HRW

At the Turn of the Runner

On the Simple Subject of Payment

By Christopher R. Head

This article is the second is a six-part series examining technically-related contractual issues that can arise during the development of privately financed hydroelectric projects. The focus of this article is on mechanisms for paying the private investor for his product.

One of the central issues to be resolved in any private infrastructure project is the mechanism by which the investor gets paid. In the public sector, such a mechanism is not necessary, and in totally deregulated markets it tends to be determined by external factors. But, for the owners of most private power schemes, the Power Purchase Agreement (PPA) is the keystone upon which the whole project is founded. The question is: how can the PPA be structured so that it will provide investor confidence *and* avoid disputes?

When independent power producers first emerged on the energy scene, the activity was predominantly in the thermal sector. It is only recently that people have begun to address the issue of how to pay for private hydropower. In the thermal sector, the situation is relatively straightforward: a fixed capacity charge covers sunk costs so that the owner can meet his debt servicing obligation, while the energy-based tariff covers variable operating costs like fuel. In most cases, the fuel cost is passed through to the offtaker (i.e., the user of the power) in the form of a tariff adjustment.

For all practical purposes, hydro has no variable operating costs. Therefore, the tariff is dominated by the capital investment, which has to be recouped irrespective of actual electricity generation. Logically, the tariff structure should comprise only a capacity payment but, in the past, this has been a difficult concept to sell. People have become locked onto the idea that the private sector is producing electrical energy, and that therefore, payment should be based on the quantum of energy delivered. In consequence, most of the early hydro PPAs were based on simple energy tariffs. To ensure that the project company had enough revenue to meet its obligations, there were usually minimum off-take requirements, but this device still left the owner exposed to loss of revenue for hydrological reasons.

With the passage of time, this "cent/kilowatt-hour" approach has been revealed to have a number of serious shortcomings when applied to hydropower. Quite simply, hydro is too complex and too valuable to be treated this way. The point is illustrated by looking at the implications of using an energy-based tariff when it comes to considering market and hydrological risks, and ancillary services.

Market risk is of concern to all private power producers. The normal way of avoiding the problem is to impose a "take or pay" obligation on the offtaker, making him responsible for buying all the energy actually generated or made available. While this concept might be applied to run-of-river hydro schemes, it is clearly difficult for a storage project where water not used today may be retained in the reservoir for tomorrow or next month, or maybe even next year. The stored energy is not necessarily lost; however, it might be if the reservoir subsequently spills. Although the basic principle may be clear, its application where there are large sums of money at stake is, at best, contentious and, at worst, almost impossible.

Even with a run-of-river scheme, the application of a "take or pay" formula can lead to disputes. That is because it is necessary to distinguish between water that has been spilled through the failure of the offtaker to take up the energy made available, as opposed to water wasted due to flood or other reasons. The situation is further complicated by the fact that many projects categorized as run-of-river actually have limited storage.

Hydrological risk is closely linked to market risk because both affect revenue. For hydro, there is no equivalent of the Fuel Supply Contract, or if there is, it is not always being honored! Whether we like it or not, hydrological risk is here to stay.

Early attempts to place all hydrological risk on the project company were generally unsuccessful because financiers were not prepared to accept the exposure, even if the sponsors were. There is now recognition that it is often unrealistic to expect a private owner to assume hydrological risk when he has not been party to the collection of the original data on which the river flow is assessed. In consequence, many utility offtakers now assume all the hydrological risk, or share it with the project company.

Some risk-sharing formulae for hydrology are unduly complicated and sometimes almost unworkable. To start with, the arrangements may have to recognize the difference between temporary flow deficiencies caused by a series of dry years and the actual under-estimation of the long-term run off. While long-term deficiencies are the more serious, both can be a problem to an owner with a strict repayment schedule to meet. The risk allocation might depend upon which category is the cause, but it can be very difficult to prove conclusively that a series of low flows fall into one category or another, particularly when the short-term hydrology is overlain by long-term cyclic variations in weather patterns.

Further complications arise from other river users whose activities can seriously affect energy production. In some cases, such as on international rivers, these may lie outside the control of the host government, and therefore there is little point in the project company seeking assurances on the maintenance of natural flows.

"On the first day of every calendar month, readings shall be taken at the Metering Station to establish the amount of electricity sold ... "

— Extract from a Power Purchase Agreement for a planned 240-MW private hydro project in China

So, from the viewpoint of hydrological and market risk, it is already evident that a number of problems can arise from the use of energy-based tariffs. But perhaps their most serious drawback is that they ignore the real benefit that many hydro schemes offer — ancillary services.

In terms of system management, hydro provides a number of valuable functions in addition to simply producing energy. These so-called "ancillary services" include load following and frequency regulation, voltage control, inductance, and the provision of both spinning and stationary reserve. These system support services are unmatched by any other form of generation. Yet, it is rare to see them identified and valued in a hydro PPA.

The reason for this is obvious. In the days of the vertically integrated public utilities, the value of ancillary services was not specifically calculated. The fact that hydro allows a thermal plant on the system to operate more efficiently, thereby reducing overall costs, was taken for granted. In the fully deregulated markets, it is becoming evident that the value of ancillary services from hydro schemes can be significant — sometimes even more significant than the energy output itself.

In fact, there are times when the owner of a hydro project should be paid to hold his plant in reserve and not generate. However, to act in this way, the owner will either need to be forced through the dispatch arrangements, or coerced through the PPA. This requires a very sophisticated PPA — or, alternatively, a very simple one that allows the utility offtaker complete freedom of dispatch, without regard to payment mechanisms.

In summary, perhaps we need to rethink our whole approach to hydro PPAs. In the end, the offtaker is usually buying much more than energy alone, but it is often difficult to put a value on ancillary services. Combined with the problems of handling market and hydrological risk, this appears to be leading inexorably toward the conclusion that it would be better to forget about payments based on energy production. In most cases, a more sensible arrangement would be one in which the offtaker simply buys capacity, to be dispatched at his own discretion, with payment linked only to plant availability.

Under such an arrangement, the offtaker bears the full hydrological risk, but this is exactly what has happened in the past when the utility has spread the risk over a large number of generating units. Any offtaker who has concerns about this might like to reflect upon the fact that his financial exposure from assuming hydrological risk is likely to be much less severe than accepting a pass-through fuel price on a thermal power station, particularly bearing in mind the increase in oil prices over the past year. Finally, think how much time and money would be saved in producing the much simpler PPA that would be required with such a formula! ▲

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