Attracting Finance for Hydroelectric Power

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Introduction

Hydroelectricity will continue to be important for meeting power requirements in developing countries. Much of the funding required for hydroelectric projects must come from non-government sources; hydroelectric projects will therefore need to be attractive to private investors. This note explores the risks investors face, how these can be mitigated, and how the World Bank Group can offer advice (as well as finance) to member countries to facilitate investment in hydroelectric projects.

Hydro Potential

From a global perspective, it is clear that the greatest potential for expanding hydroelectric power is in developing countries, which have exploited only an average of 10% of their technically usable hydroelectric resource, representing about one-third of their present total installed power capacity.

Matching Demand with Hydro Potential

However, outside China, India, and Brazil, which have large hydroelectric potential and large power demands, the location of resources and the demand for power in developing countries are poorly matched. In about a dozen medium-sized developing countries, mainly in Asia and Latin America, the expected increase in power demand will moderately constrain hydroelectric development. In Sub-Saharan Africa, resource exploitation will be severely constrained by the lack of demand. Given these constraints, installed hydroelectric capacity in developing countries could grow at 4% to 6% per year in the next 20 to 30 years.

Financing of Hydro

Assuming that the construction of a hydroelectric power plant is feasible, is it financable? Hydro schemes not only will need to be selected as the least-cost option for a new power plant – and increasing concern about both local atmospheric pollution and global warming will make the economics more favorable – but will require that some of the risks associated with their development are managed or mitigated so that private investors are attracted.
The World Bank Role

Historically, hydroelectricity has been financed predominantly from publicly supplied or guaranteed funding. During the last three decades, the World Bank has financed about 110 hydroelectric power projects in 50 developing countries. These projects range from 6.6 MW to 2,460 MW, with a combined generating capacity of about 35,000 MW. In the last five years, the Board has approved 12 projects and 10 more are in the pipeline for the period to 2000. However, if its involvement continues at the current level, the Bank is likely to finance only some 5% of the new hydroelectric capacity in developing countries during the next decade.

Private Finance

For hydroelectric capacity to grow substantially in developing countries, the needs for both local and foreign currency can only be met by mobilizing both public and private finance. The private sector has shown an increased interest in the last few years in funding hydroelectricity. The IFC approved financing for 7 private hydroelectric power projects, between 1990 and early 1995; 6 of these were relatively small (10 MW to 73 MW), and one was a large (450 MW) run-of-river project in Chile. Apart from the IFC-funded projects, over 20 projects in ten developing countries are proceeding with approved funding by the private sector. The private sector has also shown considerable interest in other potential hydroelectric developments, and in buying, rehabilitating, and operating existing hydroelectric plants.

Hydro Concerns

Hydroelectric power projects, particularly large ones, have been the focus of much controversy. For example, the large reservoirs often required cause concern when they submerge vast areas of valuable land and displace large numbers of households. Still other concerns arise for project financing, such as hydrological uncertainty, construction cost overruns and schedule slippage, power demand uncertainty, and the strain placed on the macroeconomy by large hydroelectric projects. Such concerns need to be mitigated to attract private finance. Given the World Bank's experience of lending to hydroelectric power schemes across the continents, the lessons the Bank is learning about how to mitigate these risks should be helpful for future investors.

Sites

One way to mitigate the environmental impacts of hydro projects is to find favorable sites. It is thus essential that a wide range of sites are covered by reconnaissance surveys so that the credible, least-cost options can be selected for development, in terms of both economic and environmental impacts. Broad environmental impact assessments for candidate sites should be included at an early stage in the project cycle to incorporate physical, biological, and social issues in the selection criteria. Private developers are unlikely to finance reconnaissance surveys; governments can help, by preparing dossiers of hydropower potential that cover the main selection issues.

Resettlement Issues

Population displacement from large hydroelectric projects is conspicuous and has in many cases been carried out badly, damaging the general reputation of such projects. The prime solution is to minimize the displacement through careful site selection (away from populated areas) and project design (limiting the maximum reservoir level, for example). The Bank has now focused considerable attention...
on resettlement issues, and Bank guidelines require that resettlement, at a minimum, restores the affected population's income levels and standards of living.

Project appraisals must allow fully for sufficient funding of resettlement costs, including compensation costs, resettlement costs, replacement of public assets, and administrative costs of resettlement. Estimates of the cost per person resettled are now running at as much as six times the per capita GNP of the host country. Project appraisals must also ensure that the institutional arrangements can treat resettlement issues equitably and avoid social injustice.

Hydrological Uncertainty

Hydrological uncertainty causes major uncertainty for revenues from hydropower. In many river basins during the 1980s (for example, in Colombia, Zambia, Zimbabwe, and Ghana), hydrological flows fell well below anticipated levels for extended periods and caused severe drops in hydropower output. Gathering the necessary hydrological data for analysis of investment risks arising from this hydrological uncertainty is time consuming and expensive; potential developers thus are not likely to carry it out. Countries can encourage private investment in hydroelectric projects by surveying potential sites to produce reliable information about hydrology, meteorology, seismicity, and topography. The data should be available to interested parties, but the task of developing project options from this data should be left to project developers.

Power generation projects have been subject to a substantial optimistic bias and major uncertainty in appraisal estimates of planning parameters, particularly for cost overruns and schedule slippage. An ongoing study for Bank–supported power generation projects shows that schedule slippage has averaged about 38% for thermal projects and 35% for hydroelectric projects. Cost overruns have averaged about 11% for thermal plants but 30% for hydroelectric projects.

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\begin{array}{|c|c|}
\hline
& \text{Hydro Projects} & \text{Thermal Projects} \\
\hline
\text{Cost Overrun} & 10\% & 30\%
\hline
\text{Schedule Slip} & 30\% & 20\%
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\]

In view of the probability of large overruns in hydroelectric projects, the Bank recommends that comprehensive risk analysis should be undertaken as part of the economic justification and financial planning for such projects. Conventional sensitivity analysis does not adequately reflect the inherent uncertainty in the estimates of construction costs and schedules.
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<tr>
<th>Macroeconomic Risk</th>
<th>Public financing of large hydroelectric projects can expose developing countries to the risk of lower – rather than higher – economic growth for many years. The costs of some hydroelectric projects in small economies can absorb the equivalent of many years development budget. Power projects usually do not earn foreign exchange, so the country’s balance of payments may be adversely affected. Where hydroelectric project cost overruns would crowd out other public sectors from public budgets, the country should consider a series of smaller projects.</th>
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<td>Governments’ Role</td>
<td>The issue for governments of developing countries is how to develop the confidence of private investors to undertake priority hydropower projects from an economic perspective that also introduces high investment risks. Ultimately, governments should develop track records that give private investors the confidence to take on the commercial investment risks for these projects. This is a distant objective for most developing countries, and hence governments must devise transition strategies that work toward this objective.</td>
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<td>Investor Confidence</td>
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