Comments on the **CEC's Working Paper** (and related papers)

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Environmental Challenges and Opportunities of the Evolving North American Electricity Market

January 10, 2002.

1. Major comments

- CEC's Working Paper fails to address its very natural purpose : Did NAFTA affect environmental protection (negatively or positively) concerning the development of the continental electricity market (and how will it affect it in the future) ? And then, how can measures compatible with NAFTA support sustainable development ? Will a freer trade and a larger market tend to favor or impair DSM potential and IRP possibilities ? Will it encourage or discourage badly needed investments in the transmission grid ? In its present format, the Working Paper essentially states that strong demand growth will boost the growth of the electricity generation sector – implying that a freer trade will add to that growth – and that in turn, this could lead to stronger environmental disruptions. But it often fails to support its assertions with convincing references. Even more often, the Paper makes gratuitous or false assertions (see section 3 of this brief). As such, it should be sent back to the drawing board so that much better work can be done to explore key questions such as those mentioned above.
- More specifically. When we joined the *CEC Electricity and Environment Advisory Board*, we had understood that the primary goal of NAFTA was to set up a framework in which trade disputes could be solved and trade barriers alleviated. It would then have been natural for the CEC's Working Paper to focus its attention on areas where trade barriers and disputes where specifically hampering a sustainable development of the electricity sector. We were particularly disappointed to see that the Working Paper didn't stress the fact that *Renewable Portfolio Standards* are true protectionist measures that explicitly discriminate against large-scale hydroelectricity. Unfortunately, the Working Paper falls instead victim to the ill-founded belief *"small is beautiful"*, especially when it comes to hydroelectric and distributed generation (see sections 3 and 4 of this brief). The general tone of the Paper practically supports protectionist RPS under the guise of pseudo-ecological preferences. This could actually increase air pollution and reduce the development of renewables. In sharp contradiction with the ill-founded analysis of the Working paper, the Background Paper entitled *NAFTA Provisions and the Electricity Sector* is clear-sighted on this possible discrimination against large-scale

hydroelectricity, on other illegitimate non tariff barriers and on the potential trade disputes thus created. For now, CEC should stick to its Background Paper's analysis (see section 2 of this brief).

- In our view, NAFTA will not impair the sustainable development of the electricity sector if the governments that signed the Agreement succeed in channeling the forces of liberalization towards :
  - Better market conditions for all renewable energies (without discrimination among them).
  - Better Environmental Impact Assessments (EIA), systematically taking into consideration the cumulative effects of all types of generation units and the level of service they provide (in order to compare options fairly).
  - A framework for DSM upstream measures (i.e.: market transformations at the levels of manufacturing and marketing of efficient appliances, materials, electric motors, etc.).
- On the Environmental Impact Assessment (EIA) topic, let's remind of the basic necessity of comparing energy options on the basis of similar production and level of service. The Working paper often does the opposite, especially when it fails to see the cumulative effects of small-scale production units and (precisely because of this smallness) their capacity to avoid full EIA procedures. Another important area of concern pertaining to EIA procedures is the current inequity in the level of studies and analysis required for the different generation options; an inequity that, according to us, is slowing the development of renewable options at the benefit of fossil-fueled ones. The Working Paper instead tends to legitimize this inequity (see sections 3 and 5 of this brief).
- On DSM, we have to point out that the opportunities presented in section 6 of the Working Paper may already have been taken into account in demand projections of section 3 and that future efficiency gains will prove harder than what the Paper says. We also challenge the assertion found in section 6 when it indiscriminately opposes DSM to any kind of additional capacity. Québec's experience proves that false : added renewable generation capacity can lead to major gains in energy efficiency (see section 6 of this brief).
- We must remind again the fact that large-scale hydroelectricity is indisputably renewable – if words must keep any meaning. Accordingly, its frequent exclusion from the *Renewables Portfolio Standards* (RPS) is irrational and it severely limits the potential contribution of renewables in the continental market instead of increasing it. Moreover, it violates NAFTA's principles. The Working Paper should at least have explored possible compromise solutions on this very contentious issue (see sections 3 and 7 of this brief).

