

REGULATION AND CONTRACTING IN THE HYDROPOWER INDUSTRY

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SYNOPSIS: Regulation and Contracting as Issues for Hydropower Development

The linkage between the title subjects arises from their importance to the viability of hydropower development and to its sustainability in a particular set of circumstances. These will include the legal framework of the particular jurisdiction where the development is taking place, the stage of any plans for de-regulation of the power industry, the extent of support and encouragement for renewable energy, and for hydropower within this category and the balance between independent and public power ownership.

Regulation will concern itself with costs and may well extend to the setting of tariffs for generation [and sometimes transmission] and thus determine return on investment. Alternatively it may apply to mode of development and to environmental issues, requiring strict licence conditions to be met but leaving tariff to be settled by commercial negotiation and separate contract. An important consideration will be any systematic adjustment of tariff allowed under the regulatory regime or by contract. Special regulatory arise where government policies seek to encourage renewable energy sources

Contracting impacts project development and commercial outcome in several ways. The Power Purchase Agreement sets out contractual terms under which output will be delivered to the purchasing entity. Along with the “Licence to Operate” these are the key starting points for a business venture satisfying the needs of financing agencies. Performance and year on year balance of costs, revenues and return then become measure of success. With most costs being related to capital investment and fixed charges, operating maintenance expense becomes the important variable requiring proper contractual provision.

Sustainability becomes a vital part of the equation determining the true worth and acceptability of hydropower development. The extent to which Regulation and Contracting affect that issue is highly important.

1. The need for well structured regulation and contracting practices

Hydropower is a sector of the electricity supply industry which is subject, globally, to more severe disciplines both from regulation and contracting than others. The natural source of energy produced by hydropower, water flow flowing through a drop in elevation, means that it relies on a nation’s or region’s topography and precipitation and run off and thus calls for national and possibly regional attention to ensure wise use. The dependence on natural conditions of hydrology and geology, which are rarely constant or fully predictable, brings in uncertainties which have to be covered by particularly careful contractual provisions covering both the execution of construction works and in the operation of the completed facility for best effect. There is then a linkage – through nature – between the joint topics of this presentation “Regulation and Contracting”. Both strands have a bearing on “Sustainability” which in the 21 st century is a keynote requirement of development of natural resources. Both must be well structured to reflect in a responsible way the long life of hydropower

resources and the wide range of participating stakeholders in the endeavours made to achieve proper development.

From the viewpoint provided here in Beijing we are seeing a wide range of needs in the hydropower sector and in the ways and means that are employed to further its development. A major factor determining differences between regions of the world in attitudes and approaches to development arises from the opposition which is mounted against hydropower. There is, on occasion, violent and irrational condemnation of any interference with river flow. This is based often on the charge that society should not impose artificial conditions on river regimes. This even when such change saves countless lives and property values through the range of multi benefits that river regulation, flood control, irrigation, water supply and other measures can bring. There is no doubt that proper discipline has to be applied to both regulation of development and to the contracting bases under which it proceeds.

In considering the key impacts of regulatory process and contracting requirements on the process of achieving a successful hydropower development we find that both intertwine with the traditional steps of Assessment of Resources, Study, Intent to Develop, Detailed Appraisal [including Environmental and Social-economic Aspects], Approvals and Implementation

The diagrammatic relationship, shown in Figure 1(a) below and (b) on the following page, identifies the stages of development process where Regulation and Contracting have key roles. In addition the timing and manner of the interventions which they call for can affect the staging and progress of development significantly. In certain jurisdictions the sequence and enforced duration of steps which must be followed is materially influencing the spirits of potential developers, who as a result are reluctant to face the time delays, cost of process and uncertainty of final outcome.

Figure 1(a) Relationships of Regulation and Contracting Actions for Hydropower Development

