



## ***Competitive Electric Power Markets***

# **Implications for New Hydroelectric Development in Canada**

*prepared by*  
**Philip RAPHALS**

*for*  
**Rivers Canada**

**November 18, 1997**

## Introduction

The trend toward competitive electricity markets in the United States and (to a lesser extent) in Canada has given rise to considerable debate about the environmental impacts such a change might produce. This debate has focussed almost exclusively on the atmospheric impacts of increased fossil fuel generation (greenhouse gas emissions from all fossil sources, as well as SO<sub>x</sub>, NO<sub>x</sub> and particulates from increased use of coal-fired generation). However, there has been little if any examination of the possible impacts of this shift on future hydroelectric generation. The environmental impacts of hydroelectricity are relatively well known, but are of course of a completely different nature from those of fossil fuel generation. Just as an increase in fossil fuel generation would have a noticeable impact on our air, any substantial increase in hydroelectric development would have an important impact on our rivers and on the complex ecosystems they support.

The purpose of this short paper, then, is to explore the forces that may encourage (or discourage) new hydro construction in a context of competitive electricity markets, and to lay the groundwork for a more detailed examination of these questions.

## Deregulation of electric power markets

### A. American developments

#### 1. Competitive markets

The transition toward competitive power markets in the U.S. could be said to have begun with the Public Utilities Regulatory Policy Act (PURPA) in 1978, which for the first time obliged utilities to purchase from independent producers. However, it began to become a reality with the Energy Policy Act (EPAct) of 1992, which mandated the Federal Energy Regulatory Commission (FERC) to take the necessary steps to ensure the development of a competitive wholesale power market. The keystone of FERC's efforts in this direction were Order 888, issued in May of 1996, which obliged transmission owners under its jurisdiction to provide non-discriminatory access to their lines, and the accompanying orders 889 and 888-A.

As for transmission owners who are not subject to the FERC's jurisdiction — and this includes both U.S. municipals and certain other utilities, as well as Canadian generators — they may request the right to participate in the deregulated market, by obtaining *transmission access* and *power marketer status*. The first implies the right to use the open-access tariffs of any other transmission owner in the system, and thus the right to reach consumers or marketers anywhere in the U.S. The second implies the right to make power transactions at market prices, without regulatory oversight by the FERC. Power

marketer status is granted primarily subject to considerations of market power within U.S. markets. Transmission access, on the other hand, is granted or withheld on the basis of a reciprocity condition. To be eligible for open-access transmission rights, the non-jurisdictional entity has to ensure open access to transmission lines under its control under terms equal to or better than those mandated by the FERC (Order 888).

As we shall see, it is this reciprocity requirement which has been the primary driver behind the deregulatory moves in Canada.

While FERC's jurisdiction is limited to wholesale markets, it is the opening of retail markets that is widely seen as the natural endpoint of the move toward competitive markets. Seven American states, beginning with California and Rhode Island, have already adopted legislation allowing retail competition, and many others are expected to follow this path.

While none has done so to date, it is widely expected that at least some states that proceed to retail competition will impose reciprocity requirements of their own, requiring that a producer's home jurisdiction be open to retail competition before it is allowed to compete in their market.<sup>1</sup> The same type of criterion might limit access to the new power exchanges now being set up in many regions. Thus, it is anticipated that the desire to sell into U.S. markets may eventually create substantial pressure for retail access in Canada.

## **2. Environmental impacts**

There has been much concern in the U.S. concerning the environmental impacts of the move towards competitive markets in electricity. The lion's share of this concern has been focussed on air impacts. While FERC did carry out a NEPA review of Order 888 and found no significant negative environmental impacts, there is widespread concern that old, dirty coal plants will have a cost advantage over cleaner technologies, leading to a net decline in air quality. Several large American environmental organizations have fought hard to add features to restructuring legislation in order to mitigate this expected impact.

The implications of competitive electricity markets on the development of new hydro, on the other hand, has received virtually no attention in the U.S. The obvious explanation is that there are few if any good large hydro sites still available for development in the U.S., so the issue would appear to most to be largely theoretical.

