

Valuing hydropower resources for concessions

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The hydro industry is in a state of transition, so it is now becoming more important for governments to have an understanding of the intrinsic value of a hydropower resource when negotiating a concession. The challenge is to arrive at a formula that provides the investor and the offtaker with sufficient incentives, and yet at the same time ensures that the State receives an adequate return for the use of its resources. There may be lessons to be learned from the extractive industries, where many of the problems are similar.

Hydropower is a mature technology, but in a commercial sense it is an immature industry. This is because the development and operation of hydro projects has generally been regarded as a public service rather than a commercial undertaking, at least until recently.

Things have changed over the past two decades following the opening of the market to private investors. The process started with the private sector taking over certain functions from the state-owned power utilities, acting as an independent power producer (IPP) and selling power exclusively to the utility. Under these arrangements, a closed loop is created in the sense that there is a direct link between the cost of the development (including the investor's profit and government take) and the tariff paid by the domestic consumer.

In this context 'government take' is deemed to include all forms of payment to the State, such as royalties, corporate taxes, windfall taxes, duties, and the like.

In this type of 'closed' situation, there is little point in explicitly valuing the hydro resource. Governments are usually more concerned with maintaining an affordable tariff than maximizing the royalties, and therefore their main priority is to bear down on the developer's costs and negotiate a concession which delivers reliable energy at the lowest price. There is an underlying assumption that the advantages of a good site will flow through to the domestic consumer in the form of lower charges, leaving royalties and taxes to build up only gradually over time, as the debt-servicing burden reduces.

The position changes when the direct relationship between the State, as the owner of the resource, and its citizens, as consumers, is broken. This creates an 'open' situation where the inherent tension between the interests of the governments and the consumer is no longer present. The primary concern of the State is then to maximize royalties, subject to ensuring that the project forms part of a sustainable development plan for the whole river basin, and that it is designed and built to acceptable standards.

These open situations are now more common as a result of electricity becoming a tradable commodity. The private sector is leading the industry into new markets, which include:

- export projects, where power generated in one country is sold to another;
- captive projects (auto-producers) for direct supply to energy-intensive industries; and,
- merchant plants selling power into regional markets on short-term contracts.



In each of these situations the interests of the host government are best served by ensuring that the energy is sold at the highest possible price, because this improves the prospect for a strong flow of royalties and taxes. The challenge facing any government in negotiating the concession is to try to understand the value of the resource, as well as how much it can extract in the form of royalties, taxes and duties without jeopardizing the financial viability of the project.

Nam Theun 2 in Laos, one of a new generation of hydro projects exporting power to neighbouring states, in this case Thailand. Hydro is one of the country's main exports and a major contributor to GDP.

A matrix of uncertainty

Any government trying to assess the value of a hydro resource faces many uncertainties. First, the actual configuration of the project may not be optimized at the time the concession is negotiated, and the estimated cost will only be approximate. Even when the optimization is complete, there is no single definitive cost, because it will depend on market conditions and the arrangement of the construction contracts. It is misleading to talk of a project cost as if it is a single immutable figure without, at the same time, linking it to a specific contracting model.

Another significant uncertainty lies in the cost of financing which, together with the development costs, will typically account for one third or more of the final tariff. Financing costs will vary significantly depending on the owner, the risks and the beneficiaries of the project, as well as the condition of the money markets. At the time of negotiating they will certainly be unknown.

On the revenue side, a lot depends on whether the electricity is going to be sold through a long-term PPA, or on the basis of short-term contracts in the open market. The project financing model commonly used in the developing world requires a long-term PPA with a credible offtaker. While this provides certainty for both sides, it has the disadvantage of freezing tariffs at levels determined by the market at the time the concession is negotiated.

The balance-sheet financing model tends to be used for smaller projects, and does not necessarily rely on

having a long-term PPA. Many sell into short-term power markets, where the actual value of the electricity cannot be accurately predicted far in advance. Others are developed by auto-producers with the result that the price of energy will be internalized and may not be explicitly declared. This makes it particularly difficult for the Government to assess the value of the output.

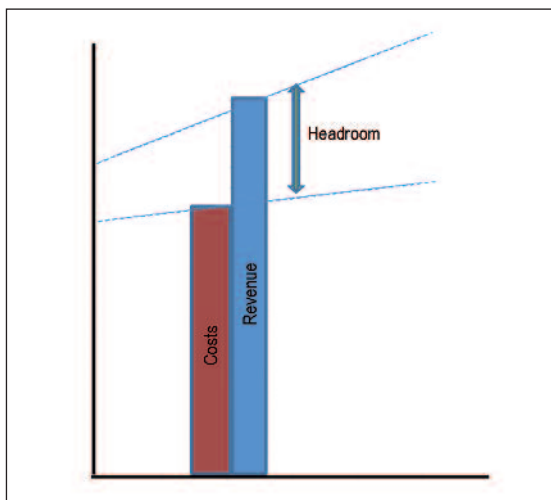
Whichever way one looks at the problem, anyone negotiating a hydro concession usually faces the dilemma of having to enter into a binding commitment without knowing what the intrinsic value of the resource is at present, let alone what it might be in 10 or 20 years time.

