The Need for a New Approach To Hydropower Financing

By Bruno Trouille

Historical data and trends of the past few years illustrate why a new approach to hydropower project financing is needed. In order to increase investments in hydropower, an effective approach must balance the market constraints of private financing with a need for a much more active role by the public sector.

Recent statements made by private developers canceling their hydroelectric power projects illustrate that the current model used to develop and finance private hydro projects is inadequate.

In order to create new ways to attract private hydropower financing, host governments and utilities, as well as multi-lateral and bilateral development agencies and donors, need to address several issues that are critical to the development of hydro projects. Some of these issues include:

- Securing the financial support of the development agencies and donors in all the front-end studies;
- Initiating all permit applications and contract negotiations that lead to project definition and acceptance;
- Necessity to have a clear strategy and policy set by the host government toward the development of hydro resources;
- Recognition of the hydro project's long-term benefits; and
- Early involvement of affected communities, environmental agencies, and non-governmental organizations.

Other issues to be addressed in the early development phase of hydro projects relate to the ability of utilities and consumers to pay market-based tariffs and the definition of a proper mix of public and private financing for the construction phase.

Once these issues have been fully addressed, the private sector can play an important role in developing and financing hydroelectric projects.

Summarizing hydro's current financing climate

One of the main reasons why private hydropower financing has not been very successful is illustrated in Figure 1. Figure 1 compares the average energy tariff required to make private hydropower financially viable and the average generation or production cost of most electric utilities. It does not represent all possible scenarios, but rather presents typical ranges of utility and project experience. The 100-year time frame shown in the figure reflects the long economic life of civil works associated with dams and hydropower facilities. Construction costs for the civil works often represent 50 to 75 percent of the total investment costs.

The high initial investment cost associated with hydropower typically requires high tariffs in the first ten to 20 years to repay the loans, satisfy the banks' debt coverage ratios, and provide an acceptable return on equity. Figure 1 shows a typical range of 4 to 8 cents per kilowatt-hour (KWH). Once the investment loans are repaid, the cost of hydropower drops dramatically since one needs only to pay for operations and maintenance (O&M) costs, royalty payments, and regular electro-mechanical refurbishments and upgrades. Over time, the cost is very stable and is not subject to fuel price fluctuations. Numerous examples show how inexpensive hydropower can be once the initial investment loans have been repaid. Average production costs are often below 1 U.S. cent per KWH.

In contrast to the high initial tariffs often required for hydro projects, the average cost of generation or production is currently between 1 and 5 cents per KWH, as shown in Figure 1. The comparison is made with the average overall generation cost rather than an alternative tariff for a thermal plant. This is to highlight the current low range of 1 to 2 cents per KWH found in many places with abundant existing hydropower facilities that have been fully depreciated and in other places where the construction of thermal power plants had been greatly subsidized. As new power plants are built, the lower range of the average genera-

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tion costs is expected to increase sharply during the next ten to 15 years.

Figure 1 clearly shows the problems currently facing the private hydropower industry. The high initial tariffs required to make private hydro financially viable in the first ten to 20 years of operation is often not competitive with current bulk power tariffs paid by customers or for alternative thermal options. As a result, very few projects have reached financial closing during the past three years.

Data in Table 1 and Figure 2 document this sharp decline in financed projects. Table 1 summarizes regional trends in installed megawatt capacity in financed projects from 1994 to 2000. The total amount of hydropower capacity was 5,507 MW, or 4.1 percent of the total installed capacity for projects financed during the six-year period.

Figure 2 shows the distribution of annual investments in financed projects over time. It reveals that less investment was made in hydropower in relation to total investments in energy production from 1999 to 2000 than in the preceding four years (1994 to 1998). This trend toward a sharp downturn in the development of new hydro has been confirmed during the past 24-month period.

The data indicate that there was substantial activity in the power sector with an average annual investment of US$20 billion to US$25 billion from 1996 to 1999, but very little investment in hydropower. The limited number of hydropower projects that went through financial closing with private developers during that period had a total investment of US$4.2 billion for an installed capacity of 3,133 MW.

The need for a new approach

The historical data indicates a lack of major investments in hydropower. Many experts predict that such investments will continue to decline. Several major factors affecting the development of hydropower projects support this pessimistic outlook:

- The lack of a stable regulatory, legal, and contractual framework in many countries, as well as a lack of well-coordinated efforts from host governments to promote hydropower development;
- The economic downturn and changed investment climate in many less-developed countries, and current liquidity crises facing many independent power producers;
- Political turmoil and uncertainties in the rate of currency exchange in several countries with large undeveloped hydropower potential;
- The competitive bidding process requested by the multi-lateral development agencies without the completion of extensive feasibility and environmental impact assessment studies;
- The inability of many utilities and consumers to pay market-based tariffs;
- The failure of several projects to reach financial closing and the high front-end development costs that have reached a price tag of US$50 million or more per project before financial closing; and
- Non-power benefits such as flood control, aquaculture, recreation, irrigation, raw water storage, or other purposes are very important, but are not bringing any financial revenues to the privately developed projects.