From a Canadian perspective, however, it is not at all theoretical. Hydro-Québec's new *Strategic Plan 1998-2002*<sup>2</sup> makes clear its intentions to develop new hydro projects for the export market, and the Canadian Electric Association confirms that there is much new

---

<sup>1</sup> Requirements of this type have been part of retail competition bills at both the state and federal levels. However, any such requirements would have to survive a potential challenge under the Interstate Commerce Clause of the U.S. Constitution.

<sup>2</sup> Hydro-Québec, *Strategic Plan 1998-2002*, 1997, 60 pp.

hydro in Canada's future.<sup>3</sup> As we shall see, the last full inventory showed some 120,000 MW of technically and economically feasible undeveloped hydro sites in Canada — more than the entire installed capacity in Canada today.<sup>4</sup> It is thus of critical importance to understand the implications of competitive power markets in the U.S. and in Canada on Canada's rivers.

## **B. Canadian developments**

While pressures for a competitive power industry analogous to those that have driven the American developments have been felt in some Canadian provinces (especially in Ontario), there is no doubt that the Canadian developments in this direction are largely in response to events south of the border. There are several reasons for this, which we can only touch on here.

- Unlike the high-cost regions which are driving the deregulation agenda in the U.S., most Canadian utilities have *rising* marginal costs. That is, the costs of new plants are *higher* than those of existing plants. Thus, while American industrial consumers are anxious to be able to buy energy from new plants, with costs far below the utilities' average costs, Canadian industrials will generally do better paying (low) average costs than if they had to pay the full cost of new plants (the province of Ontario constitutes an important exception to this rule).
- In those provinces where marginal costs are, as in the U.S., lower than average costs, the utilities are also Crown Corporations, meaning that any move to allow customers choice of cheaper suppliers could impact on the provincial treasury in a number of ways. This is particularly the case in Ontario, where restructuring has been so slow to get off the ground despite myriad pressures and a MacDonald Commission report favourable to competition and to breaking up Ontario Hydro.<sup>5</sup>

Furthermore, it should be noted that, for historical and constitutional reasons, the National Energy Board does not have jurisdiction over the national wholesale market equivalent to that of the FERC.<sup>6</sup> Thus, to the extent that there is pressure toward open markets (largely coming from the Crown utilities themselves, in pursuit of new export markets), it has resulted in provincial applications to the FERC, rather than in a parallel Canadian process, or in binational negotiations concerning the integration of Canadian and U.S. power

---

<sup>3</sup> Pierre Guimond, Senior Advisor, Governmental Relations, personal communication.

<sup>4</sup> Natural Resources Canada, *L'énergie électrique au Canada 1993*, p. 81.

<sup>5</sup> The Harris government's recent white paper, (*Direction for Change : Charting a Course for Competitive Electricity and Jobs in Ontario*), while proposing in theory to introduce competition, stops short of breaking up Ontario Hydro's control of generation, a necessary condition to the establishment of a truly competitive market.

<sup>6</sup> The Inter-provincial Trade Agreement has yet to be approved, and indeed, the energy chapter has been one of the most difficult to finalize.

markets. Instead, each provincial utility has gone to the FERC, one at a time, to try to win the right to participate in the new deregulated market.

As noted earlier, in addition to proving lack of market power *within* the U.S. markets, the other primary requirement for Canadian utilities to participate fully in U.S. markets is to offer reciprocal transmission access on their own lines. Open transmission access has been granted by the FERC to affiliates of TransAlta Utilities (Alberta) in June 1996, of Hydro-Québec in May 1997, and of B. C. Hydro in September 1997.

The following sections will briefly summarize developments in several Canadian provinces with respect to the opening of energy markets, transmission access and FERC approvals.

### **1. Alberta**

The first Canadian province to obtain FERC approval was Alberta, based on the radical transformation of its electricity industry under the Electric Utilities Act, which came into effect on January 1, 1996. To date, Alberta is the only Canadian province to have undertaken such a restructuring. Alberta has adopted a « pool » structure similar to that in New Zealand and the United Kingdom, where all electricity must be bought and sold through the pool, which posts real-time prices based on constantly fluctuating supply and demand.

### **2. British Columbia**

The application of B.C. Hydro's affiliate Powerex for transmission access and power marketer status was approved in September 1997, after an earlier application had been refused on the grounds that the reciprocal access provided to American market participants was not adequate. In the interim, B. C. Hydro adopted a transmission tariff closely modelled on the the *pro forma* tariff of Order 888.