- Finally, as Canadians and Québecois, we object strongly and feel offended by the insinuations, contained in the last five paragraphs of the Working Paper (pages 60-61), insinuations to the effect that we could be deriving a "*comparative advantage in the production of toxic intensive industries*" from our "*lax environmental regulations*" and "*lower ... environmental standards for the operation of large-scale reservoirs*" (see section 8 of this brief).

2. The Background Paper *NAFTA Provisions and the Electricity Sector* is clear-sighted on a possible discrimination against large-scale hydroelectricity

The Background Paper is remarkably clear-sighted when it exposes how, where and why there is *de facto* discrimination against large-scale hydroelectricity in various regulations and standards among some North-American jurisdictions. The analysis is especially striking when it exposes some biased and tailor-made definitions of what is *renewable* in the *Renewables Portfolio Standards*.

Unfortunately, it appears to us that the Working Paper *Environmental Challenges and Opportunities of the Evolving North American Electricity Market* falls victim to the ill-founded beliefs in the *small is beautiful* philosophy :

> *"Nevertheless, as a rule of thumb, the World Bank and others note that environmental impacts are proportionate to the scale of the project: large-scale, reservoir hydro-projects have profound immediate and secondary environmental and biodiversity impacts* (p. 17) (...) *However, to reiterate conclusions of the World Commission on Dams, the World Bank and the International Energy Agency – size matters : the magnitude of environmental damages from future hydropower will largely be a function of the size of those projects.*" (p. 28)

Such an approach does not consider impact per unit of energy; it is a serious methodological flaw (see sections 3, 4 and 5). Non-tariff barriers and arbitrary regulatory discrimination against the most profitable, effective and abundant renewable option could jeopardize the very fundamental calling of the CEC regarding the sustainable development of the continental electricity market : a freer trade and circulation of electricity made from renewable sources.

NAFTA is an international agreement; its members are sovereign countries representing the general interest of their respective populations; they have all signed and ratified the UN Framework Convention on Climate Change. The imperatives of both a UN Convention and of NAFTA should supersede preferences of some interest groups and local protectionism. There is no international agreement on the disqualification of certain categories of renewable resources, be they small or large-scale, with or without reservoir. Large-scale hydropower is indisputably renewable, it emits very low levels of GHG, and there is no basis for complacency on the part of NAFTA regarding trade-barriers based on ill-founded preferences.

On this whole issue of *small-scale versus large-scale hydro*, the clear-sightedness of the Background Paper [1] must prevail on the biased and confusing approach of the Working Paper.

[1] The Background Paper nevertheless pays some lip service to the ecological prejudice against large-scale hydroelectricity. For example, on page 15 : "*Obviously, large-scale hydropower projects affect upstream watersheds and fisheries. Moreover,*

3. The Working Paper contains many false or ill-founded statements

Table 1: false or ill-founded statements found in CEC's Working Paper *Environmental Challenges and Opportunities of the Evolving North American Electricity Market* with our comments and corrections

Working Paper's false or ill-founded statements	Our comments or corrections
"*The construction of large-scale, reservoir hydropower plants has been definitively linked to the endangerment of freshwater fish and other species, the destruction of habitats, as well as emissions of mercury and methylmercury.*" (p. 4) "*The generation of electricity through large-scale hydropower is a leading cause of extinction or endangerment of freshwater fish species. Large-scale hydropower projects also have significant and – according to the World Commission on Dams – largely detrimental impacts of habitats and fragile ecosystems.*" (p.13) "*The WCD has concluded that the construction of dams is "one of the major causes of freshwater species extinctions. Dams block or inhibit spawning grounds, change predatory relations of species, and change nutrient levels. Assessments have concluded that juveniles are especially at risk from dams.*" (p.18)	Not a single fish *species* in Quebec has been endangered by hydro plants. Expanded freshwater ecosystems, increased productivity of the milieux [2, 3, 4], and sustained water quality [5] show that hydro-power developments can lead to gains in aquatic ecosystems. As environmental follow-up studies on hydropower have shown, the survival of species and biological diversity are assured by abundant populations of flora and fauna [6, 7, 8, 9, 10, 11]. As for mercury, hydroelectric reservoirs are not a source of emissions. On the contrary, the sources of man-made mercury emissions come from the combustion of fossil fuels (like coal) and from smelters. These atmospheric emissions are then deposited on the land, where the flooding of reservoirs mobilizes it. It gets concentrated in the food chain of the reservoir in its methylmercury form. In Québec-Labrador, the data collected in reservoirs of different ages located in the Canadian shield demonstrate that between 20 and 30 years after impounding,

