

# DECONSTRUCTING HYDRO:

## *The BC Electricity Sector in this Decade*

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### INTRODUCTION

**A**S IT PREPARED FOR THE 1990s, BC Hydro was very much an organization uncertain of its mission or future. On the one hand, there was still a strong sense in the company that the lack of construction activity in the 1980s was simply a delay in the normal unfolding of its mandate, that soon it would get back to its proper role of building the major electricity generation projects needed by a growing provincial economy. On the other hand, there were some disturbing signs that the changed environment of the 1980s was not just an aberration, that perhaps it was the beginning of more profound changes that would lead to a very different kind of company. Nonetheless, Hydro still portrayed itself publicly as if little had changed. True, management had embarked on its electricity efficiency initiative, Power Smart, but there were still plans to launch its favoured mega-projects as soon as the electricity efficiency potential diminished.

In a 1991 article in this journal, this author and two co-authors surveyed the situation in British Columbia and elsewhere and predicted that the developments of the 1980s were, indeed, the beginning of fundamental change, that control of the electricity industry was slipping away from centralized monopolies like BC Hydro, and that the best Hydro might hope for would be to play an effective role in managing the electricity system in the next decade.<sup>2</sup> The title of the article was "Managing Instead of Building: BC Hydro's Role in the 1990s." The principal thesis of the article was that technological

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<sup>2</sup> M. Jaccard, J. Nyboer, and T. Makinen, "Managing instead of Building: BC Hydro's Role in the 1990s," *BC Studies* Autumn-Winter, 91-92 : (1991-92) : 98-126.

developments in the 1980s had clearly shown that small-generation technologies were economically competitive with, and less risky than, large technologies. Moreover, there was no inherent reason why such technologies could not be developed, owned, and operated by non-utility entities such as independent private generators, industrial co-generators, and even municipal governments and cooperatives. To the extent that governments and regulators decided that this was preferable to the monopoly megaproject model, which is perhaps inevitable in a market-oriented society, the best a large electric utility might hope for would be to remain in the central role of managing the new diversity of players – managing instead of building.

The 1990s have basically followed this pattern. Throughout the decade, Hydro did not launch one major project, in spite of having predicted this need in its earlier plans. Instead, it operated as the evaluator, negotiator, and purchaser in a bidding process for independent power production; supervised an increasing private role in the execution of its electricity efficiency programs; reviewed and reformed its hydro facility operating practices; developed and applied expertise in using the storage capability of the hydro facilities to buy and sell opportunistically in the expanding international wholesale market; and managed the hydro-power generation and distribution system, making a few modest investments and improvements along the way.<sup>3</sup>

The intent of this article is to repeat the speculative exercise of a decade ago. Change has continued unabated in the electricity industry. In a rapidly growing number of jurisdictions, governments have come to see that the full implication of competition in electricity generation is to ask why monopoly utilities should continue to exist. Throughout the world, electric utilities are being dismantled, sometimes privatized, and forced to open their generation market to full competition. Ironically, but perhaps not surprisingly, BC Hydro seems again to be out of step. Its recently issued plan for the next decade, the Integrated Electricity Plan (IEP)<sup>4</sup> suggests that, with the exception of the completion of a few external supply projects resulting from the independent power-bidding process of the mid-1990s, almost all growth in supply on the Hydro system will be limited to a few large projects, totaling 900 megawatts, to be owned and operated by BC Hydro or another Crown entity, the Columbia Power Corporation. The role

<sup>3</sup> BC Hydro, *Annual Reports* (Vancouver: BC Hydro, 1990–2000).

<sup>4</sup> BC Hydro, *Integrated Electricity Plan* (Vancouver: BC Hydro, 2000).

for power production from other industry players will be severely constrained, amounting to an annual addition, between 2003 and 2010, of about fifteen megawatts. This plan is in stark contrast to the evolution of the electricity industry practically everywhere else in the world, certainly to that in industrialized countries, where demand growth is being met almost entirely by small- and medium-scale non-utility resources issuing from competitive markets with minimal public funding.

This article argues the plausibility of a very different outcome from that envisioned in the BC Hydro IEP. It looks at why, and makes predictions as to how, BC Hydro is likely to be profoundly transformed, indeed dismantled, over the coming decade. It begins with a section explaining the cause and effects of major change in the worldwide electricity industry. This is followed by a section reviewing what BC Hydro did in the 1990s while all this change was occurring. It proceeds to describe what BC Hydro intends to do in the next decade and explores the reasons why, given the strength of worldwide technology and market structure trends, this outcome is unlikely. The final section provides an alternative vision of BC Hydro's future over the next decade.

#### INTERNATIONAL TRENDS IN THE ELECTRICITY SECTOR

Electricity market reform is occurring throughout the world, including in jurisdictions that, like British Columbia, are dominated by publicly owned hydropower. With regard to electricity generation, the key element of electricity market reform is to have government replace monopoly with competition, while retaining monopolies in transmission and distribution – these latter functioning as *common carriers*.<sup>5</sup>

The electricity market has three major functions: generation, transmission, and distribution.<sup>6</sup> *Market structure* refers to the number of sellers and buyers. Historically, the electric industry market structure

<sup>5</sup> For an overview, see P. Joskow, "Electricity Sectors in Transition," *Energy Journal* 19, 2 (1998): 25-52. For more detailed analysis, with country-specific case studies, see G. Zaccour, ed., *Deregulation of Electric Utilities* (Norwell, MA: Kluwer Academic Publishers, 1998).

<sup>6</sup> This characterization is deliberately simplified. In contrast, some analysts separate transmission into, on the one hand, responsibility for planning, investing in, and maintaining the transmission lines and, on the one hand, coordinating system operation to ensure effective use of these lines. Some analysts also argue that the function of electricity marketing should be identified separately rather than subsumed within generation or distribution.

was characterized by all three functions being performed by monopolies, in most jurisdictions by a single *vertically integrated monopoly*. Apparent and real economies of scale advantages in generation, transmission, and distribution justified the conclusion that an efficient monopoly was in the best interests of society, provided it was prevented from earning monopoly profits. Excess private profits were prevented either by public ownership or by independent regulation of private ownership.<sup>7</sup>

Electricity market reform is driven primarily by technological change in electricity generation. This has lowered the relative costs of smaller plants, enabling them to compete with larger ones, thus opening the door to multiple, competing generation plants and undermining the justification for monopoly in generation.<sup>8</sup> There are several reasons for this.

Large-sized, conventional generation technologies have proven to be more expensive than originally estimated. Large hydro facilities are becoming more costly to develop, in part, because of the public concerns for their environmental and social impacts. Thus, significant environmental concerns have led to the cancellation or postponement of projects (e.g., Hydro Quebec's Great Whale and Alcan's Kemano Completion project in British Columbia), costly changes to operating permits (e.g., the Columbia River dams in the United States), and even the dismantling of some older dams (e.g., various US locations). The costs of coal-generated electricity have risen because of the cost of acid gas emission reduction equipment.<sup>9</sup> The cost of nuclear power has risen substantially with more stringent safety requirements as well as with unanticipated technological problems (e.g., some of Ontario Hydro's plants).<sup>10</sup>

The evolution of the *combined cycle gas turbine* (CCGT) has resulted in efficiency gains and capital cost decreases, which, if combined with moderate natural gas prices, make this technology highly competitive with large conventional facilities.<sup>11</sup> The technology is especially

<sup>7</sup> Regulation is usually provided by a utilities commission.

