HYDROPOWER PROJECT DEVELOPMENT- AVOIDING DISPUTES AND CLAIMS

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INTRODUCTION

The title of this conference session is New Hydropower Developments and the title of this paper is Hydropower Project Development – Avoiding Disputes and Claims. It is an important subject and the author believes he has a background sufficient to address the issue. Until 2006 he was the President and CEO of Columbia Power Corporation, a British Columbia independent power producer, where he was responsible for the development of several run-of-river hydropower projects: the planning, permitting, financing, power sales, procurement and commissioning. He was also responsible for dealing with and negotiating solutions to disputes and claims with contractors. In his current role as a consultant the author has advised construction contractors and owners on project procurement options, risk management and other project planning issues. The author has also advised the Partnerships BC agency in British Columbia in the areas of procurement options and risk management for public-private-partnerships. He currently is a procurement advisor for the 135 megawatt John Hart Replacement Project on Vancouver Island. Lorne Sivertson is a member of the Canadian Hydropower Association and was formerly the Vice Chairman.

The attendees at this session will be well aware of the efforts being made world wide to control greenhouse gas emissions (GHGs) through the displacement of carbon-based energy production with renewable, "green", energy. [1] Hydropower is seen by many environmental groups and governments as a very promising source of such energy. Numerous governments have set standards for renewable energy in supply portfolios, which include hydropower.

As a result, while hydropower had a stable or declining share of electricity supply in many countries it is now growing. The US Energy Information Administration has recently reported that globally net electricity generation will grow by 87% to 2035. Renewables, including hydropower, will, the Administration says, be the fastest growing source of new electricity generation. [2] There are major hydropower developments underway or planned in Canada, the second largest hydropower generator in the world, with 70,000 MW of capacity, and another 165,000 MW of potential. [3] Site C, at 900 MW, is in the planning process in British Columbia. For Asia, in Laos the 1,070 MW Nam Theun project began

operations this year. Cambodia is planning a 1,000 MW plant on the Mekong and China has announced its intention to expand hydro capacity from 190,000 MW to 300,000 MW by 2020. [4]The Xiaowan project, operational in 2013, will be China's second largest hydro plant after the Three Gorges. [5] Africa, South America and Europe all have numerous hydropower projects planned or underway. Brazil recently announced the giant Belo Monte hydroelectric project.

What all of this means is that there will be huge capital investments in hydropower, equally large equity financings and bond placements, with equally large numbers of EPC and other forms of construction and equipment supply contracts.

Procurement for new hydropower project developments involves owners, contractors, equipment manufacturers, as well as many other parties, including governments. It is a complicated process dealing with complex projects where things can and often do go wrong. Things going wrong lead to disputes with contractors and claims by contractors. This is disruptive, time consuming and can be very costly for the owner and contractor.

The purpose of this paper is to explore why things can go wrong in new hydropower project delivery and to describe and assess some of the strategies for avoiding disputes and claims.

DISPUTES AND CLAIMS

It is rare for a significant hydropower project to be developed without a number of disputes and claims surrounding the work, the cost or the schedule. This may occur despite the best intentions of the owner and the owner's contractors. Disputes and claims take valuable time, are costly and benefit only lawyers.

There are a number of elements in a strategy to avoid giving rise to project development disputes and claims. Some of these elements are:

1. A clear definition of the project scope, an understanding of it by involved parties and minimal changes after being first established.

2. Adequate background technical information including geotechnical information and an adequate project design, specifications and cost estimate.
3. A rigorous risk management process in place at an early stage.
4. Selection of the appropriate procurement method and contractor(s).
5. Sufficient project controls established.
6. Ensuring necessary labour will be available and will have the necessary skills.
7. A regulatory, permitting and approvals process laid out with relevant responsibilities.
8. Clear project accountabilities and responsibilities set out.
9. Clear contract language and careful technical/financial evaluation of bids to highlight hidden qualifications.