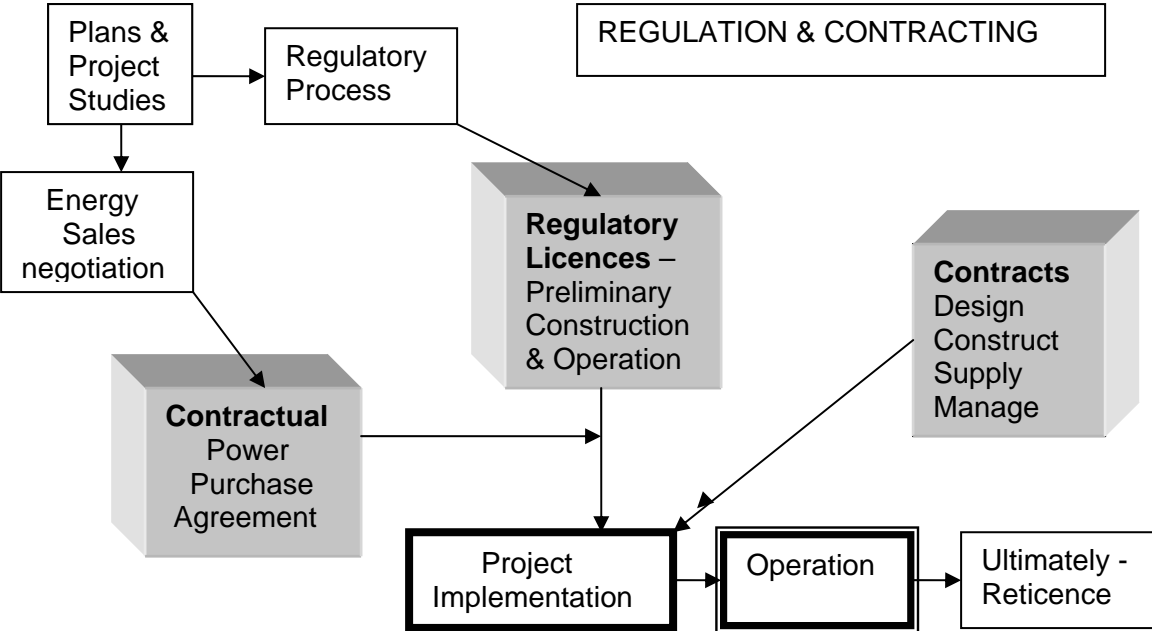


Figure 1(b). Relationships of Actions during Project Development to Completion

STAGE OF PROJECT ACTIVITY	KEY FACTORS	REGULATORY ACTION
Assessment of Hydropower Resources Master Plan for Development		
Market Signal of Need for Generation Expansion Intent to Build New Generation	MARKET INTERACTION	
Evaluation of Options Stakeholders Briefed and Opinions Sought	HYDROPOWER FAVOURED POWER PURCHASERS IDENTIFIED	PRELIMINARY PERMIT APPLICATION BEGINS LICENCE PROCESS
Environmental Study [With participation of licensing body] Socio-economic Assessment		
Preliminary Engineering Design		
Impact Assessment and Mitigation Plans Recreational Issues Examined		PUBLIC HEARINGS HELD
Commitment to Develop Made [Subject to Licence and Financable PPA]		
		FORMAL REGULATORY LICENCE APPLICATION
Site Investigation Project Design	ENGINEERING CONTRACTS	
Financial Justification Proved and Accepted Corporate/Owners Decision to Proceed		LICENCE FOR CONSTRUCTION GRANTED
Project Construction	CONSTRUCTION & SUPPLY CONTRACTS POWER PURCHASE AGREEMENT	
Project Completion And Operation	MAINTENANCE CONTRACTS	FULL [FERC STYLE] LICENCE TO OPERATE GRANTED

Having identified the linkage between these two disciplines we shall look at the specific elements of each applied to hydropower development before drawing conclusions on means of harnessing both in the task of achieving sustainability for this important long term and primary renewable energy source.

3. Approaches to the form of regulation: Light handed or Severe

With the trends towards privatisation of the electricity supply systems throughout the world there has been a steady move towards de-regulation and to a dependence on competitive market forces to maintain reasonable pricing. It has to be admitted that the moves to a deregulated market have not always succeeded. In particular

Brazil, New Zealand and Ontario, Canada have, after an experimentation, have moved back to some degree of regulation largely to avoid the volatility in pricing and sensitivity to variations in supply margins such as would be occasioned by drought conditions. There is a strong body of support for the conclusion that market driven pricing is not conducive to a healthy hydropower sector particularly under post 2000 conditions where petroleum / gas pricing and supply security is facing such uncertainty. Unsustainably low natural gas prices persisting for several years threatened the viability of some European hydropower facilities which had, after many decades of previous sound economic viability, then been faced with market prices barely meeting the inherently low operating costs of mature hydro plant. Market manipulation seriously distorted pricing and supply in western USA. Lack of timely response to low rainfall and run off produced critical conditions in New Zealand. Each of these situations focuses attention on the regulatory environment and its response to abnormal conditions.