<sup>8</sup> For an overview, see U. Hansen, "Technological Options for Power Generation," *The Energy Journal* 19, 2 (1998): 63-87. For a more detailed analysis, see International Energy Agency, *The Energy Technologies for the 21<sup>st</sup> Century*, (Paris: OECD, 1997).

<sup>9</sup> Coal plants are still financially cost-competitive in most jurisdictions, but there is a concern about greenhouse gas emissions that have not yet been incorporated into costs.

<sup>10</sup> No new nuclear plants have been started in North America in over fifteen years. See International Energy Agency, *Electricity Information 1998* (Paris: OECD, 1999).

<sup>11</sup> A CCGT uses the exhaust gases of a turbine (like a jet engine) to (1) directly turn a generator and (2) heat water into steam, which turns a second generator. These two processes explain why it is called "combined cycle." Although the turbine could burn various fuels, natural gas is the dominant energy source for CCGT.

attractive to investors because, even at smaller sizes (as small as just several megawatts), the cost per kilowatt-hour (kWh) produced is low. The energy input/output efficiency of a CCGT can be well over 50 per cent, whereas the traditional, single cycle thermal electricity plants have efficiencies of about 35 per cent. The heat produced from CCGTs can also be used for industrial, commercial, or residential heat requirements. This co-production (cogeneration) of useful thermal energy and electricity improves the energy input/output efficiency to the range of 80 per cent.

Technological change also caused a dramatic drop in the cost of electricity from new renewable technologies. With the exception of wind and biomass in some locations, these costs are still above those of conventional large plants.<sup>12</sup> However, even with a cost premium, these technologies are desirable to governments and some consumers because of their environmental benefits. Other, smaller applications include producing electricity from burning household and industrial solid waste. Even fossil-fuel CCGTs, in cogeneration applications, have substantial environmental benefits if one compares their emissions to the dedicated heat boiler and dedicated electricity boiler that would otherwise be used in combination. Larger-scale cogeneration, perhaps with CCGT, in industry (e.g., refineries, chemical plants, pulp and paper mills) can provide a significant improvement in energy efficiency, cost, and emissions relative to the central, stand-alone power plants owned and controlled by monopoly utilities.<sup>13</sup>

This technological change has had different effects depending on the jurisdiction. In jurisdictions with high electricity prices (perhaps because of high-cost nuclear power) customers may lobby for a competitive market in pursuit of immediate electricity price decreases. However, some regions have lower than average prices because of an endowment of low-cost supply, say from rich and accessible coal deposits (Alberta) or favourable hydropower sites (British Columbia). In these jurisdictions, the desire for reform is usually not as strong as it is in others. Nonetheless, there is still pressure because certain customer groups (especially industry) value the extra options that come from competing suppliers. Other drivers for reform include:

<sup>12</sup> Hansen, "Technological Options."

<sup>13</sup> Even very small, home-based cogeneration looms on the technical and economic horizon. Users becoming generators is sometimes referred to as *distributed generation*. See, for example, A. Lloyd, "The Power Plant in Your Basement," *Scientific American* 280, 7 (1999): 80-86.

<sup>14</sup> For example, British Columbia might one day be required by California to allow US producers access to BC customers as a condition for BC Hydro having access to California customers.

- fear that reciprocity conditions will require an open domestic market in order to have access to competitive export markets;<sup>14</sup>
- pressure from prospective independent power producers (IPPs) for the right to compete; and
- belief that only through competition can the initial price advantage of a low-cost jurisdiction be sustained and not exposed to risky projects that seem acceptable to a monopolist but that would not be undertaken in a fully competitive market.

In effect, every jurisdiction has unique concerns depending on factors such as the predominant generation technology (coal, nuclear, hydropower), the ideological penchant for public ownership, and the relationship to neighbouring jurisdictions.<sup>15</sup>

The potential for competition in generation has been recognized for some time. Over the last two decades, regulators and governments throughout the world experimented with policies requiring monopolies to supply part of their customers' electricity from IPP purchases.<sup>16</sup> By the late 1980s, some countries initiated *vertical de-integration*: the process of separating the potentially competitive generation segment of the industry from the monopoly (common carrier) segments. This prevents *transmission market power*: a state that occurs when control of transmission gives one competing generator an advantage over others.<sup>17</sup>

By the early 1990s, Norway and England were among the first jurisdictions to opt for market reform by separating transmission and system coordination from generation and by moving as quickly as possible towards competition in generation. With regard to this latter step, some argue that rigorous competition can only be achieved if *vertical de-integration* is accompanied by *horizontal de-integration*. In this case, the generation component is segmented into several independent, competing companies in order to prevent a few generation entities from manipulating the market and thus exercising *generation market power*. For example, in British Columbia, one approach would have every hydro facility owned and operated by a

<sup>15</sup> See P. Christensen, *Retail Wheeling: A Guide for End-Users*, 3rd ed. (Tulsa, OK: Pennwell, 1998).

<sup>16</sup> This was formalized in the United States with the Public Utilities Regulatory Policy Act, 1978, which required utilities to purchase electricity from independent suppliers where the price demanded by the supplier was less than it would cost the utility to build its next projected facility.

<sup>17</sup> Otherwise, this would be like expecting several farmers to achieve fair competition in serving a distant market even though one of them owned the railway.

different entity, while another approach would argue that open access to the grid for new competitors and some additional controls on the single owner of the hydropower facilities (especially if publicly owned) can achieve fair competition. In England, the generation monopoly was broken up into a few companies, while in Norway there are already a large number of separate electricity generation companies, including the national government, many municipal governments, and industry.

The reforms in England and Norway did not have the dire consequences that some predicted. Defenders of the vertical monopoly structure had long argued that electricity is special, that the requirement for instantaneous balancing of supply and demand at all times is a responsibility too delicate to be left to market signals. Their opponents had argued that the sector could function as a competitive market as long as the new market structure made allowances for this characteristic. In particular, one entity must be responsible for short-term system integrity, and, to be safe, a special capacity charge would be advisable to ensure adequate and timely investment in order to meet load growth.<sup>18</sup>

Through the 1990s, the move towards competition in electricity generation has become commonplace as one jurisdiction after another opts for market restructuring.<sup>19</sup> Vertical and horizontal structure is not, however, the only issue in electricity market reform. Another key issue is whether or not customers and competing power producers can deal directly with each other instead of always dealing via the utility.

The competitive market model that excludes this direct contact is known as *wholesale competition*. In this model, generators or marketing agents compete to sell power to the distribution utility, which then retains the monopoly of retail sales via regulated tariffs that bundle commodity and delivery charges. In the alternative model, *retail competition*, generators or retailers may sell directly to customers, with the distribution utility delivering the commodity under separate,

<sup>18</sup> The specific concern is that electricity might exhibit the same cyclical investment trends as do other commodity markets, in which overinvestment is followed by underinvestment. This can lead to dramatic price fluctuations, such as an upward spike to indicate to investors the gains from new investments. For many, this is part of the efficient operation of markets. However, given that electricity is such an essential commodity, there is concern that dramatic price fluctuations should be prevented by a special mechanism. Events in California in 1999-2001 have confirmed this concern and reforming jurisdictions are now carefully studying how England ensured continuous new capacity investment.