This paper will focus on elements # 3, risk management, and # 4, procurement methods, in this list. It should be noted that these two elements are not independent and should be closely interrelated.

RISK MANAGEMENT – AVOIDING DISPUTES AND CLAIMS

It is asserted here that the overriding objectives for an owner in developing a hydropower project are:

- A project developed on budget.
- A project developed on schedule.
- A project developed that is fit for purpose and meets performance expectations.

These objectives may not be met or can be compromised when risk events materialize along the development path. When risk events arise, when things go wrong, there likely will be disputes between the owner and his contractors. And disputes often lead to claims.

Every project faces risks. Not all risks are known. There are always, to quote the former US Secretary of Defense, Donald Rumsfeld, unknown unknowns "things we do not know we do not know." However, many project risks are well known. They are common in hydropower project development.

Some of the common hydropower project risks are:

- Failure to obtain or comply with regulations or changes by governments to regulations mid-course.
- Equipment, materials, construction and other cost changes.
- Deficient or faulty technical information.
- Unanticipated sub-surface conditions, quantity estimates, in-stream works.
- Incomplete, misunderstood or changed project scope.
- Unclear responsibilities, poor communications and coordination.
- Design and construction errors, omissions, changes.
- Performance requirements not clearly set out or followed.
- Labour disputes, safety incidents, third party interventions or damages.

It should be noted that to the extent risks occur for a hydro project, they would likely occur during the pre- construction or construction periods or within a few years after commissioning. Major problems can, of course, arise a number of years after commissioning, when guaranties and warranties have expired, which brings additional problems to the owner. There are procurement methods for extending contractor performance risk exposure, which will be dealt with below.

Risks, then to the extent possible, should be identified and dealt with. There are a number of ways for dealing with risks:

- Risks can be accepted by the owner.

- Risks can be avoided.
- Risks can mitigated.
- Risks can be transferred.
- Risks can be shared.

A risk management process involves consideration of all of these options. A risk matrix can be used in the first stage of the process. The matrix fields are:

- Risk identification and description.
- Estimation of the consequences of each risk.
- Estimation of the likelihood of the risk.
- Quantification of the impact of the risk on the project schedule, cost and performance.
- Allocation of the risk: transfer, share or retain.
- Identification of the means to reduce the likelihood of the risk. [6]

The information developed in risk assessment should be reflected in the estimated project cost: that is, the estimated capital cost plus the valuation for risks, all in life cycle, present value terms. The output is then used to make investment decisions, risk allocation decisions and decisions on procurement approaches. In deciding which risks to transfer, retain or share a good rule is to assign risks to those who can best manage them. Some risks are better borne by the owner, others by the contractor. Some risks, such as geotechnical and cost escalation may not be possible to transfer and at best will have to be shared.

Risk transfer is not simple and not a free ride. Transferring of risks to contractors can meet with resistance and higher bid costs reflecting contingencies. However, risk transfer probably is not a zero sum game, contrary to the view of some individuals who are involved in the business. A contractor who accepts a risk may not increase his proposal cost by the full expected value of the risk event. The contractor may assume he can manage the risk

effectively and will discount it. One major contractor has told the author that in their risk management process they assess the value of risks they must bear and may discount some risk costs in their bid by 50%.

With a project design, scope, cost estimate, technical requirements and an assessment of the costs of risks retained, shared and to be transferred, an owner is prepared to solicit project bids. The bids may or may not match the budget estimate and may deviate significantly. A recent study of infrastructure projects in Canada reported that many bids received deviated significantly from the pre tender estimate. [7] Negotiations likely are required after bids are received and if, at the end, bid costs and owner costs substantially exceed the estimate the project investment decision may have to be revisited.

It should be noted that even though a risk is transferred to a contractor, if it occurs the contractor may mount a challenge and ultimately an arbitrator or court can make a decision "splitting the difference", or worse for the owner. A transferred risk may not remain transferred. Carefully crafted contract language and careful oversight by the owner are essential to avoid a re-transfer of risks.