A further strong influence of post 2000 thinking is global Kyoto-led concern over CO₂ gas emissions and the widely accepted imperative that renewable energies must form a larger proportion of electricity supply. Regulatory approaches have been widely accepted which apply compensatory pricing (either by enhanced revenue or capital subsidy) to energy outputs from wind, biomass, wave, tidal stream and small hydropower plants added to the supply chain. Surprisingly and contrary to logical thinking hydropower has had some difficulty in securing its rightful inclusion in the “renewables” sector despite its undisputable dependence solely on renewable cycles of rainfall and evaporation. In the maliciously competitive market place opposition to hydropower has found a negative feature in the exaggerated claims of gas emissions from certain reservoirs. Hydropower has had to defend its position of an environmentally benign energy source. Furthermore the inherent opposition among a section of the public to large scale undertakings of any kind has been brought to bear against the larger hydropower projects such as Three Gorges. The essential need for large scale approaches to social needs for flood control and human survival or to irrigation and potable water needs -- also elements for survival – will have to predominate as we move through the 21st century – the century of water dominance – leaving behind the 20th century of oil!

The continuance of degrees of regulation to meet sensible demands of social economics may work against the efforts of the “pure” economic theories of overwhelming reliance on market forces. Yet intervention, properly scaled and applied is likely to be frequently necessary in the foreseeable future. Trends towards depletion of petroleum reserves and to dependence on more globally remote and interruptible far distant sources of supply may yet place renewable energies including, quite rightly, large scale hydropower in a commercially strong position. An environment appropriate for light handed regulation – or for none at all -- may well emerge

4. What can be said for severe regulation: FERC licence practice as the historical case.

The most prominent Regulatory Practice applied to Hydropower is clearly that imposed by the US Federal Energy Regulatory Commission (succeeding the original Federal Power Commission established in the early part of the 20th Century). The regulation it imposes must be categorised as severe but this does not imply a negative result. It has adapted to the changing nature of the US Hydropower Sector from the original municipality led developments of the early 20th century through eras after era of investor owned hydropower to the upsurge of independent developments, many of relatively small scale, in the last 20 years. The FERC licence reissue process calls for re-examination of the quality, need and justification for the particular hydropower development of the site under review at 50 year intervals. Safety and environmental acceptability are now overwhelming considerations. Re-licence will reflect changed societal attitudes to tribal interests and to those others pressing for alternative uses. In the extreme the procedure may lead to abandonment and removal of a dam and restoration of natural conditions. Regular reporting requirements at intervals during the licence period apply a discipline and pre-warning of changed circumstances. Despite the severity of the

process the US hydropower sector the all the more healthy today from the near 100 year actions of the regulatory agencies at both Federal and State level.

Not all development comes under the FERC jurisdiction. Much has also been achieved through the large scale multi-purpose works of TVA, the US Army Corps of Engineers and the US Bureau of Reclamation, through major water supply programmes and, by municipalities with significant hydropower resources within their jurisdictional boundaries.

Serious question remains, however, whether a similar regulatory environment would ever suit any other national jurisdictions in today's world. The Federal / State structure of USA with many trans-boundary river crossings and nowadays vast interstate commerce including electrical energy (both domestic and import), demanded the Federal approach. National security would now be even higher on the list of reasons for the centrally administrated regulatory structure. However, it is unlikely that other comparably sized nations, for instance the Peoples Republic of China or India would elect to adopt a similar structure. Times have changed from the first half of the 20th century. Institutions, including Regulatory Agencies for hydropower must have a much stronger societal leaning and be responsive to the Stakeholders who have now emerged as a powerful element in the development equation. Provinces and States within a Federal structure would, today be expected to lead whatever regulation was to be required. With the firm trend to separation of Generation, Transmission and Distribution/Supply functions within the industry it is likely that the "common" service of Transmission will remain, more often than not, regulated and provided as accessible to all users for power wheeling.

5. Environmental pressures have brought stronger regulatory influences

There is no doubt that environmental issues impact hydropower heavily. The acceptability of new sites proposed for development will require intensive study, review, debate and, no doubt. Typically the US has led the way to impose more exacting FERC requirements and to widen the involvement of all manner of State and Federal Agencies in permitting processes. Stakeholders and other involved parties secure added comfort from securely regulated processes which are seen to protect individual rights against exploitation by more substantial corporate or single interest groups.

Throughout the past century there has been a growing recognition of the value of water as a national asset. It may be confidently accepted that the 21st century will be an era where water takes on a prominence exceeding that given to oil in the 20th century. A prime difference will be that unlike oil where accumulations, securely held underground, can be corporately or nationally "owned" reserves of water are. apart from seasonal reservoir accumulation, transient. They require overriding control within State Country, or Regional jurisdiction or by International Treaty. Regulation is likely to become increasingly vital as demand for sustainable supplies primarily for potable water and irrigation increase.