In the power sector, this problem is almost unique to hydro. It rarely occurs in the case of thermal power, where fuel is invariably treated as a pass-through cost, and the only resource involved is the land on which the plant is built. Hydro is more complicated because of the need for the Government to secure an adequate return for the use of its natural resources. In this respect, hydro has more in common with the extractive industries (oil, gas, or metals) than it does with thermal power.

Economic rent or headroom

Irrespective of whether one is talking of water or mineral resources, the scope for government take on a concession is ultimately determined by its economic rent. This is a concept used by economists to define the excess returns in any production process above the inputs required. In the hydropower industry, people sometimes refer to this surplus as the 'headroom', being the difference between the cost of the development and revenue it creates. The greater the headroom, the more scope there is for both the State and private investors to receive an attractive return.

A good site should naturally have more headroom than a poor one. But it is not as simple as that, because a lot depends on the revenue stream and the way in which the project is constructed and financed. There is a tendency for governments negotiating private concessions to take a 'hands-off' attitude when it comes to the question of the price of the power and construction/financing arrangements, in the mistaken belief that these are matters only for the concessionaire. Nothing could be further from the truth, as these issues have a direct bearing on the headroom, and therefore on the potential returns to the State.



Headroom is the source of the developer's profit and the State's revenue. It is determined by: the quality of the site; the cost of the development; and, the revenue stream.

As already noted, at the time a concession is negotiated both parties will have only an appropriate idea of the profitability of the project. There may well be asymmetrical views on this, with the government generally believing that the project is more profitable than the developer concedes (this is apparently a well known phenomenon in the extractive industries). Furthermore, the parties may have different views over what constitutes an equitable apportionment of the headroom. The timing of the government take is another important factor, as most hydro projects are cash-strapped in the early years, but very profitable later.

Whichever way it is divided, both sides should start by recognizing that it is in their joint interests to maximize the headroom created by a project. Although the situation will vary from country to country, in most cases a government granting a hydro concession has a legitimate interest in any factor affecting the headroom. The State needs to have an overview of all negotiations, even though it may not be party to any of the contracts affecting construction, financing or power sales.

Ultimately, a project will only go ahead if both the Government and the developer see enough benefit in it for themselves. The developer's requirements are easily identified and measured in terms of bankability and equity returns. But for the government, the situation is more complicated because the project has to be judged on long-term economic criteria rather than relatively short-term financial measures. This may include taking account of multipurpose benefits that cannot easily be given a monetary value. In the end, the value of the resource can only really be determined on a "willing buyer-willing seller" basis, determined at the time the concession is negotiated. But therein lies another problem created by the duration of such agreements.

The test of time

Hydro concessions are typically granted for operating periods of 15-25 years, which means that when the development phase is included, they are actually looking forward 20 - 30 years. Such periods are unusually long for any commercial contract, particularly where the financial arrangements are often cast in stone at the outset.

A lot can change in quarter of a century. The last two decades have seen a fivefold increase in oil prices, soaring global energy costs, serious exchange rate volatility, and water shortages in many parts of the world. Against this background it is not easy to draw up hydro concession agreements with a royalty structure that is still going to appear reasonable in 10 or 20 years time.

A stark example of this is the 2060 MW Cahora Bassa project on the Zambezi river in Mozambique. Built in the early 1970s to export power to South Africa, Cahora Bassa is in many respects the forerunner of the modern IPP. It is a magnificently impressive project from a technical viewpoint, but in commercial terms it is a sorry lesson on what can go wrong with a long-term PPA which is overtaken by events (see photo and caption on the next page).

Governments around the world are currently negotiating hydro concessions, which will extend through the generations, in some cases to 2040 and beyond. Few people appear to be giving much thought to the implication of such long-term commitments. Even if



Cahora Bassa, Mozambique. Built in the final stages of Portuguese administration, to export power to Eskom, South Africa, under a PPA defined in Rand, without any provision for exchange rate adjustment or escalation. Shortly after commissioning, the HVDC transmission line was blown up and remained unusable for more than 10 years. By the time the line was reinstated, the Rand had devalued by a factor of ten, and the project was committed to deliver energy at less than US¢1/kWh. The PPA was eventually renegotiated after years of sub-economic operation.

they are concerned, it is not easy to avoid a Cahora Bassa situation, where an agreement that appeared perfectly reasonable at the time it was negotiated looks entirely different some years later.

With world energy costs inexorably rising, and a premium on clean renewable energy, the most obvious concern is that at sometime in the future governments will find themselves committed to selling their energy resources at prices which no longer reflect the true value of electricity. Alternatively they may need to change water-management priorities, and be constrained from doing so. These are not easy matters to address, particularly where there are long-term agreements in place, but one has to ask whether the existing approach to hydro concessions is as flexible as it might be. There is a need to explore how concessions can be made more robust to withstand the unpredictable changes that can occur over such a long periods.