While a risk management process is very useful in all forms of project procurement, some procurement forms are better suited to risk sharing and transfer. An owner's requirement to control of all aspects of project development will not fit well with some forms of procurement. Control generally means responsibility and risk exposure. This is the subject of the next section in this paper.

PROCUREMENT METHODS – MANAGING DISPUTES AND CLAIMS

There are a number of procurement methods (contract forms) used for project development in the waterpower industry. These forms have differing risk management features as well as a differing incidence of project disputes and claims. Some contract forms also have been shown to do better than others in achieving the owner's project development objectives: a

project that is on budget; a project that is on schedule; and a project that meets performance expectations.

A procurement method may be selected only because of its risk management features and expectation of meeting the owner's project development objectives. Other criteria may be more decisive, however. The project size and complexity are important factors. So too is the time available to commence and complete the project. Many firms select a procurement method that is familiar to them and familiar to the industry regulators. As will be shown in this section, while there may be good evidence supporting one procurement form over others, inertia and other reasons influence the movement away from less advantageous procurement forms to others. Again, the argument here for a test of an advantageous procurement form is the extent to which it can achieve project development objectives while avoiding disputes and claims.

Four procurement methods are considered here:

- Design-Bid-Build
- Early Contractor Involvement.
- Design-Build.
- Public-Private-Partnership.

Design-Bid-Build (DBB)

DBB is a traditional form of procurement for power utilities, at least in North America. It has persisted in part because of familiarity to owners, contractors and regulators. It has a number of advantages, including more or less complete control by the owner over design and equipment provision. It also has a number of disadvantages.

DBB is a sequential process. The owner either designs the project in-house or engages an engineering design firm to do so. The design completed is definitive, subject to change orders. It supports detailed cost estimates, although as noted earlier, recent evidence for

infrastructure projects in Canada shows that fewer than 20% of the bids received for DBB contracts were within 10% of the pre-tender estimate. [7]

After the DBB design and cost estimates are completed the owner seeks bids on electrical equipment, machinery and civil works from various qualifying contractors. The owner retains most of the project risks, seen by owners as the cost of having significant overall project control. In this case risk management can amount to simply a matter of assessing risks and incorporating expected values into the project budget with contingencies, not transferring or sharing them.

While owner control is seen as a DBB advantage, risk exposure is a disadvantage. A major risk is that arising out of a lack of single point responsibility. There can be a disconnect between the designer and the contractor(s), inviting obstacles to achieving project development objectives and hence opening the door for disputes and claims.

Early Contractor Involvement (ECI)

ECI is also known as an Alliance. It is used in the UK and is being promoted by some of the larger EPC contractors in North America. ECI is seen by its promoters as having a number of advantages over DBB.

In ECI an engineering/construction contractor is brought in by the owner at an early stage of project planning. At this stage a preliminary project concept is developed, a budget prepared and schemes for identifying, quantifying and allocating risks are set out. The contractor may be paid nominal amounts for services at this early stage.

After the first stage the ECI contractor may be requested to submit a design-build (DB) proposal, generally compliant with the base concept. The contractor may be awarded a DB contract, but there is no guarantee.

The benefits of ECI include that there is better collaboration between the owner, the designer and the constructor from the beginning of the project. Risks and their assignment are better understood. Risk premiums should be reduced as a result and there should be

fewer disputes and claims. Promoters of ECI argue that it can significantly reduce project delivery timelines as well as reducing cost in comparison to DBB.

Critics of ECI argue that, among other things, it reduces competition. Bishop comments on ECI as practiced in the UK as follows:

"Early contractor involvement, or ECI, is the latest stage in the evolution of procurement strategies for public sector highway construction. Lowest cost bidding begot the two-envelope process, which begot design and build, which begot DBFO and PFI. Each step of the way was designed to improve efficiency and reduce over-runs in time and budget, usually with only qualified success.