The concept of water basin management planning, which forms the backbone of emerging European legislation will have a profound effect and could influence regulatory processes. Hydropower projects seeking consent for development would be required to establish that they conform to the "Plan". This would have to include verification that they provide the best use of the water resource on a sustainable basis. Regulation may well impose an obligation to review and verify this at intervals through a licence period and a requirement to re-license probably under increasingly severe scrutiny after 40 – 50 – or 60 years. The inherent long life of hydropower facilities adds a valuable element of sustainability but also a responsibility for long term verification of their social and economic worth.

Over time there may well be a change in public attitude and acceptance. Over 30 years or so the attitude to large dams has altered largely as a result of objection from a very vocal minority seeking preservation of

natural watercourses for aesthetic and recreational reasons. A much more impelling concern, though usually far distant from the international objector's arm-chair and lifestyle, is the treatment accorded to populations displaced by large reservoirs. It is universally accepted that national policies should ensure that, overall benefits do in fact flow in good measure to the affected populations. The benefits should also be sustainable. A large element of these may initially be protection of life and livelihoods against death and destruction from flooding. In the longer term they must include provision of socially and progressively adaptable new communities adapted to the 21st century and beyond. Once again the key word is sustainability. Guidelines and principles set out by the World Dam Commission (WDC) and such bodies as International Hydropower Association (IHA) are valuable in providing developers and regulators with a sensible basis for achieving this.

It has to be recognised that the increasing scale of project undertakings does and will in future bring stronger opposition. This is apparent with highway construction, with new airport facilities scaled for 20 years of increasing demand, with forms of power generation other than hydropower -- "bigness" in itself in today's individualistic society is a negative factor. However, the "bigness" or scale of human demand will almost certainly go on growing and exceed the scale of moderate and small scale response that the objecting side of society clamours for. Even where attempts are made to counter large scale adverse effects, such as greenhouse gas emission through wind generated energy the scale of the benign response itself is beginning to bring opposition to it. There is little doubt that regulation will have a substantial effect on making the inevitable trend to larger and larger scale undertakings more acceptable to society. Water related issues, affecting as they do, life itself, may be expected to lead in the formulation of regulatory approaches, either light handed or severe.

6. Dams and Development

The first five years of the 21st century were severely impacted in regard to progressive development of large dams and associated projects by a reflective process carried out by the World Bank [WB] and International Conservation Union [ICUN]. This was instigated by reaction to some justifiable concerns to sectors of society unduly threatened or affected by large dams. It led to a World Dam Commission Report dangerously imbalanced with unreasonable corrective sentiments. For a year or two, sufficient disruption to orderly development occurred to create a planning "blight" in this vitally important sector. Reaction was severe particularly from nations where livelihood and life depended on effective provision of greatly increased water supply. Fortunately the World Bank finally took a responsible lead and declared continuing support for well justified water resource development, including where necessary and justified, large dams. As noted in 5. above guidelines have been established which will, no doubt, form a framework for regulatory process.

7. Operations in a Deregulated Environment

The global trends of the past ten years have been to deregulation of the electrical industry and while this has had wide support there is a strong body of opinion that this has brought less benefit to hydropower than to competing forms of power generation. The question is whether deregulation leads to stimulation of investment and a healthy power industry. There has certainly been stimulation of short term, quick return investment. The emergence, almost coincidentally with deregulation, of CCGT generation at the 1000 MW scale matched this form of relatively lower capital cost plant with a financing market preference for short term pay-back from power project investment. Natural gas prices were favourably low with fuel contracts of reasonable price and term available. This sector of the industry flourished for

9 to 10 years before the predictable hardening of the fuel supply market occurred, influenced by impending depletion of significant gas resources securely close to demand and the shift to less reliable sources – both politically and geographically.

Hydropower with its relatively higher capital costs and longer term financing needs did not match the model moulded by the CCGT approach and favoured by financial markets. Private Power turned to gas-fuelled generation. Globally there was only modest Independent Power Generator investment in hydropower. This was achieved in the face of financing concerns over the sector's exposure to unforeseen geological conditions and to deviations from long-term hydrological flows. Also contributing to the weak support was the belief that relatively small hydropower development and run-of-the-river schemes were preferable from environmental and socio economic points of view. Misguided attitudes such as this arose through the period of re-examination of large scale hydropower by the WB and ICUN Commission noted in 5. above. Furthermore the industry faced the extraordinary view, proclaimed by competitive energy sources, that hydropower – of any appreciable size – was not truly renewable. Fortunately much has been done to return to a truthful assessment but there remains a lack of objectivity in power and energy stakeholders who have substantial fuel commodities to exploit regardless! The deregulated power market adds vigour to the debate and great care is necessary to prevent distortion of the balanced economic, social and environmental profile in which hydropower deserves much greater prominence.

