

The Crucial Issue of Design Responsibility

By Christopher R. Head

With this article, HRW launches a special 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 assigning responsibility for project design.

The winds of change affecting the global power industry are having a large effect on the way in which hydro projects are implemented. In the shift from public to private financing, one of the most significant — but largely unnoticed — changes is the way in which responsibility for the design of a project has moved from the owner to the contractor. It is also, arguably, the change that is least understood by many of the parties involved.

The move to make the contractor responsible for design of the project is the result of a more general trend toward EPC (engineering, procurement, and construction) or turnkey contracts. In this type of contract, the contractor effectively provides a “one-stop” construction service. This formula has worked well in the process and thermal power industries, and is favored by financiers because of its perceived contractual simplicity.

However simple this approach may be in concept, its application to complex hydroelectric projects is anything but straightforward. This is because hydro projects involve heavy civil engineering — typically dams, river intakes, tunnels, and underground works — which does not readily lend itself to being precisely defined in advance. Design and construction are inextricably linked processes, with conditions revealed during construction feeding back into the final design.

Under the contractual approach traditionally used for hydro projects, the owner retained responsibility at all stages of the design; he determined what should be built, and the contractor simply delivered the end product under his supervision. At all stages, the owner retained full control of both design and the quality assurance process.

In contrast, the essence of the EPC approach is that the contractor is responsible for all aspects of implementation, including design and quality management. He generally inherits a preliminary design in the form of a project brief, which specifies the overall layout and key dimensional features such as the full supply level and tailwater level. The brief also will specify performance criteria that can be easily measured, such as unit efficiency and power output, but it is likely to be very sketchy when it comes to the detail of the civil

works. It is difficult to precisely specify performance criteria for civil works because they tend to revolve around intangible issues such as the ease and cost of operation and maintenance, the project's long-term durability, and, ultimately, safety. It is in these areas that there can be inherent design conflicts between construction costs and what might be subjectively described as “good engineering practice.”

The problem is aggravated by the nature of the EPC bidding process, which often takes place against a background of inadequate site data and an unclear project brief. In many cases, the prospective owner (the project company) will not clearly know what is required, except that it should be the cheapest project in the shortest possible time. Often, the owner has neither the opportunity, nor the inclination, to carry out the extensive front-end studies necessary to define the works in detail, and he is understandably reluctant to spend money ahead of

***“The Contractor shall carry out
and be responsible for the design
of the Works” - Clause 5.1 in the
International Federation of Consulting
Engineers' 1995 FIDIC Orange Book
Conditions of Contract for Design-
Build and Turnkey.***

financial closure when his own position is secure. By the time financial closure is achieved, the construction contract will be in place and the price fixed.

The situation is not helped by the confrontational legal structure surrounding many projects. Sometimes, the project company will be advised by its attorney to give the contractor minimal design information at the bidding stage, on the grounds that this reduces the company's subsequent exposure to claims relating to design inadequacy. Quite apart from lessening the chances of getting a sensible bid, this strategy is likely to seriously rebound during the construction stage when it becomes apparent that the expectations of the two parties are different.

So, the EPC contractor ends up with a price and a commissioning date — and a lot of latitude to decide what he is going to deliver within those two global constraints. He begins to realize that design responsibility is not a burden, but a savior. Having committed to a fixed price with heavy liquidated damages for late delivery, he begins to look for every opportunity to reduce cost and shorten the construction schedule through value engineering. This is a perfectly legitimate and necessary engineering activity, and any wise contractor will pursue it to the utmost. Problems only arise in the gray areas where there are potentially large sums of money to be made by questionable design compromises.

Unfortunately, there can be many gray areas. For example, there are likely to be differing opinions over what is needed when it comes to the design of intake and desilting arrangements; or the specification of tunnel linings, dam foundation treatment, rock support measures, and the like. In the end, the contractor naturally will influence the design toward the scheme that he wants to build, which may not always be what the owner expects.

But, you argue, surely the contractor's design has to be approved by the owner or his engineer? Correct, but if the brief is too vague, the project company may have limited scope to act. It is perfectly possible to build a project that meets short-term operating criteria, but which is sub-optimal in the longer term. One can easily see how a contractual requirement that "... the project shall be designed for a working life of 50 years ..." can be open to wide interpretation, depending on which side of the "contractual divide" one is standing.

Good engineering can sometimes be a matter of subjective judgment. The owner might not like the design with which he is presented, but he may be powerless to intervene without serious contractual repercussions. If the contractor asserts that his design meets the project brief, it may be difficult to prove otherwise. The owner then faces a dilemma; whether to accept the design or override it by issuing a Variation Order. The

latter immediately provides an opportunity for the contractor to renegotiate his obligations on both price and schedule. If the owner elects to argue that his instructed variation is nothing more than what is called for in the original project brief, he may have to go to arbitration to prove it. Faced with this situation, and the knowledge that they dare not take any action that could be interpreted as delaying the works, many owners simply will sit tight and hope for the best.

There is still only limited experience with hydro-power projects being built under EPC arrangements, but experience so far suggests that many of the disputes on such contracts have their origins in design-related issues. This is because the owner sometimes appears to be unaware of the potential risks of surrendering control of the design on the basis of an inadequate project brief. In attempting to protect himself and the lenders, he may be inadvertently exposing both to greater risks.

For most hydroelectric developments, there will inevitably be some evolution of the design during construction. If the project company is not to lose control of this process, it has to resist the facile solution of putting all design responsibility, and therefore all the associated risks, onto the EPC contractor. A more productive approach may be for the project company to retain control over key aspects of the design in return for offering the contractor protection against variations in cost brought about by certain specified design changes. ▲

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The articles in this series are meant to raise awareness and provoke thinking about issues related to contracting. Please share your comments, reactions, ideas, experiences, and solutions on the topic of assigning project design responsibility. Send comments to Marla Barnes, HRW Managing Editor by E-mail: mbarnes@hicpub.com or by Fax: (1) 816-9312015.