"ECI is a close relative of D&B, in that it exploits contractor's unique understanding of construction processes to the benefit the design process. The difference is, as the name implies, that ECI involves the contractor far earlier… Although only a handful of ECI schemes have reached completion so far, it is received wisdom that it is a good thing. However, there have been significant teething troubles along the way… The key benefit was that it 'potentially reduces preparation time for projects by 30% to 40%, by carrying out some parts of the development process simultaneously rather than consecutively'…"[8]

Design-Build (DB)

There are several variations of DB. It can be a component of an ECI arrangement and can be a component of a public-private-partnership procurement arrangement. DB is increasingly being used by industry for large scale, complex projects. Independent power producers and some public utilities in Canada are choosing the DB procurement approach for their new projects.

DB basically involves the final design, some permitting, scheduling, construction, testing and commissioning assigned to a single entity for a fixed contract price. Final design is not completed before construction commences, unlike DBB, but proceeds with it. The DB process can include an evaluation stage, where the final investment decision, before

significant design costs are incurred, is made after the fixed-price DB contract bids are received by the owner. This variation has been called design-evaluate-build (DEB). [9]

The DB contactor builds to a scope, a basic engineering design and Owner's Requirements prepared by the owner. The conceptual design is usually not more than 30% complete when the DB contract is awarded. For that reason, final costs and schedule can only be estimated by the DB contractor, who generally, accepts all or a large portion of the project cost/schedule risk. Having a contractor accept 100% of cost risk has been possible in the recent past but has become increasingly difficult. Contactors now generally want some amount of risk sharing in this area. The DB contractor also accepts design, construction and limited performance risk. DB is not a procurement method appropriate to all owners:

"If clients want deep involvement in design, the d-b process is not the appropriate form of contract. The client representative needs to be vested with power and authority to make decisions." [10]

A key aspect of DB contracting is the identification, quantification and allocation of project risks. As Ambrosone has said " it is obvious that identification, quantification, equitable allocation and management of risks as discussed herein is essential for understanding how to minimize claims and contribute to d-b contract price certainty." [10] While the DB contractor may accept a significant portion of the cost risk, some risks; geotechnical for example, likely must be shared with the owner. Scope changes and design changes initiated by the owner will be the owner's risk. Responsibility for design errors, construction errors or omissions should rest with the DB contractor. However, not all risks are known in advance and even if they are, if they occur can result in disputes and claims. This can be the case in particular if the contract language is loose.

While most project development problems become evident during construction or within a few years after commissioning, not all are. Performance issues, with turbines, generators and transformers, for example, can arise after project warranties and guarantees have expired, becoming larger problems for the owner. Such risks can be dealt with through a variation of the DB model, which amounts to an extended warranty. This is covered in the next section of this paper.

With respect to meeting the project development objectives of the owner there is good evidence that DB performs better than DBB. One such example here is the 185 megawatt Arrow Lakes Generation Station (ALGS) in British Columbia. ALGS was initially pursued as a DBB project but the project owners, Columbia Power Corporation, found that the combination of a lengthy construction schedule and high initial cost estimates made it uneconomic. Realizing this, Columbia Power and their engineering firm advisors developed a totally new project concept and preliminary design, which reduced the project budget estimate and eliminated a number of cost and construction risks while at the same time truncating the construction schedule.

The ALGS concept was advertised, technical and legal documents prepared, an RFP process initiated, competitive DB bids submitted, evaluated and DB contract award made, all within 18 months. Construction commenced 3 months after the contract award.

The ALGS project was completed ahead of schedule, three years earlier than would have been the case under the preliminary DBB schedule, and on budget. The fixed price bid was more than 40% lower than the DBB cost estimate and project energy cost 30% lower. [11]

There was a post-commissioning approach channel uplift event at the ALGS, however. It was costly to repair and saw the plant out of operation for several months. There was a dispute and claims followed, but the contractor and insurers bore a major portion of the costs.