Like Alberta, B.C. has carried out extensive deliberations on possible restructuring of its electricity industry, but until now, they have not led to major changes. In 1995, the B.C. Utilities Commission carried out a six-month consultative process, with public hearings. The report recommended moving gradually toward wholesale competition, but rejected retail access.<sup>7</sup>

In January 1997, the BCUC launched a second set of hearings on retail access. However, these hearings were aborted days before they were to begin. Instead, the government created a governmental Task Force on Electricity Market Reform, to be chaired by Mark Jaccard, who stepped down as chair of the BCUC to take the position. The Task Force issued a preliminary report in June, and its final report is due by December.

---

<sup>7</sup> B. C. Utilities Commission, *The British Columbia Electricity Market Review : Report and Recommendations to the Lieutenant Governor in Council*, September 11, 1995, 95 pp.

### 3. Quebec

Since the suspension of the Great Whale project in the fall of 1994, Quebec has been moving toward a complete overhaul of its decision-making mechanisms with respect to energy. Already in the summer of 1994, the (Liberal) Quebec government held a consultative process leading to recommendations favouring the implementation of Integrated Resource Planning (IRP). In February 1995, the new (Parti Québécois) government launched a major consultative process, known as the « public debate on energy », in which a 15-member roundtable heard some 300 briefs on all aspects of energy policy. Its report favoured IRP, energy efficiency and the establishment of an arm's-length regulatory body (a « Régie »).<sup>8</sup>

The government tabled legislation to create such a Régie (Bill 50) in October 1996, and soon after published its new energy policy, largely based on the public debate report. Bill 50 was adopted in December, and some of its provisions were put into force in May and June of 1997.

The energy policy and Bill 50 for the most part reflected the recommendations of the public debate report. There was one major exception, however: the policy made a commitment to restructure the Québec electricity sector in order to permit competition and deregulation. While the public debate report had mentioned the issue, and had recommended early hearings on it, it had counseled great prudence, and suggested that such restructuring may not be in Québec's interest.

In fact, during the period when Bill 50 was still under consideration, the cabinet had adopted a decree that in effect opened the transmission system to third parties.<sup>9</sup> This decree was adopted without prior publication, citing the urgency of Hydro-Québec's FERC application. However, following the rejection of B.C. Hydro's initial application, Québec replaced Bylaw 652 with another (Bylaw 659), more closely modelled on the pro forma tariff of Order 888.<sup>10</sup>

Based on the revised application, FERC granted Hydro-Québec's U.S. affiliate open transmission access on May 9, 1997. However, it deferred decision on the market power issue (and thus on Hydro's request for energy marketer status), pending further analysis. A decision approving Hydro-Québec's application was rendered on November 12, 1997, despite vigorous opposition by the Grand Council of the Crees (of Québec) as well as a "common front" of consumer and environmental groups.

---

<sup>8</sup> Gouv. Du Québec, *Pour un Québec efficace : Rapport de la Table de consultatoin du débat public sur l'énergie*, March 3, 1996, 150 pp.

<sup>9</sup> Government of Québec. 1997. *Order-in-Council 1559-96: Hydro-Québec By-law number 652 respecting the conditions and rates for open access transmission service*. Gazette officielle du Québec, December 31, 1996, 5487-5507.

<sup>10</sup> Government of Québec. 1997. *Order in Council 276-97: Hydro-Québec By-law number 659 respecting the conditions and rates for open access transmission service*. Gazette officielle du Québec, March 12 1997, Vol. 129, No. 10, 971-1014.

While until recently Hydro-Québec appeared to favour rapid moves toward a competitive and deregulated electricity market, it now appears to have second thoughts. At a recent talk at an academic conference in Montreal, HQ Vice President Thierry Vandal indicated that HQ does not foresee opening Quebec's retail market to competition, nor does it favour additional steps to create a vigorous wholesale market in Quebec. It should be noted that, under the regime established by Bylaw 659, apart from Hydro-Québec, only the nine municipal and one private distribution utilities, which account together for just 3% of the Quebec market, can purchase electricity on the wholesale market. Furthermore, a related decree<sup>11</sup> specifies that they can only purchase from out-of-province suppliers, not from independent producers in Quebec.