<sup>19</sup> L. Ruff, "Competitive Electricity Markets: One Size Should Fit All," *The Electricity Journal* 12, 9 (1999): 20-27.

unbundled delivery tariffs regulated by a utilities commission. In jurisdictions that are implementing retail competition, it is usually large industrial customers who first gain access to electricity sellers, although a growing number of jurisdictions are extending this to all customers.<sup>20</sup>

Another key issue in electricity market reform is public ownership. Some argue that privatization must accompany the move to competitive markets. This conviction was central to the reforms in England. Others note that privatization is not essential. Several countries, the earliest example being Norway, now combine private and public ownership in the competitive generation market. Indeed, the ownership pattern has changed little in Norway. The hydropower system is still owned predominantly by municipalities or the central government. Private industry owns a modest number of generation facilities, a slight increase in the decade since reform. The key consideration is that public ownership not undermine competition, and the market participants seem satisfied that this is not occurring.

Countries that have completed most of the key stages in moving towards fully competitive generation markets include New Zealand, Australia, Chile, Argentina, England, Norway, Denmark, Sweden, Italy, Spain, and parts of the United States. Almost all jurisdictions are examining the issue, and many are in various stages of reform.

In Europe, the European Union issued a directive requiring member states to make key market reforms over the coming decade. This includes the creation of an independent system operator for transmission and distribution systems, separation of generation activities, open access to delivery systems, and retail competition for large and (eventually) small customers.<sup>21</sup>

In North America, electricity market structures are primarily the responsibility of individual states and provinces. In Canada, Alberta has reformed its market and Ontario is in the process of doing so. In the United States, California led the way in 1998, and twenty-three states had passed reform legislation by January 2001. Most other states are at some stage of achieving competitive electricity generation markets.

After two inconsequential years and low prices, California's reformed market encountered dramatic problems in the summer of 2000. The hot summer of that year led to an eight per cent increase

<sup>20</sup> Christensen, *Retail Wheeling*.

<sup>21</sup> International Energy Agency, *Energy Technologies for the 21st Century*.



in peak demand (extra air-conditioning load) just when the system had little reserve capacity, and this supply-demand imbalance precipitated a crisis that increased wholesale electricity prices throughout western North America. The crisis is attributable to several factors. First, the Californian reform did not include a mechanism to ensure a sufficient capacity margin. In England, all consumers pay an extra capacity charge, which both provides an incentive for old units to be kept in reserve (rather than decommissioned) and motivates new capacity investments. It is not certain that this will be required in all competitive electricity markets, but it is a good precaution during the early phases of reform. Second, reform required the distribution utilities to purchase all power for retail customers at short-term prices in a mandatory wholesale power exchange. This exposed the utilities, and perhaps, ultimately, their consumers, to the potentially volatile spot market. Long-term fixed-price contracts provide one way to avoid this exposure. Third, with so much of the marginal generation capacity based on natural gas, the demand growth in electricity also put pressures on natural gas prices, which rose substantially in the year 2000. Fourth, when supply shortages and rising natural gas prices did lead to rising wholesale prices, which utilities were required to pay in order to meet service obligations, the utilities were not allowed to pass on the costs to ratepayers. For the year 2000, California utilities had a revenue shortfall of over twelve billion dollars (US).

This money represents windfall profits to producers selling to the California market. BC Hydro saw its net electricity trade revenue climb from CDN\$700 million in 1999 to \$1.1 billion in 2000, most of this from buying electricity during off-peak periods, storing it in its hydro reservoirs, and selling during peak periods when wholesale prices were highest.<sup>22</sup>

The governments and electricity regulators of California and the United States are working to correct the California problem and to prevent its recurrence. This will involve some combination of stimulating capacity additions, permitting longer-term contracting by utilities (or their representatives), establishing better procedures to mitigate market power in the power exchange, and developing mechanisms and financial incentives to ensure voluntary demand reductions during periods of supply shortage.

Although electricity market reforms throughout the world are still relatively recent, the following trends are emerging.

<sup>22</sup> BC Hydro, *Annual Reports*.

- Competition has usually brought efficiency gains, leading to price reductions in some jurisdictions and increased profits in a few.<sup>23</sup>
- California, in contrast to most jurisdictions throughout the world, recently experienced dramatic price increases.
- Smaller generation technologies, seen as less risky, account for a substantial part of capacity growth in reformed jurisdictions.
- The pace of technological innovation has quickened, especially with respect to developing and commercializing small, distributed generation technologies.
- Interconnected grids are operating as a common carrier for trade between jurisdictions, with a generally positive impact on total system efficiency.
- Horizontal market power appears to be declining as new participants enter the market, but this concern is still substantial in many jurisdictions.
- The environmental effects have been generally positive, but governments are recognizing that, if they want to further reduce greenhouse gas and local air emissions, then they need additional mechanisms that affect the environmental outcome of market activity.

#### BC HYDRO'S ACTIVITIES IN THE 1990S

As this wave of reform swept through much of the industrialized world, BC Hydro managed to emerge from the 1990s with a market and corporate structure little changed from what it had at the beginning of the decade. A vertically integrated utility, BC Hydro dominates the BC electricity market. West Kootenay Power Ltd. (WKP), the other vertically integrated utility, is about one-tenth its size. Hydro is publicly owned, while WKP is investor-owned; both are regulated by the British Columbia Utilities Commission (BCUC).<sup>24</sup> There are also a few small, investor-owned utilities and six municipally owned distribution utilities – all but one of which is supplied by WKP.

About 85 per cent of the electricity generated in British Columbia is from hydropower, supplemented by natural gas, wood waste, diesel, and small amounts of other energy forms. The most important hydroelectric developments are on the Peace River and Columbia River systems, and the transmission grid is interconnected with those in Alberta and Washington State.

<sup>23</sup> See Zaccour, *Deregulation of Electric Utilities*.

<sup>24</sup> As explained below, in just the last couple of years, the BCUC's regulatory authority over BC Hydro has been severely constrained by the government.

The question of electricity market reform in British Columbia loomed throughout the 1990s, but BC Hydro survived the decade intact.<sup>25</sup> In 1995, the government commissioned the BCUC to conduct an inquiry and to provide recommendations on market reform. The BCUC recommended that the government move forward with market reforms that would ultimately break up BC Hydro.<sup>26</sup> However, the government never formally responded to the report until, in 1997, it formed a task force to again explore ways of achieving some degree of market reform, primarily in terms of competitive generation and customer access.<sup>27</sup>

Although significant market reform did not occur, it would be a mistake to see the 1990s as uneventful. As the flagship Crown corporation, BC Hydro found itself in the midst of a substantial policy struggle. Under the premiership of Mike Harcourt (1991–96), the Cabinet had difficulty maintaining a consistent vision for BC Hydro. Some members of government were interested in a more open approach to setting electricity policy and a reduced role for BC Hydro. This was associated with several activities.