8. Contracting in the Competitive Deregulated Power Market

Regulation and Contracting are both very significant factors in the successful advance of sensibly planned hydropower increments in generating capacity. The one sets the terms and conditions under which the regulated “service” is to be supplied to the consumer. This may include tariff and price related conditions. The other covers the contractual terms and conditions of what may be either a regulated or unregulated contract between the supplier and the purchasing entity acting on behalf of the ultimate consumers. Dealing with both in the context of this paper brings out some significant points:

Of equal or, at least like importance, is the difference between Public Power and supply by Independent Power Producers [IPPs]. Under regulated supply the conditions which are likely to apply would follow column “A” for both. Under deregulated conditions commercial freedom to apply a mutually acceptable contractual basis would apply in general with some jurisdictions having more confining legislative requirements than others. Size of contractual obligations in capacity of supply, energy amounts over defined periods, value of transaction and the source of funding all will have a bearing on the documentation. In recent years a significant number of major transactions have been put in place for hydropower supply and as time goes on these are being tested by commercial reality. A key issue is the interdependence of the terms of the financing arrangements and the terms of the Power Purchase Agreement. These must be closely linked if not coincident in term and quantum.

These issues are historic and reference to 35 year achievement can surely be forgiven to make certain still valid points. The historic example is of unprecedented size and yet of modern Build – Own – Operate – Transfer (BOOT) nature. It may serve to bring home several points regarding a closely related private Power Supply Contract and its financing arranged by an Independent Power Developer and financing institutions with a long term view. This happened much earlier than the 10 to 15 years on which attention has concentrated so far and which has seen the “conversion” to “short-termism” in the power sector.

The transaction, for the Churchill Falls Hydropower Development in Labrador, Newfoundland was committed to contract 36 years ago and is now approaching its primary term of validity, 40 years. Bond finance was

arranged with the insurance sector initially for these 40 years but later extended to 60 year term under matching power sales agreement with the Province of Quebec.

The scale of the project is comparable to Chinese hydropower undertakings. The installed capacity is 5500 MW in a single underground power plant supplying about 34,000 GWhrs per year, largely to the Province of Quebec with US export to New England and with some local supply. Following the identification of the hydropower resource in the 1950s by a private corporation, BRINCO, with a wide range of resource exploration rights throughout Labrador the undertaking was brought to fruition over a period of 20 years facilitated, during that time, by technological advances in extra high voltage transmission, by advancing demand and by adoption of very large scale capacities in turbines, generators and transformers and a bold decision to undertake its full scale development without staging. It involved an investment of one billion US dollars (in today's values \$ 14 billion) on construction in a harsh northern sub arctic environment. It was completed ahead of schedule and within budget. Environmental impacts were minimal.

The energy price was negotiated without regulatory intervention as a Province to Province transaction with the Purchaser, Hydro Quebec, participating in the equity financing and guarantor of completion. The private development company, Churchill Falls (Labrador) Corporation, was succeeded as Owner by the Province of Newfoundland after the Build – Own – and Operate phases gave way to “Transfer”. Of key significance is the absence of any provision for price escalation and the unusually low contracted energy price, decreasing as bond maturity dates occurred. Lessons must be learned that despite freedom from fuel cost escalation, operating and maintenance costs inevitably increase and have to be covered throughout the 60 year or longer plant operating life.

While the basic underpinning of the Churchill Falls undertaking was the long term PPA of equal importance was the contract for construction under which the development was successfully completed. The works were packaged into a large number of sub-contracts under Engineer/Manager direction and control with competition from many eastern Canada and North American contractors mobilised with work assignments early in the schedule.

Significant lessons were to be learned from the Contract elements of this very large hydropower venture, which was, in fact, the fore-runner of BOO and BOOT principles, now widely accepted in the power and other sectors.

9. Impacts on Successful and Sustainable Hydropower Development

The two major pillars of essential commitment to hydropower examined here have to have the third leg (as of the three legged stool) to achieve stability and permanent assurance of service sustainable over the long life of this renewable energy source. The third “leg” is most certainly environmental acceptability capable of being prolonged through several generations of public stakeholders. Regulatory Processes now engage public participation to an extreme degree and a responsible relationship is being developed. In this process there is evidence that regulatory interventions may already be too invasive of sensible development process particularly in respect of time, with environmental sensitivities being mainly responsible. Care is now essential to ensure that the industry is provided regulatory and contracting processes that do allow and encourage real progress in ensuring that hydropower takes its rightful place in Renewable Energies' contributions to society's long term well-being.