hydropower has significant impacts on transboundary air pollution. Although clearly air pollution problems will differ from fossil-fuel burning electric power generation, air pollution can include both mercury and carbon dioxide". Let's just state that everything in this statement can be proven false or ill-founded. Except in some cases where migrating fish species may travel a long way upstream, projects won't affect upstream watersheds and fisheries. And the transboundary effects on air pollution by large-scale hydro will be essentially very positive (by avoiding emissions from coal-fired generation), especially for mercury and carbon dioxide. On these pollution matters : IEA (2000), *Hydropower and the Environment: Present Context and Guidelines for Future Action*, Volume II, Main report, IEA Technical Report, IEA Hydropower Agreement.

[2] Gouvernement du Québec (1992), *État de l'environnement*, Ministère de l'environnement. Éd. Guérin, Montréal, 560 p.

[3] Sarma, N.K. (1990), *Environmental impacts of water resources projects : The Indian experience*, P.239-248 in : United Nations (1990), *The impact of large water projects on the environment*, Proceedings of an International Symposium, October 21-31, 1986, Unesco, Paris, 570 p.

[4] Dixon, J.A., L.M. Talbot et G.J. M. LeMoigne (1989), *Dams and the environment, Considerations in World Bank projects*, World Bank, Washington, 64 p.

[5] Schetagne, R. (1992), *Suivi de la qualité de l'eau, du phytoplancton, du zooplancton et du benthos au complexe La Grande, Territoire de la Baie James*, p. 13-25 in : Hydro-Québec (1992), *Les enseignements de la phase I du complexe La Grande*, Actes du colloque tenu les 22 et 23 mai 1991, 219 p.

[6] Hydro-Québec (1996), *La Grande Hydroelectric Complex; Water Quality, Plankton and Benthos*, Information sheets produced by Hydraulique et Environnement, Groupe Production, Sheet # 6.

[7] Hydro-Québec (1996), *La Grande Hydroelectric Complex; Greenhouse Gas Emissions*, Information sheets produced by Hydraulique et Environnement, Groupe Production, Sheet # 4.

[8] Hydro-Québec (1996), *La Grande Hydroelectric Complex; Fish Communities*, Information sheets produced by Hydraulique et Environnement, Groupe Production, Sheet # 8.

[9] Hydro-Québec (1996), *La Grande Hydroelectric Complex; Waterfowl*, Information sheets produced by Hydraulique et Environnement, Groupe Production, Sheet # 9.

[10] Hydro-Québec (1996), *La Grande Hydroelectric Complex; The Drowning of 9,604 caribou*, Information sheets produced by Hydraulique et Environnement, Groupe Production, Sheet # 5.

[11] Hydro-Québec (1993), *Complexe hydroélectrique La Grande, Rapport d'avant-projet*, Groupe Équipement, CDRom.

[12] Hydro-Québec (1994), *La Grande Hydroelectric Complex; Mercury and Hydroelectric Development*, Information sheets produced by Hydraulique et Environnement, Groupe Production, Sheet # 7.

[13] Natural Resources Canada (2000), *Sensitivities to Climate Change in Canada*, Global Climate Change, http://sts.gsc.nrcan.gc.ca/adaptation/main.htm, p.13.

[14] Atlantic Salmon Journal, Autumn 2001, Vol. 50, No.3, http://www.asf.ca/Journal/2001/fa01/acid.html and http://www.asf.ca/acidrainns/index.html.