- The government had the BCUC conduct a public inquiry into Alcan's Kemano Completion project and ultimately halted it.<sup>28</sup>
- Some Cabinet members supported the efforts of the BCUC to regulate all utilities, including Hydro, with an open, public involvement process called *integrated resource planning*, even though this, at times, led to regulatory processes and decisions that were at odds with the goal of using Hydro as an instrument of government investment policy.<sup>29</sup>

<sup>25</sup> For an overview of the political context and personalities involved, the following two sources are helpful. W. Skene, *Delusions of Power: Vanity, Folly and the Uncertain Future of Canada's Hydro Giants* (Vancouver: Douglas and McIntyre, 1997); K. Froschauer, *White Gold: Hydroelectric Power in Canada* (Vancouver: UBC Press, 1999).

<sup>26</sup> BC Utilities Commission, *The British Columbia Electricity Market Review* (Vancouver: Government of British Columbia, 1995).

<sup>27</sup> M. Jaccard, *Reforming British Columbia's Electricity Market: A Way Forward* (Vancouver, Government of British Columbia, 1998).

<sup>28</sup> BCUC, *Kemano Completion Project Review* (Vancouver: Government of British Columbia, 1994).

<sup>29</sup> Integrated resource planning involves comparing, on an equal footing, energy supply investments with efforts by the utility to encourage energy efficiency, which, in turn, may eliminate the need for some supply investments. It is usually an open process that involves interested parties, the idea being that it will enable the planning decisions of utilities to be both understood and supported. This openness helps the utility and its regulator grasp how different interest groups view the trade-offs that need to be made with respect to economic, environmental, and social objectives. See BCUC, *Integrated Resource Planning Guidelines* (Vancouver: BCUC, 1993); and BC Hydro, *Integrated Electricity Plan* (Vancouver: BC Hydro, 1995).

- The government flirted with the idea of pursuing market reform and, in 1995, directed the BCUC to conduct an electricity market review.
- Yielding to the market access pressures of independent power producers, in 1994 the government directed BC Hydro to issue a general request for proposals for IPP projects.<sup>30</sup> Hydro was swamped with responses but has since only pursued a few of these.
- In 1994, BC Hydro completed its major collaborative effort to estimate electricity conservation potential.<sup>31</sup> However, this was followed by a substantial review of its Power Smart program, which led to several key policy shifts.<sup>32</sup> Future emphasis would be on: (1) influencing manufacturers and retailers as much or more than end-use customers; (2) using loans more often than grants in order to recover more costs from customers who would reap the benefits and fewer costs from non-participants; and (3) relying more on private, non-utility companies to carry out the efficiency measures, thereby reducing the need for Hydro personnel.
- In fulfilling a commitment to environmentalists and residents affected by hydro facilities, the government also had BC Hydro conduct a major public review of how it managed water flows. This review eventually led to several modifications in system operation.<sup>33</sup> More recently, BC Hydro is preparing water use plans for each of its facilities, sometimes with significant voluntary restrictions on use.

At the same time, a countervailing tendency within government, generally associated with the former minister responsible for BC Hydro, Glen Clark, pushed for Hydro to retain not only its monopoly control of the electricity market, but also its function of serving the strategic political goals of government through its investments and other activities. Throughout the decade, Clark had Hydro bring forward various investment proposals only to have the larger ones frustrated both by lack of need (slow demand growth, commitments to

<sup>30</sup> Following criteria first established by the government's Crown Corporations Secretariat, BC Hydro issued a request for proposals and produced its own policy guidelines. See BC Hydro, *Resource Acquisition Policy: Multiple Account Evaluation of Electricity Resource Alternatives, Resource Acquisition Strategy* (Vancouver: BC Hydro, 1994). To avoid allegations of bias in the selection of winning IPP bidders, the government appointed an independent panel to make recommendations. See J. Allan, P. Bradley, B. McRae, W. Nieboer, and J. O'Riordan, *Report of the Independent Power Producers Review Panel* (Victoria: British Columbia Government, 1996).

<sup>31</sup> BC Hydro, *Electricity Conservation Potential Review, 1988 - 2010: Summary Report* (Vancouver: BC Hydro, 1994).

<sup>32</sup> BC Hydro, *Power Smart: Five Year Review* (Vancouver: BC Hydro, 1994).

<sup>33</sup> BC Hydro, *Electric System Operations Review* (Vancouver: BC Hydro, 1994).

IPP supply) and by the detailed review process required by the BCUC. Nonetheless, Clark pushed through several smaller initiatives. These included:

- an increasingly independent role for POWEREX (Hydro's export subsidiary) in trading in the west coast electricity market;<sup>34</sup>
- a government/Hydro energy efficiency initiative called BC 21;
- development of recreational sites at the major hydro facilities;
- some small hydro developments or redevelopments, notably Stave Falls near Vancouver; and
- an expanded push for international project development by BC Hydro International.<sup>35</sup>

Perhaps the most important initiative in this direction only involved BC Hydro indirectly. Clark was instrumental in the creation of the Columbia Basin Trust, a new entity responsible for managing the regional share of downstream benefit revenue that British Columbia would begin to earn in the late 1990s as compensation from the Columbia River Treaty. The Columbia Basin Trust is comprised of regional politicians and provincial appointees.<sup>36</sup> Its mandate is to use the funds to support regional economic development, with a strong emphasis on further hydro investments. The trust and the provincial government together own the Columbia Power Corporation, which is the instrument for carrying out such investments. Because the Columbia Power Corporation is not a utility – being, in effect, a publicly owned IPP – it is exempt from BCUC regulation. In a convoluted arrangement, Clark had Hydro transfer its development rights at the Keenleyside Dam to the Columbia Power Corporation, which is now developing the project.<sup>37</sup> It will sell the power to Alcan, who will, in turn, sell it to BC Hydro to fulfil supply obligations agreed to prior to the cancellation of the Kemano Completion project. In effect, both Alcan and the Columbia Power Corporation are conduits by which what was to be a BC Hydro project gets developed as a separate, publicly owned facility for exclusive sale to BC Hydro customers. This

<sup>34</sup> POWEREX was able to generate a growing amount of revenue for Hydro and, ultimately, the government as it improved its ability to use Hydro's massive storage capability for trading in the west coast electricity market.

<sup>35</sup> This particular initiative backfired as a project in Pakistan turned into a major scandal for the government, especially for Clark.

<sup>36</sup> BC Government, *Columbia Basin Trust Act* (Victoria: Statutes of British Columbia, 1995).

<sup>37</sup> The Keenleyside Dam was built in the 1960s to provide additional storage for US dams downstream on the Columbia River. The project is to develop its electricity generation capability. In the 1995 BC Hydro IEP, Keenleyside is shown to be high-cost relative to many alternatives.

odd structure enables the project to go ahead without facing the open, and perhaps constraining, regulatory processes of the BCUC.<sup>38</sup>

When Clark became premier in 1996, his strong views about Hydro's economic development role led to important changes in the last years of the decade. With two key actions, Clark dramatically reduced the BCUC's regulatory authority over BC Hydro without openly acknowledging his intent. First, with an order in council, the government froze Hydro's rates and prohibited the BCUC from initiating a rate hearing.<sup>39</sup> Hydro's rates had been frozen by the government since early in the decade, but the order in council prevented any examination by the BCUC that might actually lead to a rate reduction. Second, the government issued a ministerial order that exempted BC Hydro and POWEREX from BCUC regulation regarding electricity supply contracts.<sup>40</sup> This cleared the way to use Columbia Power Corporation (and possibly other entities) to develop power projects on BC Hydro's behalf (starting with Keenleyside), thus avoiding regulatory oversight while being assured of having BC Hydro as a ready purchaser and having almost all British Columbians as captive customers.

