any debt securities used to finance construction must be determined at an early stage.

With many of the potential small hydro sites controlled by public entities, congressional legislation on the tax status of revenue bond financing for small hydroelectric developments may be desirable. Suitable legislation could decrease the current uncertainty in regard to the financing costs of many projects. Also, if small hydro developments were added to the list of categorically tax-exempt activities (Internal Revenue Code SEC. 103 (b) (4)), publicly developed small hydro developments would be assured of low-cost of capital. This would make more projects financially feasible, thereby accelerating small hydro development and furthering the nation's energy plan.

The marketing of small hydro output will play a central role in achieving feasible projects. The marketing agreement will, in many cases, provide the security necessary to obtain project financing. Consequently, adequate financial and legal counsel must be obtained to ensure that the ultimate power contract contains all the essential elements for financing to be arranged.

Summary Procedure. Figure 7-1 summarizes a procedure applicable to the economic and financial analysis of small hydroelectric projects. There are three major stages in the analysis. First, all of the cost, power production and marketing information must be assembled and organized in an understandable manner. Second, the economic and financial analysis is done using the best estimates of all the project parameters. The economic analysis screens and ranks the development options. If none of the options is viable, the analysis can be terminated. The financial feasibility of options that appear economically viable is then investigated. Once again, if no viable financing plan can be formulated the project may be infeasible. Third, if one or a number of the development options are viable, the impact of changes in the major project parameters may need to be investigated. In the case of small hydro, sensitivity analysis will usually suffice. However, in some cases a risk analysis may be necessary. This would most likely occur when the project alone is the security for the lenders.

Cost Guidelines for the Study

Level-of-effort guidelines that can be used to determine the costs to perform the power market and economic and financial tasks of a feasibility study have been based on experience in developing cost proposals for small hydroelectric and other related projects in addition to having documentation as to the actual expenditures incurred for completed projects. Fifteen to 25 percent of the total feasibility costs is generally required to complete the market and economic and financial tasks.

Power Market Analysis. This task generally consists of peforming the market analysis as discussed in Section 3 and preparing the narrative portion, which would include tables and figures as appropriate.

Completing the power market task will take anywhere from 15 to 25 man-days and approximately 10 to 15 percent of the total feasibility study cost.

Economic and Financial Analysis. Preparation of the economic and financial analysis has been discussed extensively in this volume of the Feasibility Investigation Manual. While this task is central to project feasibility and integrates all of the information into a measure of economic desirability, the level of effort involved is relatively modest.

The economic and financial analysis task will take anywhere from six to ten man-days and approximately five to 10 percent of the total feasibility effort. In addition, the level of effort estimate takes into account the preparation of the narrative portion, which would include supporting tables and charts as appropriate.

The level of effort that can be expected in completing the power market and economic and financial tasks of a small hydroelectric project feasibility study is summarized below.

Task	% of Total Cost	Total Man-Days	Level of Effort by Professional Classification (Man-Days)		
			Draftsman/Tech	Jr. Associate	Sr. Associate
Power Market	10-15	15-25	2-3	10-15	3-7
Economic and Financial	5-10	6-10	1	3-5	2-4

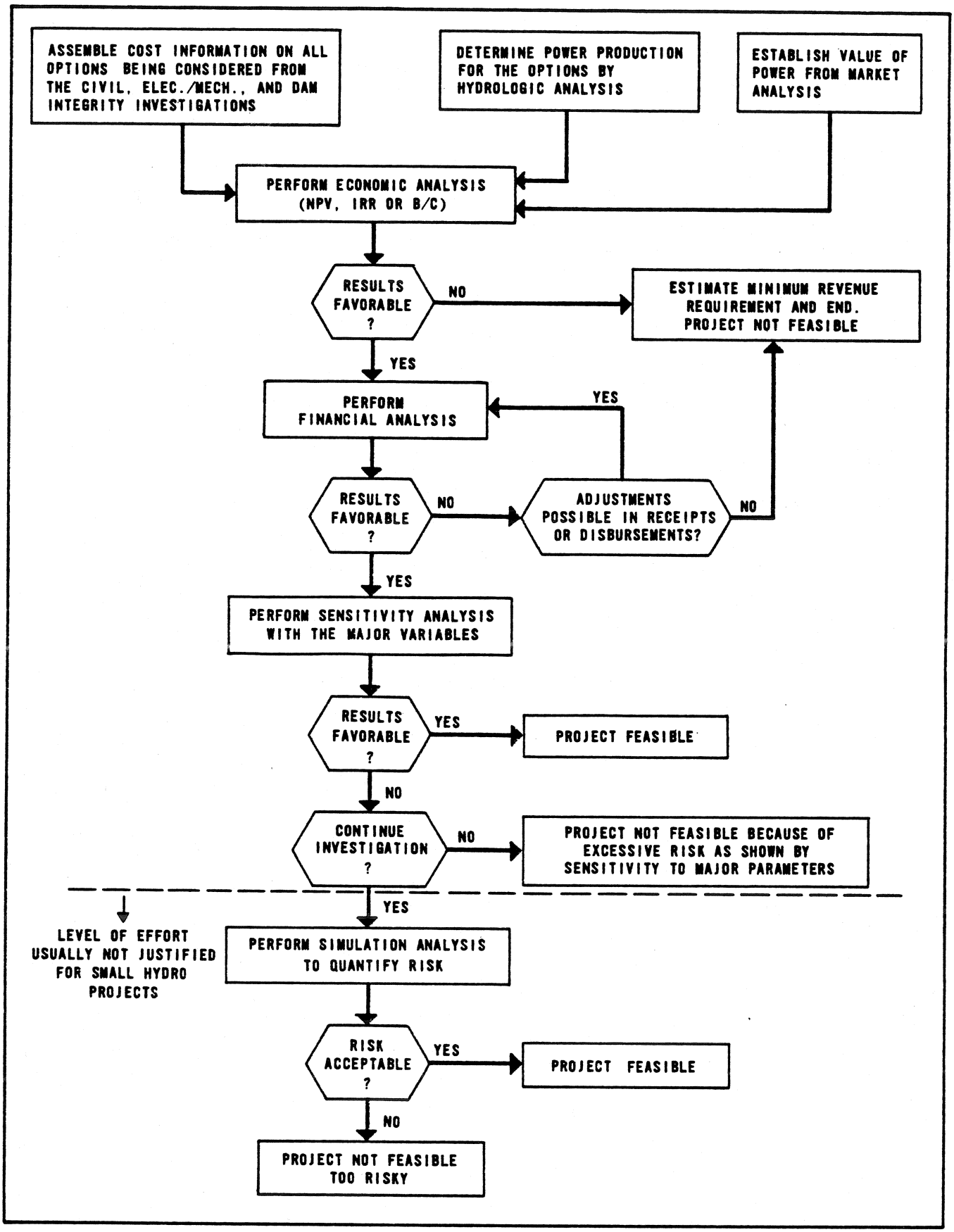

Figure 7-1. Summary procedure.

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