At the Turn of the Runner

What Is a Feasibility Study?

By Christopher R. Head

This article is the fourth in a special six-part series examining technically-related contractual issues that can arise during development of privately financed hydroelectric projects. The focus of this article is on the need for an adequate feasibility study for making investment decisions.

Feasibility studies are like opera singers — they come in all shapes and sizes, and at dramatically different prices. With the divas, though, you always get the same story ending, no matter how good or bad their individual performances might be. Regrettably, that is not always the case when feasibility studies turn into projects.

The significance of the feasibility study is that it invariably forms the basis of two key contracts that are central to the process of private hydro development. These are: the Concession Agreement, under which the host government grants the project company the right to develop a particular site; and the Construction Contract. In both cases, there is a need to define the scheme, and that definition is usually based on the feasibility study. A lot of parties, including the owner and the financiers, depend upon its findings for one reason or another so that ultimately they permeate many aspects of the contract arrangement.

All projects start with a feasibility study, although it is a term that means all things to all people. To the investors and lenders who are now playing an increasingly dominant role in hydro development, a feasibility study is essentially a financial exercise. The commercial viability of the project obviously must be their ultimate concern. But what if the original assumptions upon which their analysis is based are seriously flawed?

The essence of a good hydro project is that it is tailored in every respect to a unique site. There is no such thing as the standardized designs that are common for thermal generating plants. Nobody buys a *Frame 6* hydro project. The study of a hydro scheme needs to address a multitude of subjects in depth — including the optimum size and engineering concept, the cost and construction schedule, its performance and risk profile, and the environmental effects. Under each of these main headings, there is a whole series of site-specific issues to be considered.

To be blunt about it, there are a lot of indifferent reports around on potential hydro projects. They masquerade as feasibility studies when, in the past, they would have been barely regarded as being at pre-feasibility level. This is not necessarily to cast aspersions on the authors of these works, but more on those that commission them and then fail to recognize their limitations. A pre-feasibility study should be the basis for deciding whether to invest in further investigations; it is not a suitable foundation for making a commitment to go ahead with the project on a "date-sure, cost-sure" contract with draconian penalties.

Once there were well-established minimum requirements for what constituted a hydro feasibility study. They included detailed topographic mapping, site investigation, *in-situ* testing, materials surveys, economic optimization, and a raft of other investigations. These were not undertaken lightly because they were time-consuming and expensive. Yet, the prospective owners commissioned them because they were considered essential for making sound investment decisions.

I had an interesting insight into this problem recently, when visiting a country seeking private investment in hydro projects. The government agency concerned had commissioned studies that were to be the basis for competitive bidding. However, on examining the reports, it was evident that they all showed projects with identical layouts and engineering concepts, irrespective of site conditions and despite being located on widely separated river basins. Now it could just possibly be a coincidence, and perhaps I am being unduly suspicious, but all were carried out by the same consultant at a ridiculously low price, and one was left with a sneaking suspicion that this was a bad case of "design churning."

It is not always easy to readily distinguish between

a good and a bad feasibility study, and in consequence there is a danger of major investment decisions being based on work that is not as thorough or extensive as it should be. It takes experience to recognize that behind the over-precise dimensioning of a spillway there lies an assumption that has led to the underestimation of its capacity by a factor of two. Or, that the length of the steel liner for the pressure tunnel has been determined without any rock stress measurements. It can be easy to overlook the fact that the impressive tables, giving 50 years of historic daily flow records to two decimal places, are in fact extrapolated from only 12 months of actual flow measurement using a dubious calibration curve.

For any project study, one has to start by making assumptions using the best information available. The mistake is to treat the results of such as being more definitive than they are.

"Things are seldom what they seem; skimmed milk masquerades as cream."

— W.S. Gilbert in HMS Pinafore, 1878

At feasibility level, there are broadly two aspects to be addressed. The first is concerned with the gathering and interpretation of site data so that, as far as possible, the uncertainties surrounding the scheme can be removed. This is very important in the assessment of risk. It is easy to draw the line of a tunnel on a map, but quite another thing to determine the likely tunneling conditions. Site investigation should also reduce the contractor's price, as the more information he has, the lower the contingency needed for uncertainties.

The second aspect is optimization — ensuring that the development of the site realizes its full potential in terms of meeting the needs of the power system and other water users, and that the engineering concept provides the right balance between cost and risk. Under private financing, this aspect can be very sensitive as it raises the fundamental question of for whose benefit the scheme is being optimized, and against what criteria. Should the project configuration and installed capacity be shaped by what the host government considers to be in its long-term interest, or is it to be determined by the private developer whose priorities may be different?

For example, a stretch of river might be developed by building a dam or, alternatively, by using tunnels to command the same head. Provided the environmental effect is not too great, it is probable that the government's interest would be best served by building the storage option, so that it becomes more valuable as the power system matures and requires more peaking energy and ancillary services. The private developer, on the other hand, is likely to opt for the run-of-river scheme because it will be less contentious and easier to finance, and almost certainly more profitable if he is being paid on an energy-based tariff.

If he has the freedom to do so, the private developer can be expected to optimize the scheme to match his power sales agreement. He is unlikely to voluntarily shoulder the additional costs of providing extra capacity for peaking, nor provide the enhanced hydraulic systems necessary for more responsive ancillary services, unless he is required to do so or paid for the added benefits.

Under some jurisdictions, the private developer can build whatever scheme he wishes, but usually the formula is more prescriptive, with the government defining exactly what it wants built. Whichever approach is adopted, the only sound foundation for determining the correct project concept is an adequately resourced, competently undertaken feasibility study. It is essential that this important stage of the project cycle is not skimped, and that either the government or the private developer takes ownership of it.

There is logic in the argument that the feasibility study should be undertaken by the host government, because a study is needed before the government can determine what it wants out of concession. Unfortunately, in many cases there is no longer a mechanism to finance these work studies through government sources, as feasiblility studies are now perceived to be the responsibility of the private sector. But the private sector will generally not finance them either, without a secure position on the project — and when that time is reached, the project is already fixed.

There may be no easy answer to this conundrum, except that we should all recognize the difference between a well-researched document on which serious investment decisions can be based, and concept studies prepared at a much more preliminary level. ▲

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