It should also be noted that the Québec government's new energy policy gives exclusive access for hydroelectric sites up to 50 MW to the private sector. At the present time, the only alternatives open to private developers are to export their power or to sell it to Hydro-Québec, though there are suggestions that the municipal market may be opened to them in the near future.

#### **4. Manitoba**

The other large hydro generator in Canada, Manitoba, has not yet filed an open access or power marketer request with the FERC. However, in June 1997, Manitoba adopted legislation (Bill 55, The Manitoba Hydro Amendment Act) that empowers the utility to adopt a transmission tariff like the one prescribed by Order 888, thus opening the door to a successful application. An explicit purpose of the Act is "to market and supply power to persons outside the province ..." (sec. 2).

New Brunswick does not intend to seek FERC approvals in the near future. However, the New Brunswick Power Commission has recently indicated that a transmission tariff to permit wheeling through the province will be implemented by January 1998.

## **Planning issues**

### **C. Paradigm change**

The move toward competitive electricity markets has had a dramatic effect on the processes by which new generation projects are planned. Prior to this development, most planning was done by some variant of either the traditional Least-Cost Planning (LCP) approach, or the more advanced least-cost Integrated Resource Planning (IRP) approach. Under IRP, each utility determines its future energy needs and then chooses among both

---

<sup>11</sup> Gouvernement du Québec. 1997a. *Décret 618-97*. Gazette officielle du Québec, 28 mai 1997, 129<sup>e</sup> année, n° 21, 2987.

supply- and demand-side alternatives based on economic, environmental and social criteria.

In the new competitive context, however, this approach has been largely discarded. Instead, with electricity seen as a commodity, the decision whether or not to build a particular power plant is becoming more and more a commercial decision, based strictly on estimations of risk and potential profits. While continuing environmental regulation may still make it possible to exclude certain projects, the idea of taking environmental impacts and other externalities into account in the planning process is rapidly being lost, as is the very concept of project justification.<sup>12</sup>

#### **D. Prospects for new hydro development in a competitive market**

It is widely, and correctly, believed that the advent of competitive electricity markets will tend to favour resources with low capital costs (e.g. natural gas plants) and to disfavour capital-intensive projects like hydro or wind. This is due largely to the uncertainties of projections of future market behaviour. Whereas in the past, market risk of new projects could be transferred to captive customers (through the utility's guaranteed rate of return) or to external buyers through long-term contracts (e.g. NYPA's 20-year contracts with Hydro-Québec, which would have allowed the Great Whale project to go forward), in the brave new world of competitive markets, venture capital will have to be found to meet the development costs of new projects.

It would be incorrect to conclude, however, that it will be impossible to find venture capital for new hydro projects, even in a fully restructured environment. As in any other business, the attractiveness of an investment depends on the balance between expected return and risk. If the expected return is high enough, one can assume that venture capital will make itself available.

In the United States, some companies have started to build "merchant plants" — power plants built without long-term commitments for the sale of their power, but rather with the intention of selling their output on the short-term market. This is a recent development, and, to date, merchant plants in the U.S. have all been natural gas-fired. In Latin America, however, there appears to be considerable interest in building merchant hydro facilities.

---

<sup>12</sup> As long as the utility remains the unique purchaser of electricity, the decision to make export commitments can be subjected to regulatory oversight, and the means used to serve these commitments can be selected based on IRP or least-cost principles. Thus, any project, even one built to serve export commitments, must still be justified in relation to other supply-side or demand-side alternatives, taking environmental and social impacts into account. However, wholesale transmission access allows independent producers to build for export without any broader justification. In British Columbia, which has been at the forefront of the application of IRP in Canada, the Environmental Assessment Act of 1995 made clear that for private power projects, the existence of a sales contract for export would satisfy the requirement for project justification — and this even before wholesale transmission access had been granted.



Given current views of the short- and medium-term outlook for electricity markets, it would appear unlikely that, in the short term, significant amounts of new hydro will be developed in Canada for export by private capital. The market price for bulk electricity in the U.S. is widely expected to stabilize somewhere around 3 cents (U.S.) early in the next decade, well below the values most Canadian utilities have in the past used as their “avoided cost”.