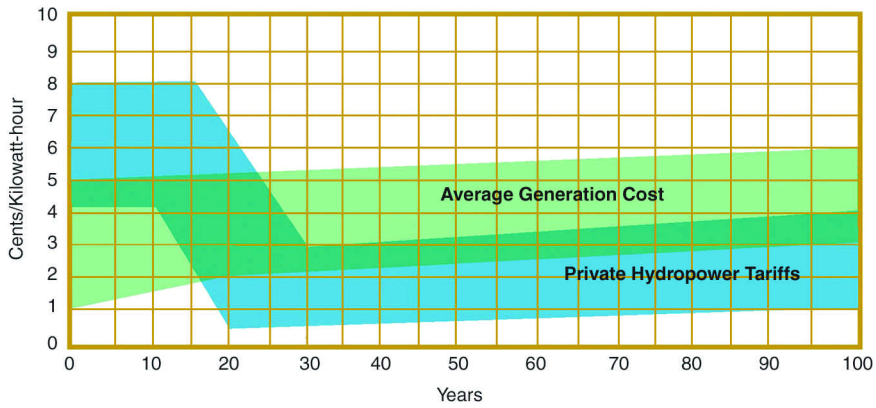
The Office for Promoting Private Power Investment (OPPPI) in Zambia is working with the World Bank and other donor agencies to develop a comprehensive strategy for analyzing the technical, environmental, and financial risks of developing hydro projects, such as the proposed 120-MW Itezhi Tezhi project.

However, investments in hydropower do not have to decline. With the collaboration of governments, utilities, agencies, and the private sector, the existing approach used to finance hydropower projects can be considerably enhanced.

Improvements in early phases of project development

The development of water resources often raises complex and controversial economic, environmental, and social issues with long-term effects. It is unacceptable to leave the decision to proceed with a project to only a few selected stakeholders. On the other hand, it is important that the work done by the World Commission on Dams, the United Nations Environment Program (UNEP) Dams and Development Project, various international and national

Figure 1



High tariffs in the first ten to 20 years of operation can deter private investment in hydropower.

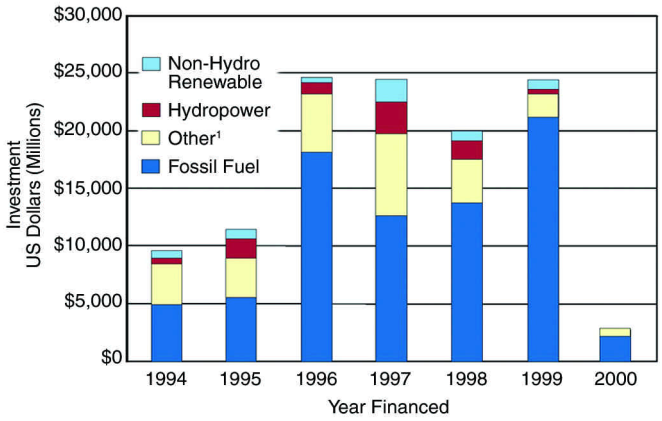
Table 1

Installed Megawatt Capacity for Projects Financed Between 1994 and 2000

Region	*Fossil*	*Hydropower*	*Other*[1]	*Non-Hydro Renewable*	*Total*
Americas	31,591	1,648	9,866	600	43,705
Asia	35,726	1,860	11,654	2,466	51,706
Europe and Central Asia	16,339	1,999	8,386	1,179	27,903
Middle East and North Africa	5,791	0	3,112	0	8,903
Sub-Saharian Africa	808	0	42	0	850
Total	90,255	5,507	33,060	4,245	133,067
Total (Percent)	67.8	4.1	24.9	3.2	100

Note 1: Other includes Waste to Energy, Cogeneration, and Multi-fuel Generation

Figure 2



Note 1: Other includes Waste to Energy, Cogeneration, and Multi-fuel Generation.

From 1994 to 2000, international energy investments show that significantly less investment was made in hydropower compared to many other types of energy. For the sake of clarity, costs and tariffs are shown in 2002 US dollars.

hydropower associations, the International Commission on Large Dams, the non-government organization (NGO) community, and other relevant agencies be used to enhance and streamline the process of hydropower development.

Most importantly, the host government should have a clear and approved strategy and an energy policy regarding the development of hydro and renewable resources. There are still too many instances where such a framework is not in place or where the authority to set the agenda and to lead the efforts is not vested into one coordinating entity. The authority to make important decisions is often left to various ministers, the head of the utility, and a few other government appointees. Each one has an agenda and a particular view on privatization. Furthermore, electees and appointees are subject to short political tenure.

The host government often does not speak in one voice. When a host government does not speak in one voice, it is a major impediment that can add months and years to the early developmental phase of hydro projects. The host government should reduce bureaucracy to expedite project development and provide tax credits and other incentives whenever necessary.

It is critical for the World Bank and other aid agencies to continue supporting the development of new laws and a sound regulatory environment, and to ensure that proper authority and funding is given to the agency leading the coordination of the host government's development efforts. This cannot be done solely through irregular visits from Washington D.C. or other headquarters. It requires an active lobby of the local representatives of these agencies and of governments supporting liberalization of the power sector.