The combined effect of the Clark government's initiatives has been to return Hydro, in league with Columbia Power Corporation, to the virtually unregulated status of pre-1980. Hydro today is, in effect, one of the few remaining unregulated monopolies, public or private, in a developed country.<sup>41</sup>

This larger picture of confused political direction for BC Hydro throughout the 1990s had repercussions in terms of the contrast between how Hydro behaved and what it actually accomplished. Hydro seemed as if it were ready, at any moment, to resume its preferred status as builder of electricity megaprojects. However, it was not able to unshackle itself until the last two years of the decade. When Clark had to step down as premier in 1999, the uncertainty quickly returned.

During the 1990s, Hydro yielded only slightly to the forces of reform. In order to assure access to the US market, the corporation established a wholesale transmission tariff, which required the internal

<sup>38</sup> In an ironic twist, the Trust and Columbia Power Corporation also became occasional lobbyists for market reform, viewing Hydro's control over domestic sales and the grid as a hindrance to their own desire to find customers for, and wheel power from, additional projects.

<sup>39</sup> BC Government, *Order in Council 0695* (Victoria: BC Government Regulations, 1998). In the face of a legal challenge, the government has since initiated legislation to strengthen its legal authority to bypass the BCUC. See BC Government, *Budget Measures Implementation Act* (Victoria: Statutes of British Columbia, 2000).

<sup>40</sup> BC Government, *Ministerial Order M-22-9801*, (Victoria: BC Government Regulations, 1998).

<sup>41</sup> In contrast to BC Hydro, West Kootenay Power has shown considerable interest in market reform.

separation of transmission functions from generation and distribution. By early 1997, it looked as though Hydro would have to go even further, as the US Federal Energy Regulatory Commission (FERC) rejected the export permit application of POWEREX and Hydro. This explains Clark's willingness to contemplate market restructuring and his government's creation of the task force on market reform.<sup>42</sup> However, with only a slightly different structure, and no major reform, Hydro Quebec was subsequently awarded an export permit by FERC. Following this precedent, and having made similar changes, Hydro and POWEREX succeeded in their second try for the permit. With this achieved, the Clark government abandoned the initiative for more substantial reforms.

Thus, Hydro's resource activities in the 1990s involved a combination of management activities with a modest amount of resource development, few of which were its own projects. Here are the major developments.

- Hydro continued with its Power Smart efficiency programs.
- Hydro initiated modest Resource Smart projects, enhancing the capabilities of its existing facilities.
- Hydro installed selective catalytic reduction on its Burrard Thermal Plant in the Lower Mainland, reducing emissions of local air pollutants from burning natural gas.
- Hydro's Stave Falls plant near Vancouver was rebuilt, with an additional forty megawatts of capacity.
- Hydro contracted for 14 megawatts from the Purcell woodwaste project.
- Hydro contracted for 240 megawatts of cogeneration from the Elk Falls project on Vancouver Island.
- Hydro contracted for electricity from several small IPP projects.
- Hydro's contract for supply from Alcan will be met by the Columbia Power Corporation as it develops the 170 megawatts Keenleyside project (target 2003).
- Hydro was negotiating for 240 megawatts of cogeneration from the Port Alberni project on Vancouver Island (target 2003). An alternative project on Vancouver Island is under negotiation.

In reviewing these activities, it is apparent that Hydro did not complete, or even start, any of the major projects that were on its wish list at the end of the 1980s. Thanks to the influence of Clark, the corporation

<sup>42</sup> W. Skene, *Delusions of Power*.

never lost its ambition to undertake major projects; however, it found itself in the position of managing the electricity system rather than building facilities. The one consolation is that Hydro resisted the pressures for reform. At the start of the next decade, Hydro can look back at the 1990s and characterize this as a decade in which it at least managed to survive intact.

#### THE NEXT DECADE:

#### BC HYDRO'S PLAN AND ITS CHALLENGES

Early in the year 2000, BC Hydro released its first IEP since 1995.<sup>43</sup> The IEP is like an integrated resource plan in that Hydro purports to examine all options to meet electricity needs over the next decade, including IPP resources and greater electricity efficiency. However, Hydro's plan, and the process of producing it, differs significantly from conventional integrated resource planning. First, Hydro produced the plan in-house, with virtually no public involvement. Since independent regulatory oversight is also absent, there is no elicitation of public views on the plan. Second, Hydro treats electricity efficiency as invariable, estimating a specific contribution and not allowing the intensity of effort to vary. Third, Hydro does not assess the current IPP potential and cost, relying instead on information from previous IPP proposals in the mid-1990s and its internal estimate. There is no independent bidding process to provide either a market verification of Hydro's assumptions about IPP potential or to determine the appropriate balance between utility and IPP contributions to supply.

As a result, Hydro's IEP looks remarkably like the development plan that a monopoly utility would have produced in North America prior to the 1980s. Different levels of electricity efficiency or load shifting are not explored, and the contribution from IPPs is assumed negligible once projects committed to in the previous decade are completed. Hydro's IEP is focused, instead, on the rationale and siting considerations for its own megaproject – a 640 megawatt CCGT plant. The plant would be located on Vancouver Island and would be supplied by a second natural gas pipeline partly owned by Hydro, thus deferring the need to replace the underwater electricity transmission lines to the island.

After 2002, Hydro's IEP includes the following resource additions, as shown in Table 1.<sup>44</sup>

<sup>43</sup> BC Hydro, *Integrated Electricity Plan*.

<sup>44</sup> As noted, the status of a natural gas-fired project at Port Alberni on Vancouver Island is uncertain.



- The Seven Mile hydro project (90 megawatts) should be completed by late 2002. It is owned by BC Hydro.
- The Keenleyside hydro project (170 megawatts) should be completed by 2003. This is developed by the Columbia Power Corporation, also a publicly owned entity, for guaranteed electricity sales to BC Hydro.
- The CCGT plant on Vancouver Island (640 megawatts) should be completed by 2007. It would be owned by BC Hydro.
- Hydro intends to acquire new green<sup>45</sup> supplies to meet roughly 10 per cent of load growth through the decade, for a total of 180 megawatts by 2010. It is unclear if Hydro or another Crown corporation would own any of these new green resources.

Assuming that all of the green resources are from non-government IPPs, the investment in electricity production for the BC domestic market in the next decade, according to Hydro's IEP, would be 900 megawatts (83 per cent) developed and owned by Crown corporations and a maximum of 180 megawatts (17 per cent) developed by competing, non-government producers. From a close look at BC Hydro's

TABLE 1  
*BC Hydro Integrated Electricity Plan:  
Existing and Planned Resources 2000 - 2010 (MW)*

	2000	2005	2010
<b>Existing Resources</b>			
Existing Hydro	9,649	9,649	9,649
Existing Thermal	996	996	996
Existing IPPs*	466	466	466
Alcan Purchase	147	147	147
<b>New Resources</b>			
Keenleyside		170	170
Seven Mile #4		90	90
Green Power		122	179
CCGT			640

\* Includes Elk Falls Cogeneration (2001) and Purcell Woodwaste (2001) and 212 of previously completed IPPs.