Experience of the extractive industries

While the issue of resource valuation and concession terms is relatively new for the hydro industry, this is not the case for the extractive industries where there are many years of accumulated experience. While there are obvious differences (most notably in the extractive industries, the rate of production can be controlled and the resources have a finite life) there are also strong similarities as both involve investment in remote areas with high front-end risks and heavy capital costs.

The main difference is that oil, gas and metals can all be easily transported and sold on international markets in hard currency, at prices which are publicly benchmarked. In contrast, hydro tends to be more geographically constrained, although this is gradually changing through regional markets and long-distance transmission lines.

The subject of concession arrangements in the extractive industries has attracted a large amount of attention over the years - much more than in the case

of hydropower. Many reports have been published on a wide variety of subjects including different concession models, resource valuation, economic rents and government take. For example, the situation in the oil and gas industries is well summarized in papers from the Van Meurs Corporation [2008¹]; and the topic of mineral taxation has been studied extensively by the International Monetary Fund [Baunsgaard, 2001²] among others. Some of their conclusions of direct relevance to the hydro industry are as follows:

- Fiscal regimes in the extractive industries have evolved over the years to reflect changing commodity prices and the developing market. In general this is a matter of re-balancing royalties, taxes and incentives, but the general trend has been towards an increasing government take as markets mature.
- The extractive industry typically uses three generic licensing arrangements: concession agreements; production sharing contracts; and, risk service contracts. The first most closely equates to a model typically found in hydro IPPs. The amount of the government take is not influenced by the choice of licensing arrangement.
- Experience has shown that market analysts have been consistently and dramatically wrong in forecasting oil prices. The same is true for many other commodities. This makes it difficult to draw up long-term concession agreements that will stand the test of time.
- Rapid increases in oil prices over the last decade have resulted in many governments suffering severe losses as a result of sub-optimal fiscal regimes embodied in pre-2003 agreements negotiated on the basis of predicted oil prices of around \$20-25/barrel. At the time of writing, the current price of Brent crude is around \$118/barrel.
- In negotiating concession terms, the assessment is often complicated by the investor and the government having an asymmetric view as to the likely profitability of a project. In practice neither side can be certain, and therefore it is desirable to build as much flexibility as possible into the terms of the concession.
- Government take is influenced by a number of factors, most notably the price of the commodity, the size of the resource, the cost of production, the risks, and the competition for the resource. In the upstream oil industry, the undiscounted government take typically ranges from 25 per cent to 95 per cent of the divisible income (divisible income being the surplus between gross revenues and costs) over the lifetime of the project.

An important recent development in the extractive industries has been the move towards establishing a model mining development agreement (MMDA), which is intended to serve as a negotiating template between the investor and the State for mining concessions in developing countries. Based on an analysis of more than 50 mining concessions, the work is being undertaken by the International Bar Association, supported by the World Bank. The process is nearing completion, and the first draft is now available at www.mmdaproject.org.

MMDA is aimed primarily as a tool for use in situations where a mature mining code is not in place, or where the mining code must be supplemented by private agreement, or as a template for an agreement with state-owned mining enterprises. Among its many provisions there is a financial section which addresses the different fiscal arrangements that

might be used in a concession including rentals and royalties, the latter being variously classified as either profit-based, value-based, or unit-based. There are also commentaries on windfall profits and resource rents.

The model MMDA is not prescriptive, as it cannot define financial relationships in a generic way, but it is of interest in the sense that it illustrates the various approaches currently in use, including the provision for updating royalty rates and other fiscal terms at defined intervals in an attempt to be equitable to both parties.

Not all of these concepts are easily applicable to hydropower. For example, there is no international benchmarking of electricity prices which might be used under certain formulae as a basis for royalty payments. However, notwithstanding the differences, there are no doubt lessons to be learned from a more detailed study of the MMDA proposals.

Conclusions

Governments need to have some understanding of the value of a hydro resource when negotiating an open hydro concession. They are usually faced with the dilemma of having to enter into long-term binding agreements without knowing what the potential profitability of the project is in current market conditions, let alone what it may be over the duration of the concession.

The extractive industries face similar problems, and they have not been particularly successful in solving them. However they appear to be moving towards more

flexible agreements and a greater awareness of the needs for governments to protect the value of their resources through time. It remains to be seen whether the hydro industry can strike the balance that will encourage the entrepreneurial skills needed to harness large hydro resources with all of the risks this entails, while at the same time ensuring that the host government receives a fair return for the use of those resources. ◇

References

1. **Van Meurs, P.**, "Maximising the value of government revenues from upstream petroleum arrangements under high oil prices", Van Meurs Corporation; June 2008.
2. **Baunsgaard, T.**, "A Primer on Mineral Taxation" IMF; September 2001.



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