However, looking at the longer term, this judgement must be taken as less than certain. Because the electricity market has become so short-term, hardly anyone is interested in projecting conditions beyond five or at most ten years in the future. This contrasts starkly with the earlier situation, where the power industry routinely based major investments on its predictions of cost of demand projections far in the future. Today’s market projections are for the very short, short and medium terms; and little if any attention has been paid to the longer term.

Current market projections are based on the widely held view that the price of natural gas will remain very low. While this is undoubtedly the best prediction to make today, past forecasts of future prices for fossil fuels have been spectacularly wrong. In particular, future gas prices could be expected to rise in the event of another worldwide oil crisis (since the two fuels can substitute for each other in some markets), or in the event that proven gas reserves begin to fall. Indeed, given the dramatic rate at which the U.S. electric industry is converting to gas, it would not be surprising if at some point a price impact is felt.

That said, it is important to realize that the new market structures now being established will govern decision-making in electricity for a long time. If a regime is established whereby promoters are free to develop hydro sites whenever they (and their financiers) judge it to be financially interesting to do so, the number of projects under consideration at any given moment will vary with the prevailing consensus about the future market price of electricity. If and when the expert community begins to forecast higher prices, one could expect to see a strong interest in new hydro development.

Furthermore, it must be recognized that government ownership of large utilities also affects generation choices. Even if market forces might tend to discourage investment in large and capital-intensive resources like big hydro projects, Crown utilities are influenced by other factors as well, such as governments’ job-creation agendas. Furthermore, government loan guarantees give provide an access to capital independent of project risk. Thus, as attested to by Hydro-Québec’s new *Strategic Plan 1998-2002*, the disincentives to new hydro development in a deregulated market are not necessarily sufficient to prevent Canadian Crown utilities from pursuing an aggressive hydro strategy.

## The implications of deregulation for Canada's rivers

### E. Building for export

#### 1. Crown utilities

Under the fast-disappearing planning paradigm, even those provincial utilities that favoured exports (mainly Hydro-Québec, B. C. Hydro and Manitoba Hydro) normally justified projects based on projected domestic needs. However, they were often willing to « advance » projects in order to supply exports until domestic needs caught up to supply. Even in Quebec, which pursued exports in the 1980s and early 1990s far more vigorously than any other Canadian province, they were always justified as advancements of projects that would eventually be needed for meeting domestic demand.

The advent of competitive markets in the U.S. has changed all that. More and more, building for export is seen by Canadian utilities as a realistic and attractive way to increase profits.

André Caillé, CEO of Hydro-Québec since the fall of 1996, has been extremely vocal about his interest in building for export. In March 1997, he told a parliamentary commission that he expected HQ's share of the North American electricity market to rise from 4% to 6%, implying \$4 billion in additional annual sales. At other times, he has talked about more than doubling HQ's exports (close to 20 TWh in 1996).

Because increasing exports would not require increasing peak capacity, but only energy production, Hydro-Québec favours diverting rivers into existing projects over new developments. To date, it has spoken publically of eight new river diversion projects, specifically for the export market:

- the diversions of four additional rivers (the Portneuf, Sault aux Cochons, Manouane and Boucher Rivers) into the Bersimis and Manic-Outardes complexes, for about 1.2 TWh per year,
- the diversions of the Carheil and the Pekans (tributaries of the salmon-rich Moisie) into the Sainte-Marguerite project, now under construction, and
- the diversions of the Great Whale and Rupert Rivers into the La Grande complex.

Hydro-Québec's *Strategic Plan 1998-2002* calls for increasing total sales by 20 TWh from 1997 to 2002, and by an additional 20 TWh from 2002 to 2007. For the period 1997-2002, this is to include 6 TWh of additional exports, to be derived from new river diversions. Considerable new resources will of course also be required to meet the 20 TWh sales increase foreseen for the later period.

In British Columbia, B. C. Hydro apparently has not expressed any intention of developing new large-scale hydro projects for export, though its recently acquired power marketer certificate gives it the power to do so.