Arrow Lakes Generating Station

While the ALGS channel uplift incident could not have been avoided as designed, the overall cost of and time for repairs could have been reduced had Columbia Power included an Owner's Requirement for a head gate at the channel entrance to allow a quick response and repair of the channel in the dry. It was not included, saving over $30 million in construction costs. Instead, a temporary cofferdam had to be built after the event to allow repairs. [10] The repair solution of the project design firm, Harza Engineering Company (MWH), as built by Peter Kiewit Sons Co., was very effective, reducing future up-lift risks.

The ALGS pre-construction risk assessment carried out by the owner had indicated that the risk of needing a head gate was small compared to its cost. But clearly, even unlikely risks with large consequences can occur.

A number of studies have been carried out into the effectiveness of DB contracting versus DBB contracting for infrastructure projects. The US Federal Highway Administration in a 2006 study comparing the two forms of procurement concluded that:

"The greatest motivation and realized benefit to a contracting agency of using design-build instead of design-bid-build contracting is the ability to reduce the overall duration of the project development process by eliminating a second procurement process for the construction contract, reducing the potential for design errors and omissions, and allowing for more concurrent processing of design and constructing activities for different portions of the same project." [12]

A study published early in 2010 into DB and DBB procurement in the Ghanaian construction industry reported that:

"The study revealed that most DB projects are completed within their respective budgets whilst a greater number of DBB projects incur cost overruns due to variations and price fluctuations. The time performance comparison also placed DB projects better than their DBB counterparts…The study further revealed that, there is no significant difference between the qualities of completed projects executed under the two procurement methods." [13]

In a 1994 study by Ndekurgi and Turner the authors found that:

"The use of design and build is on the increase with many clients perceiving it as providing better value for money and giving rise to less disputes than other procurement methods…the few disputes encountered have concerned abortive work inaccuracies in the client's brief, conflict between the brief and the contractor's proposal, and valuation of variations." [14]

In the interest of objectivity, a final word on DB procurement from Ambrosone:

"It is evident from Revay (2000), Osborn (2000) and APEGN (2003) that d-b is not a panacea for ruling out claims and as such, contract price certainty will not be known until the end of the contract, i.e. after any disputes and claims have been negotiated/arbitrated/litigated or otherwise resolved. "[10]

On the broader questions of does a DB contract ensure project price certainty and does DB contract price economy come at the expense of quality, Ambrosone provides evidence not favourable to DB. In a survey of "seasoned" industry DB practitioners in major civil engineering and hydroelectric projects in British Columbia he found through an extensive questionnaire that:

"Testing of Research Hypothesis No.1 …found that there was significant agreement that d-b contract price certainty is a fallacy…Testing of Research Hypothesis No. 2… found that there was significant agreement that achievement of d-b contract price economy is at the expense of quality." [10]

Disputes and claims are not eliminated with DB contracting, but can be reduced in comparison to DBB. The findings on the extent to which DB contracting achieves the owner's project development objectives are mixed, however, which is not to say that DB is worse in this regard than the other contracting forms.

Public – Private – Partnerships (PPPs)

PPPs are a common form of public infrastructure procurement in the UK, Canada and Australia. In Singapore the Sports Hub will be a PPP as will the new desalination plant. The new water plants, incinerator and several other projects were PPPs. Price Waterhouse Coopers sees an expanding role for PPPs in Asia for the development of basic infrastructure, including electrical power generation. [15] In British Columbia PPPs are used for roads, bridges, hospitals and schools. A form of a PPP has been used by Columbia Power Corporation for two hydropower plants at or adjacent to the Columbia River. BC Hydro, the Crown owned utility in British Columbia, is examining PPP procurement, moving away from DBB for all of its generation and transmission projects.