Source: BC Hydro, *Integrated Electricity Plan*, 2000.

<sup>45</sup> Although there is no clear definition in Hydro's IEP, "green" is apparently equivalent to renewable; Hydro mentions small hydro, woodwaste, solar, and wind but does not mention fossil fuel-based cogeneration. See BC Hydro, *Integrated Electricity Plan*, 31. This contrasts with the definition of environmentally desirable technologies in Section 5 of this paper, these latter including this type of cogeneration in certain circumstances.

IEP, it is difficult to believe that Hydro gave the alternatives to public power projects a fair chance. Deciding between alternative resources requires subjective trade-offs. When such decisions are taken behind the closed doors of monopolies, it is difficult to know what weight was given to different objectives.

There are smaller-scale alternatives to Hydro's large CCGT plant. In the IEP, Hydro acknowledges that 300 megawatts of wood waste and 300 megawatts of small hydro are almost cost-competitive with the CCGT. This assessment was made before natural gas prices climbed dramatically in 2000, thus improving even further the prospects for wood waste and small hydro. In any case, this is Hydro's estimate, not the result of asking IPPs to submit competitive bids. Experience with competitive bidding has shown that these kinds of resources are more plentiful and cost-competitive than are the untested estimates of monopoly utilities. Missing completely from Hydro's IEP is the potential for additional cogeneration, other than the two large pulp mill cogeneration projects proposed on Vancouver Island in the mid-1990s. Again, the experience elsewhere has been the opposite; industrial cogeneration has flourished and cogeneration in commercial and institutional buildings has begun to develop.<sup>46</sup> Hydro can also increase its efficiency and load shifting efforts, which, in the IEP, are presented as constants.

The main message of the Hydro IEP is that small resources are inadequate to meet the province's electricity growth. First, in its survey of supply options, Hydro ignores most types of cogeneration, mentioning only the potential for small amounts of wood waste cogeneration. Then, when referring to renewable, small-scale resources, Hydro says: "There are some small hydro and woodwaste projects close to being cost competitive with combined cycle and are considered to have no greenhouse gas emissions. However, the potential contribution from these resources is relatively small and insufficient to supply all of BC Hydro's new resource requirements."<sup>47</sup>

Instead, BC Hydro's plan is to complete the 640 megawatt CCGT in 2007, leaving it with excess capacity of 621, 455, and 317 megawatts in 2008, 2009, and 2010, respectively.<sup>48</sup> Hydro's basic message is that it has to build big because the total of small is not enough, which is what monopoly utilities said in the past in order to justify their mega-

<sup>46</sup> Hansen, "Technological Options."

<sup>47</sup> BC Hydro, *Integrated Electricity Plan*, 24.

<sup>48</sup> *Ibid.*, V.

projects – from coal to hydro to nuclear. But, as noted, regulators got smart in the 1980s and forced monopoly utilities to take supplies, big or small, from competing non-utility generators. As it turned out, small supplies flourished, usually proving to be plentiful, cheaper, better for the environment, more socially desirable, and less risky.

Risk is of particular concern. BC Hydro plans to complete a large, fossil fuel-based CCGT just when governments may be urgently pushing to meet their commitments to reduce greenhouse gas emissions, perhaps using measures that render emissions costly. Future natural gas prices may fall back to the low levels assumed by Hydro, but there is considerable uncertainty about this, and there is a chance that they will be substantially higher. Today, CCGT is usually developed on a small scale, except when it is associated with a large thermal requirement, enabling cogeneration that hedges risk by generating two distinct products: heat and electricity. Finally, the cost of Hydro's proposed CCGT must include the cost of building a natural gas pipeline to Vancouver Island. The first pipeline, built a decade ago, was substantially over budget, at great cost to BC taxpayers.

The Clark government was not known for a cautious approach to public-sector investment risk. Indeed, BC Hydro's vision is easier to comprehend if one assumes that its latest IEP represents the legacy of the pro-public monopoly position of Glen Clark. The IEP was developed in the years prior to 2000, when Clark was still premier. Subsequent governments are likely to have a different vision of the role of BC Hydro.

#### SPECULATION ON THE BC ELECTRICITY SECTOR IN THIS DECADE

The recent California problems with market reform are unique. Certainly, every reforming jurisdiction has faced special implementation challenges, but California's problems are of a magnitude and scope that dwarf all others. Major interventions by governments and regulators are involved in correcting the mistakes of the initial reform effort.<sup>49</sup>

For those who still believe in a centrally planned, publicly owned electric sector, the California drama vindicates their scepticism. For those who believe in unfettered markets, the responsibility for what

<sup>49</sup> F. Sioshansi, "California's Dysfunctional Electricity Market: Policy Lessons on Market Restructuring," *Energy Policy* 29 (2001): 735-42.

happened in California lies with timid reformers who failed to pass market prices through to consumers. What does all this mean for the future of electric sector reform?

The California fiasco has not eliminated the argument for electric sector reform. Indeed, developments in electricity and natural gas suggest that, in terms of supply and demand dynamics, energy markets will remain as uncertain in the future as they were in the past. Environmental harm from fossil fuels (e.g., air pollution, greenhouse gases) adds to the uncertainty over future regulations, technological change, and costs. The risks for electricity generation investment are, therefore, more pronounced than ever. Under these conditions, market-oriented societies usually want private investors to assume some of the risk. This is consistent with the reform of competitive electricity generation.

At the same time, electricity reformers in California have provided a valuable lesson for reformers throughout the world: electricity is not just another traded commodity like wheat, lumber, or copper. Average households have a more immediate relationship to electricity. They face a bill every month or two, and they expect extremely high reliability. California's experience has reinforced the argument, already understood by previously reforming jurisdictions, that government cannot design market reform and then abandon the scene. Public involvement and scrutiny must be ongoing, with mechanisms that ensure (1) sufficient long-term investment; (2) reliability; (3) no abuse of market power; and (4) protection of consumers from market volatility, even if this requires slightly higher rates than could be achieved in the marketplace.

Thus, movement towards competitive generation markets in British Columbia remains the most likely scenario for this decade. This reform will benefit from the lessons of California and elsewhere. It will also be tailored to the unique circumstances of electricity in British Columbia, in particular, to the dominant influence of large hydro facilities.<sup>50</sup> This will require an approach that recognizes a continued significant role for the public sector, both in ownership and in ensuring a balanced market and predictable rates for consumers.

In this final section, I predict the broad character of electricity market reform in BC. I begin by looking at overall industry structure

<sup>50</sup> For a discussion of differences between jurisdictions, see M. Jaccard, "Oscillating Currents: the Changing Rationale for Government Intervention in the Electricity Industry," *Energy Policy* 12, 7 (1995): 579-92. See also Ruff, "Competitive Electricity Markets"; and Joskow, "Electricity Sectors in Transition."

and then address its individual components: generation, transmission, and distribution. This discussion includes issues such as private versus public ownership and retail versus wholesale markets. Finally, I discuss specific social and environmental concerns. Figure 1, at the end of the section, summarizes my discussion.