Once these objectives are met, the private sector can play a key role.

Selecting a team of hydro experts

Through a transparent and competitive process, the host government or utility should select an advisory team that would work with them to:

- Develop the technical, environmental, and socio-economic justification of the proposed project;
- Actively engage the local and international non-government organization community in the project definition;
- Initiate a dialogue with potential lenders (multi-lateral, bilateral, and commercial banks) to assess the project risks, develop a preliminary bankable financing package, and justify the need for public financing;
- Identify the most appropriate legal and contractual ways to implement the project, as well as a sustainable tariff structure that reflects the financial constraints in the consumers' ability to pay;
- Develop an overall schedule of activities to reach financial closing; and
- Prepare all documents leading to a project concept and definition report.

The advisory team should be led by a reputable firm and composed of experts fully knowledgeable in all key aspects of hydropower development. The advisory team would hire, as required, additional support for consulting, environmental, engineering, legal, and financial services to assist in the preparation of the necessary studies, permit applications, socio-economic and environmental impact assessments, field surveys, and site investigations.

The end product will be a project concept and definition report equivalent to a detailed feasibility study or pre-design with sufficient geological and hydrological field investigations to clearly understand, assess, and mitigate the potential risks. A full environmental impact assessment should be performed along with a detailed analysis of the political, legal, and financial environment surrounding the project.

The advisory team would negotiate a general contract agreement, in which the responsibilities, duties, and financial

rewards of each party would be well defined. All subcontracted consulting, environmental, engineering, legal, and financial work should be fully paid by the contracting utility or agency. For the advisory team, financial incentives could be added to its contract, depending on the risks anticipated in developing the project concept and definition report. A mix of fixed monthly retainer payments, direct cost reimbursements, and incentives fees at critical milestones of the development process could be negotiated. These expenditures would be repaid to the government or aid agencies at the time of financial closing on the project.

The advisory team also should investigate the full value of the hydropower project in a deregulated electricity market, as well as other potential non-power values such as flood control, water supply, roads, and recreation. Ancillary benefits (dispatching and scheduling, frequency regulation, load following, spinning reserve, voltage support and reactive management, and "cold" and "black" starts) should be quantified to the maximum extent possible, besides the traditional capacity and energy values.

Furthermore, benefits associated with reductions in greenhouse gas emissions should be investigated and carbon credits obtained from the World Bank Prototype Carbon Fund or other programs.

Finally, the advisory team should perform a detailed risk analysis. This should be based on the results of all the technical, environmental, and financial studies as well as site investigations. The severity and probability of potential risks (such as hydrologic, geologic, political, socio-economic, environmental, and currency exchange) should be investigated. An optimum allocation of these risks to those best able to control the risk factors should be recommended and discussed with the host government, developers, and potential equity investors and lenders.

Involving agencies in the developmental phase

Too often, private hydropower projects are designed to maximize short-term revenues, rather than to meet the wider and longer-term requirements of the power system and to develop the non-power potential benefits. A more comprehensive and integrated approach to project development would assist in the justification for public financing.

It is unrealistic for host governments and utilities to expect the private sector to pay for these studies. Multi-lateral, bilateral, and donor agencies need to support host governments in financing such studies and participate more actively in the developmental phase. Adequate funding should be provided by these agencies when the host government does not have the resources to finance these studies.

A number of extensive front-end technical, environmental, and socio-economic studies and site investigations are required to determine the optimum project parameters. Concessions, off-take or power-purchase agreements, and royalty arrangements need to be negotiated, and a myriad of permits and other legal documents need to be prepared during this phase.

A detailed analysis should be made early in the development process to assess and forecast the tariff level that would be acceptable to the power purchasers, or the expected hourly marginal costs of generation in a deregulated electricity market. Once this level is defined, the team should analyze a number of financial scenarios to render the project financially viable.

Participation of the multi-lateral, bilateral, and national development banks in this evaluation process is essential in order to establish a proper mix of public and private financing. This can be achieved in a number of ways. For example, the public sector could finance all or parts of the major civil works, such as the dam or road infrastructure, while the private sector could finance the powerhouse and all electro-mechanical facilities. This combination of public and private financing would reflect the many secondary economic benefits provided by the project.

As an example of such a new approach, the Office for Promoting Private Power Investment (OPPPI) in Zambia has been working with the World Bank and other donor agencies to implement Zambia's hydropower potential and develop a comprehensive strategy before the start of the construction phase. OPPPI — established to convey to investors the government's commitment to provide the necessary regulatory authority and fiscal incentives for developing and implementing hydro projects — has been actively involved with the development of hydropower in Zambia and is now supervising an environmental impact assessment of the entire Kafue River Basin. OPPPI also acts as a government representative during ongoing discussions with private consortiums to develop the 750-MW Kafue Lower and 120-MW Itezhi Tezhi hydro projects on the Kafue River.

What it will take

Though major investments in hydropower have declined in recent years, financing of projects can improve with an approach that starts with governments and utilities, as well as multi-lateral and bilateral agencies and donors. By establishing favorable policy structures and financial support during the early development phase, those entities can enable the private sector to play a key role in the development of hydro projects. ▲

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