As for Manitoba, Prof. George Chuchman of the University of Manitoba wrote in a recent study that :

« The changes in the Manitoba Hydro Act are obviously aimed at providing competitive access to non-adjacent wholesale markets in MAPP [U.S. Mid-Continent Area Power Pool] and beyond by gaining U.S. regulatory approval from FERC. Comparative advantage in hydro generation makes this prospect potentially very attractive for Manitoba Hydro. The changes in the Act also pave the way for development of hydro-electric sites dedicated to long term power exports. »<sup>13</sup>

It should also be noted that the usual accounting treatment of exports by the Crown utilities has the effect of mixing (more expensive) new generation into the generating system, thus gradually increasing average costs. To the extent that new projects developed for export are handled in this way, the result would be an exaggeration of the cost-effectiveness of these projects, forcing domestic ratepayers to in effect subsidize some of the development costs.

## **2. Private producers**

As we have seen, in provinces with wholesale transmission access, like Quebec and British Columbia, private projects developed for export have considerably fewer regulatory hurdles to meet than do utility projects for domestic demand. In Quebec, projects under 50 MW are reserved exclusively for independent producers and municipal distributors, who are completely exempted from the jurisdiction of the Régie de l'énergie. The situation is similar in B.C.

## **F. Undeveloped hydro potential in Canada**

It is difficult to obtain good estimates of the undeveloped hydro potential in Canada. According to data published by Natural Resources Canada in 1993, Canada has more than 35,000 MW of cost-effective, undeveloped hydroelectric potential.<sup>14</sup> To put this figure in perspective, it is the equivalent of almost a dozen projects of the size of Great Whale.

---

<sup>13</sup> George Chuchman, U. of Manitoba, *Electric Utility Deregulation and Competition: Implications for Manitoba*, 1997.

<sup>14</sup> While the underlying data have not been updated since 1993, in its 1995 edition of *Electric Power in Canada*, Natural Resources Canada indicated that it expected an additional 35,000 MW of hydropower to be developed in Canada within the next 20-30 years (table 7.8).

	ECONOMIC POTENTIAL		TECHNICAL POTENTIAL
	MW	Number of projects	
Québec	15 183	6	37 055
Ontario	4 024	18	12 385
Manitoba	5 260	12	5 260
Saskatchewan	870	4	935
British Columbia	10 538	18	18 168
Alberta	1 923	2	9 762
Newfoundland	2 555	6	4 623
Nova Scotia	0	0	8 499 (incl. 8319 MW of tidal power)
New Brunswick	2 555	2	600
Yukon	350	7	13 701
N.W.T.	2 473	13	9 201

Source : Natural Resources Canada, Electric Power in Canada, 1991, Table C1.

This total *excludes* sites which are technically unfeasible or environmentally unacceptable, as well as those which were not considered cost effective in 1993. (If the last two criteria were to be ignored, the potential would rise to almost 120,000 MW.)

At the same time, it also includes several projects which are no longer seen as likely. While it is not clear exactly what cost criteria were used to define “cost effective” in the preparation of NRCan’s tables, it was probably something on the order of 6¢/kWh, “levelized” over the life of the project, in 1993 dollars.

Under the planning paradigm in effect at that time for vertically integrated hydro utilities, long-term plans were developed to meet expected growth in their domestic markets, in a context of increasing marginal costs. That is, it was known and accepted that each project would typically cost more than the last (since the cheapest ones were developed first and major technological improvements in an industry as mature as hydropower were not foreseen). Thus, each hydro utility developed a “stack” of future projects, with a somewhat arbitrary cutoff cost.

However, because of the drastic changes underway in the North American electricity markets, the notion of “cost effective” has changed substantially. As noted earlier, most of the projects mentioned in the next section would probably not be considered cost effective today — though they may well be tomorrow, if price projections for the electricity market were to rise.

Thus, the information that follows concerning the economic hydro potential in Canada should be seen as extremely preliminary.

It should also be noted that information concerning small hydro sites are apparently not included for several provinces, including in particular Québec and British Columbia.