In a typical PPP a contractor, or more likely a consortium of firms including a bank, will agree to design, build, finance, operate and maintain a project for a specified period of time. The model can be design-build-finance- maintain (DBFM) or design-build-finance-rehabilitate (DBFR). The latter involves a turn over of the asset to the owner at some prescribed future date in a state of repair set out in advance in an agreement.

The agreement governing a PPP is called a concession agreement. Here the concessionaire recovers its investment and earns a return for delivering a specified service. The payments can consist of milestone payments during construction, a lump sum payment at project completion, although in some counties this is not done due to government budget constraints. In all cases there will be annual payments over an extended term, 15 to 30 years. Failure to perform as agreed to results in payments being withheld. For a hydropower PPP project performance payments could be based on the delivery of a specified amounts of energy and making available annually a certain amount of capacity, with allowances for scheduled outages for maintenance and some forced outages.

Like DB, risk identification, quantification and assignment is a key component of a PPP procurement model. One of the risks in any form of procurement is long- term project performance. Ambrosone writes:

"…the owner may think he has passed the risk to the d-b contractor, in the long run the risk may well revert to the owner. This may be the case for example when a problem arises because the d-b contractor economized either the design or the construction of the work. …In such cases the owner may need to consider whether the d-b-operate form of contract would be more appropriate for shifting the risk of operation and maintenance expenses to the contractor." [10]

In fact one of the significant PPP benefits from the DBFM or DBFR procurement format is the transfer of long-term performance risk to the concessionaire. It amounts to an extended warranty. A substantial share of the payments received is for performance delivery to a standard over a number of years. Failure to do so reduces the payment. Another benefit is the reduction in claims and disputes, but only if the concession agreement is well crafted and performance monitoring is rigorous. A third benefit from the PPP format, at least as seen in British Columbia, has been clear cost and schedule savings vis-à-vis DBB procurement. Governments have seen these benefits as offsetting the private sector's higher profit and debt service costs vis-à-vis the lower cost of government debt.

Summary And Conclusions

Electricity consumption will continue to grow rapidly with population and world GDP growth well into the future. This growth will be more rapid in Asia than in other regions. Because of increasing concerns over the effects of fossil fuel power generation, the growth in electricity generation will increasingly rely on renewable fuel sources. Hydropower is projected to take a major role in meeting new electricity demands because of cost advantages in comparison with other renewables and because it is considered relatively benign environmentally. There is a long list of hydropower developments either planned or already underway in Canada, Africa and Asia.

Billions of dollars will need to be invested if these hydro projects are to be realized. A large share of this investment could be wasted if things go wrong during the pre-construction,

construction and post construction periods. There are numerous risks on the way to meeting the owner's objectives of seeing their project developed on budget, on schedule and fit for purpose.

A number of strategies can be followed to reduce risks or mitigate their impacts. This paper focused on the risk management process combined with effective procurement tools for increasing the chances of meeting the owner's project development objectives. Meeting these objectives also helps reduce disputes with contractors and related claims.

Based on the experience of the author and the available evidence it is concluded here that the process of identifying, quantifying and allocating project risks is a necessary first step to reducing risks and managing their impacts. The next step is using the product of this exercise: properly accounting for the cost exposure in the project business case; and transferring those risks which can or should be transferred, sharing others and retaining still others. It always must be recognized that risk transfer will come at a cost, but should come at a cost lower than if retained.

While risk assessment and management should be integral to all forms of project procurement, some forms can deal with transferred or shared risks better than others. In this paper four hydropower project procurement methods were examined: traditional design-bid-build (DBB), early contractor involvement (ECI), design-build (DB), and public-private-partnerships (PPPs). ECI and PPP are really only modified forms of DB.

Again, based on the author's experience and the available evidence, it is concluded that the attainment of the owner's project development objectives and the avoidance of contractor disputes and claims are better served by ECI, DB or PPP than traditional DBB. However there are no absolutes here and a well-informed diligent owner, with careful preparation, working cooperatively with qualified contractors can avoid many contract disputes and claims with any of the procurement forms examined here.

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