### *Industry Structure*

Prevention of transmission market power ultimately requires vertical de-integration, which separates the grid-related common carrier functions (system operation, transmission planning, transmission tariffs) from generation and, perhaps, from distribution. Severing the link between transmission and distribution is less important since these will both continue to be regulated monopolies. However, if there are several distribution utilities, each covering a separate region, then all of these should probably be separated from the transmission system in order to ensure the fair treatment of each. In any case, it is the vertical separation of transmission and generation that is critical if generation is to become a truly competitive market.

What does vertical de-integration mean legally? In its purest form, the transmission company should have no ownership links to any of the generation companies. However, compromises are possible as long as the main objective is met; that is, that the transmission company never discriminates in favour of one particular generating company. Compromises that have been tested elsewhere include allowing the former utilities (BC Hydro and WKP) to retain ownership of their transmission systems but delegating operation to a separate company.

What does vertical de-integration mean physically? This is not as simple as it might seem. The distinction between transmission and distribution normally concerns the distinction between high voltage lines and the low voltage lines feeding final customers. However, allocation decisions need to be made for some medium voltage lines, which are generally part of the distribution system but may play critical transmission back-up roles. Between transmission and generation, the demarcation issue is even more complicated. If one imagines a dam planned in some remote area (the Liard River, for example), then the true costs of supply from such a facility are the costs of both the dam and a new, long-distance transmission line to connect to the grid. Thus, if an existing transmission line is essentially used for the one-way transmission of power from a generator, then that line could be considered to belong to the generation company and not to

the transmission company.<sup>51</sup> The government or the BCUC must deal with this issue as part of industry restructuring.

### *Generation*

The transition to a competitive generation market must take into account the costs of production in the previous monopoly system. In some jurisdictions, the costs (hence tariffs) may be higher than the new competitive costs of production. A decision must be made as to whether all or some of these *stranded costs* are paid by customers before they can purchase their electricity at the new market price. In contrast, in jurisdictions like Alberta and British Columbia, the costs of production are lower than are the competitive commodity prices. While one could argue that BC consumers should pay the market price, with the benefits flowing to BC taxpayers as owners of Hydro, it is unlikely that politicians will support increases in domestic electricity prices as part of market reform. Various mechanisms, such as *entitlement contracts*, enable domestic customers to benefit from the low-cost facilities, perhaps paying a blended price if their entitlement is insufficient to cover all of their consumption.

As Norway has shown, competitive generation markets do not require the privatization of existing generation facilities. Indeed, hydro-power is special in its broad social and environmental considerations. Even in the United States, no federal administration has dared privatize the hydropower facilities of Bonneville Power and Tennessee Valley Authority. Thus, it is unlikely that a BC government will attempt to privatize the province's major hydropower generation. In a reformed BC market, BC Hydro will probably be a publicly owned corporation that owns the same hydropower facilities, having divested its interests in transmission and distribution.

If left alone, this new generation company would have a great deal of market power and would be able to influence domestic electricity prices to its advantage. In order to address this, horizontal de-integration is one drastic option; at its extreme one could envision a separate corporation owning each dam. This is undesirable and probably unnecessary. First, the expanding trade on the west coast of

<sup>51</sup> This issue has significant financial implications. If the transmission line is considered to belong to the generating facility, then the generating company must cover the investment and operating costs from its electricity sales revenue. If the line is considered to belong to the transmission company, then all transmission users must help pay for it through their transmission tariffs.

North America means that market power within a single jurisdiction does not guarantee an ability to influence the price for the larger trading area. Second, a great deal of the power from the BC Hydro generating facilities could be tied up at entitlement contract prices. Third, there are ways to constrain yet further the trading practices of a BC Hydro generation company and to monitor its effect on prices. This would include the creation of an open trading exchange with a trading manager. These remedies should be exhausted before advancing to more drastic measures involving full or partial horizontal de-integration.

In the early phases of market reform, customer access to generators should be limited to the large customers. Distribution utilities can purchase on behalf of small customers, and customers should be informed clearly and repeatedly of that part of their purchases that is subject to market volatility. Furthermore, options should be available so that customers can fix into longer-term price security.

### *Transmission*

The transmission system must function as a non-discriminatory common carrier. Analysts usually distinguish two key components of managing the transmission grid: one is controlling the investment and maintenance of the physical infrastructure for high voltage electricity transportation; the other is system operation – namely, the control of generation and transmission to balance load throughout the system and to maintain reliability. These functions could be allocated to different organizations or they could be carried out by the same regulated monopoly. It may make little sense to fracture the BC electricity sector any more than is necessary for competitive generation, so a single BC transmission company should be adequate. As part of its system operation responsibility, this company could operate an independent power exchange with spot market, in which generators make hourly bids to meet load, including load balancing and other ancillary market services. Both of these monopoly functions should be regulated by the BCUC. Integrated resource planning of some form would be required to justify grid expansion investments.

Ownership of the transmission company is not a critical issue with regard to achieving a competitive generation market. All that matters is that the company ensure non-discriminatory access to the grid and that it fairly allocate the costs incurred by system use to those who cause them. Thus, the company could be publicly or privately

owned, but it would be regulated by the BCUC. It could even operate as a trust, in which the users play a role in overseeing the management of the system. In British Columbia, it is likely that the transmission company would, initially, be publicly owned, although, in the natural gas sector, Westcoast Energy Inc. provides a model of what it might be like to have a private transmission company instead.

A key issue in transmission service is rate design. Because the costs and benefits of providing power to the grid and taking power from the grid are not uniform, economic efficiency suggests that transmission rates should be distance-based, hence regionally differentiated. For example, if a new transmission investment to Vancouver Island is required, then the rates for high voltage electricity delivery should reflect the extra costs caused by those islanders who consume electricity. Also, new electricity supplies on Vancouver Island might earn a transmission credit to reflect the transmission cost savings to which they give rise. However, regional transmission rates are not easy to achieve, either administratively or politically. Alberta has addressed this challenge with a compromise solution: the payments to generators are based on location, but all consumers take power from the grid at postage-stamp rates.<sup>52</sup>

### *Distribution*

The distribution system must also function as a non-discriminatory common carrier. This is why distribution utilities should not own generation facilities. Having a monopoly of delivery in their service areas, distribution utilities would be regulated by the BCUC.

One issue for market reform in British Columbia is whether or not the BC Hydro distribution operation should be broken up into regional distribution utilities. There are benefits but also challenges to doing this. Regional utilities may seem to be more regionally responsive, but they may also lack economies of scale in terms of planning, rate design, operations, and maintenance. WKP is already a regional distribution utility, and there are several municipal utilities. If additional regional utilities are formed, then possible regions are Vancouver Island, the Lower Mainland, the North Coast, the North and Northeast, and the Okanagan.

<sup>52</sup> Natural gas transmission delivery tariffs in British Columbia already have a degree of regional differentiation, and the transmission component in their bill is different for West Kootenay Power customers than it is for BC Hydro customers. But it is difficult to believe that full regionalization is politically possible with electricity, given the history of BC Hydro's postage stamp coverage of most of British Columbia.



Another issue is whether the distribution utilities should be privately or publicly owned. Being regulated monopolies, there is no competitive reason for privatization. If there are regional utilities, then there could be a mix, with some private and some public.

### *Social Concerns*

Some have argued that electricity market reform will have negative social impacts. This might include price increases or price volatility, deterioration of reliability, reduced services to high-cost customers, consumer misinformation from competing retailers, and job loss and declining working conditions in the electricity industry. Some of these impacts have occurred to some degree. Market reform in England led to job loss in the coal industry, and California has had more than its share of high prices, high profits by generators, and reliability concerns.