## **G. Prospects in individual provinces**

### **1. Québec**

As noted earlier, Hydro-Québec has expressed a strong interest in developing new hydro resources for export. As well, Québec has a very large number of potential small and medium hydro sites, on some 500 rivers. The technical potential for these sites alone is estimated at over 10,000 MW.<sup>15</sup> As noted above, development of sites under 50 MW is reserved exclusively for the private sector (or for municipals, aboriginal groups, etc.) and is not subject to any oversight by the Régie de l'énergie. Québec's Environmental Quality Act provides procedural requirements for approval of such projects, but no criteria for guiding such approval.<sup>16</sup>

It should be noted that the Natural Resources Canada figures for Québec include both the Great Whale and the Nottaway-Broadback-Rupert megaprojects, neither of which is currently part of Hydro-Québec's planning. This is primarily due to the large capacity surplus in Québec, as well as the low value of electricity for export. However, it should be noted that Hydro-Québec is very actively interested in diverting both the Great Whale and the Rupert Rivers into the existing La Grande complex, in order to increase its energy output without building new turbines.

### **2. B.C.**

An inventory done for private hydro producers in 1987 revealed over 600 sites, of varying economic potential, all under 20 MW.<sup>17</sup> The accompanying inventory reveals over 250 sites with estimated costs of under 4¢/kWh, for a total capacity of almost 1000 MW and some 4 TWh per year of energy production.

Since that time, more than a dozen of these projects have been built. As the economic conditions have worsened for new hydro, many of these projects would today be unattractive. But, in the words of the inventory's author, « eventually, the gas bubble will burst, and hydro's day will come back. »

---

<sup>15</sup> Gouvernement du Québec. 1996. *L'énergie au service du Québec — Une perspective de développement durable*, pp. 40-42.

<sup>16</sup> This contrasts sharply with the Federal Power Act in the U.S. (as amended by the Electric Consumers Protection Act of 1986), which requires that, " ... in deciding whether to issue any license [for a hydroelectric project], the Commission, in addition to the power and development purposes for which licenses are issued, shall give *equal consideration* to the purposes of energy conservation, the protection, mitigation of damage to, and enhancement of, fish and wildlife (including related spawning grounds and habitat), the protection of recreational opportunities, and the preservation of other aspects of environmental quality."

<sup>17</sup> Sigma Engineering, *Small Hydro Technology and Resource Assessment*, 1987.

### **3. Manitoba**

While NRCanada reported a substantial number of potential new hydro sites in Manitoba, it appears that most of them are on the Churchill-Nelson river system, downstream from earlier developments. Such developments usually have lesser environmental impacts than virgin sites, since much damage has already been done.

### **4. Newfoundland and Labrador**

For several years now, Newfoundland Hydro has been negotiating with Hydro-Québec regarding development of the Lower Churchill Falls project (Gull Island and Muskrat Falls, 2300 MW). These negotiations have of course been complicated by the ongoing disagreement between the two provinces on the long-term contract under which HQ purchases almost the entire output of the Upper Churchill project (over 5,000 MW) for well under a cent a kilowatt-hour. Nevertheless, it is again reported that the two sides are close to agreement.

It should be noted that Quebec's open access transmission tariff for the first time makes it possible for Newfoundland to develop Lower Churchill without Quebec's participation, and to sell directly to U.S. markets without requiring negotiations with Hydro-Québec.

## **Conclusion**

It seems clear from this brief examination that, despite substantial disincentives to capital-intensive generation, the shift to competitive electricity markets in North America may well lead to significant new hydroelectric development in Canada in the medium term, and even in the short term. This is most clear in Quebec, where Hydro-Québec has already announced its intentions to build new hydro projects to serve the export market. Newfoundland and Labrador is clearly interested in doing the same (possibly in conjunction with Hydro-Québec) for the Lower Churchill project, and Manitoba Hydro has also expressed similar interest. While British Columbia appears to be more reticent, in the short term, the cost-effective potential for new hydro there appears to be substantial. Further research would be necessary before forming an opinion as to the likelihood of significant new hydro development in B.C. over the medium term, but the possibility should not be excluded.

Finally, it should be noted that the open-access transmission policies which have now been adopted by Quebec, Alberta, Manitoba and B.C. for the first time make possible the development of remote rivers in Labrador, the Yukon and the Northwest Territories without the direct participation of the southern provinces. This possibility has received little if any attention to date, and certainly any such development would be many years away.

Nevertheless, it must be kept in mind that the changes currently underway in the electric industry are of a deep and fundamental nature, and that the new rules being elaborated at

this time will in all likelihood govern the continent's electric system for many years to come. In this light, it is not premature to inquire into the long-term consequences of this restructuring, and the steps that would have to be taken to make it compatible with energy sustainability over the long-term.