Fortunately, there is now a decade-long record of electricity market reform that enables reformers to take precautions that minimize these social impacts. In British Columbia, job loss in the electricity sector is unlikely, given that hydro facilities are not labour-intensive (unlike coal-based electricity in England) and that transmission and distribution would remain regulated monopolies. The new smaller technologies being developed in competitive markets are associated with considerable economic activity, which must be weighed against any job losses due to the transition. Entitlement contracts can protect domestic consumers from price volatility and higher prices. Codes of conduct can ensure that misinformation from marketers is minimized; BC achieved this in the early 1990s when it opened the natural gas market. Long-run investment incentives and, thus, short-run reliability should be ensured with a capacity charge, as in England. Operation of a power exchange can be protected from private-bidder market power by the dominant role of the publicly owned hydro facilities. Reform has no effect on customers who are costly to serve because the transmission and distribution policies of monopolies would remain regulated by the BCUC.

### *Environmental Concerns*

If environmental damages are not internalized in technology choices, then the move to competitive markets may have negative environmental impacts. England was fortunate in that competitive markets favoured natural gas over coal for strictly financial reasons, yet natural

gas happens to be cleaner than coal. Most jurisdictions are unlikely to be as lucky.

*Environmentally desirable technologies* are technologies with substantial environmental advantages over the conventional options. These include renewables, like wind, biomass, small hydro, solar, and geothermal, but some argue that they should also include those fossil fuel-based technologies that are more efficient and thus less polluting. Cogeneration technologies are frequently seen this way. Because they are often higher-cost, environmentally desirable technologies will not increase their market share without special assistance. Many jurisdictions have accompanied their market reforms with policies to support renewables. The most popular policy is the *renewable portfolio standard*, which guarantees a percentage market share to renewables (and other desirable technologies in some jurisdictions).<sup>53</sup> The standard has been implemented to accompany market reform in Australia, Denmark, Italy, and seven states in the United States. It is now under consideration for broader application by both the US federal government and the European Union.<sup>54</sup>

With market reform, adjustments to electricity efficiency policies may also be required. Additional electricity efficiency is seen as desirable mostly for its environmental benefits. Thus, monopoly electric utilities have been required by government or regulators to subsidize additional efficiency efforts. In a reformed market, the subsidy cannot be provided by the former monopoly generating company as this would be an unfair cost disadvantage relative to competing generators. A charge to transmission and distribution users is emerging as the favoured means of collecting revenue for extra efficiency effort. The delivery organization for electricity efficiency programs might be government ministries; the distribution utilities (as with natural gas today in British Columbia); or a separate, non-profit quasi-government entity. For example, England and New Zealand have established separate corporations or trusts responsible for efficiency, with government and/or consumer funding.

<sup>53</sup> T. Berry and M. Jaccard, "The Renewable Portfolio Standard: Design Considerations and an Implementation Survey," *Energy Policy* 30 (2001): 263-77.

<sup>54</sup> More decentralized renewables, like roof-top photovoltaic electricity, require a net-metering policy from the distribution utility that allows the meter to run backwards at times. This policy can be implemented in both the reformed and the monopoly industry structure and so is not detailed here.

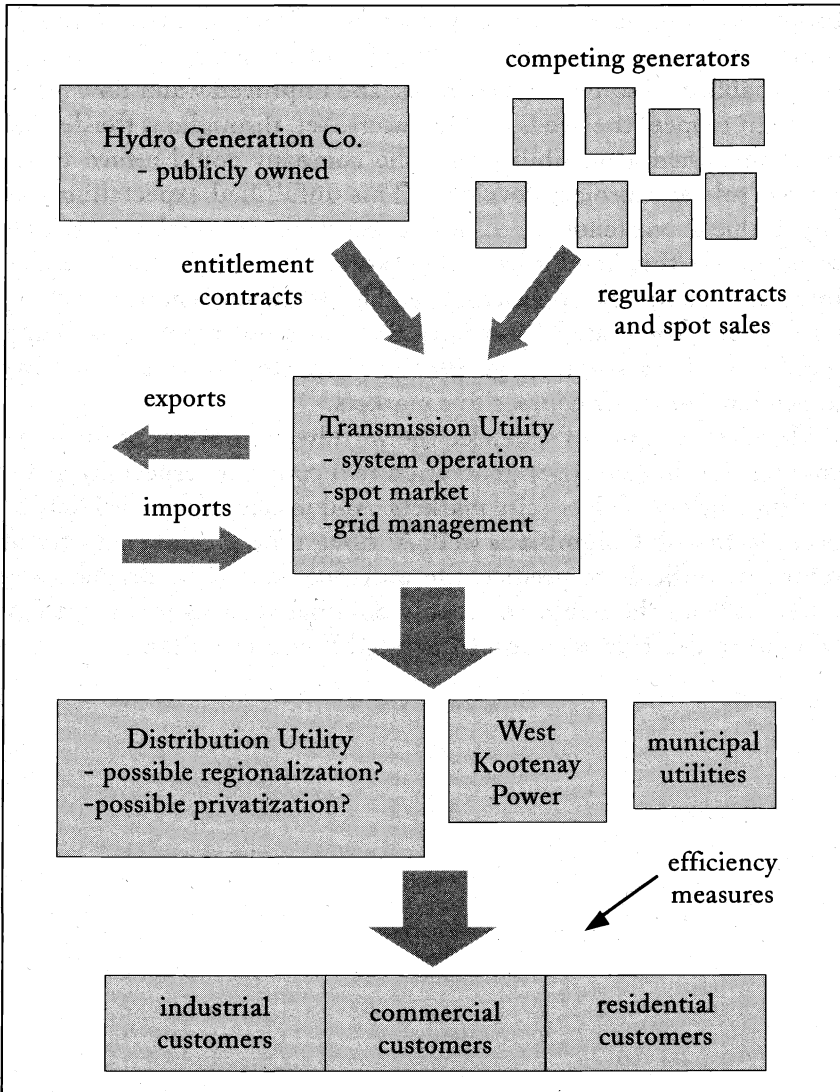


Figure 3: Possible BC electricity market structure.

## CONCLUSION

Consistent with a worldwide trend, BC Hydro ceased to be a power project development company in the 1990s, functioning instead like a management company as it negotiated with independent power suppliers, coordinated electricity efficiency efforts, pursued wholesale trades using the storage of its existing facilities, marginally increased the capability of some of its facilities, and improved water flow management to meet the needs of other users. Yet, throughout the decade there remained a possibility that the company could return to its former role as a project developer. This unfulfilled expectation was largely due to one tendency within the government, which was seeking to again use this key Crown corporation as an economic stimulus integral to its strategic political goals. This tendency is now in decline, but Hydro's Integrated Electricity Plan does not reflect this, being dominated by a single large project with almost no role for independent power or competitive markets.

However, in spite of setbacks, the worldwide movement for more competition in electricity generation will continue, especially given the uncertainty of electricity markets. And market reform is likely to occur in British Columbia as well. Although the precise character of reform is difficult to predict, the outcome should be dramatically different from the public monopoly dominated investment strategy laid out in BC Hydro's 2000 Integrated Electricity Plan.