"(...) *a recent assessment conclude that dams are the main reason why 75 percent of all native Pacific Salmon stocks are now classified as being at moderate to high risk of extinction*". (p. 18)	mercury levels in lake whitefish and northern pike return to average levels encountered in natural environments [12]. In short, reservoirs are at the receiving end of mercury pollution and are not responsible for it. Nevertheless, hydroelectric projects in Québec have incorporated mitigative measures to reduce the health risks for native populations during that 20-30 year period.. Hydroelectric plants have on-site effects on natural habitats that are manageable with proper planning and mitigative measures. Fossil fueled alternatives are poisoning those habitats and fragile ecosystems and they are changing their most basic life-support system: their climate; furthermore, they make no difference between protected and non-protected areas. According to Natural Resources Canada, "(...) *the climate change associated with a doubled atmospheric concentration of CO_2 may virtually eliminate salmon habitat from the Pacific Ocean*" [13]. Hydro dams are part of the solution to global warming. Furthermore, on the East Coast, it is considered that the main threat against the Atlantic Salmon is acid rain [14]. Hydro dams, again, are an important part of the solution to acid rain in the North-Eastern parts of North-America where Hydro-Québec sells.
"*Nevertheless, as a rule of thumb, the World Bank and others note that environmental impacts are proportionate to the scale of the project: large-scale, reservoir hydro-projects have profound immediate and secondary environmental and biodiversity impacts.*" (p. 17)	See sections 4 and 5 of the present brief for a discussion and refutation of that bias against large-scale projects (for all options) pervading the whole analysis of the Working Paper.
"*An intense debate has continued around assessing the comparable impacts of different sized dams – namely large-scale versus small-scale dams. The IEA notes that the trend is "away from reservoirs which inundate relatively large areas of valuable land, major settlements, areas occupied by indigenous people and areas with unique habitats. Generally, there is a tendancy towards smaller sized reservoirs.*" (p.18)	The same report by the IEA also states that comparisons of electricity generation options must always take into account the reliability and flexibility of the energy services provided. For example, "Windpower (...) needs a backup system with immediate response, generally hydropower with reservoir" [15]. Everything else being equal, small run-of-river projects will not provide the year-round amount of electricity services that large-scale multi-annual reservoirs do provide (both <u>energy</u> and <u>power</u> when needed).
"*An example of low impact hydro projects is the Canadian Hydro Developers Inc.: their portfolio for hydropower ranges from 6.6 MW – in Ragged Chute, Ontario – to as little as 1.3 MW, in Moose Rapids, also in Ontario.*" (footnote, p. 28)	It would take more than 4 000 of these 1.3 MW plants to equal the capacity of the single Robert-Bourassa dam in Québec. To meet demand profile or to serve as back-up for wind power, there would also be a need for 4000 small reservoirs and/or diesel back-up plants.
"*In fact, the International Energy Agency has recently noted that any large-scale energy project is likely to be at odds with the goal of sustainable development.*" (p. 43)	This unconditional preference for the small scale is no more rational in the fossil-fueled options area than it is for the renewables. Again, rational thinking tells us that 4 000 1.3-MW microturbines won't be more sustainable than 5 one-thousand-MW gas-fired-turbines plants. Microturbines are in fact much less efficient than large combined-cycle-turbines plants (see table 3 in section 4.3).
"*Free trade in electricity opens new markets that otherwise would not have been served by a domestic utility. <u>Free trade not only brings with it new markets</u>, but larger markets, which in turn can have important <u>impacts on the size of generating facilities</u>.*" (p.59)	This assertion is gratuitous. A freer continental trade, accompanied by unbundling of formerly vertically integrated monopolies should in principle be as much favorable to the emergence of small power producers. The more so since larger markets means more competition, which leads to short term profitability : this should create a favorable environment for the implementation of smaller

[15] IEA (2000), Hydropower and the Environment, Present Context and Guidelines for Future Action, Volume II, Main Report, IEA Hydropower Agreement, p. 55.

	production units. In anyway, it is the cumulative effect that matters from an continental environmental perspective (a perspective that goes with NAFTA's status). It doesn't really matter if the production units are small and numerous or large and few.
"*Such large-scale projects also have significant impacts on local and indigenous communities. For example, the Grand Council of the Crees recently noted their concern over the environmental challenges posed by large-scale river diversion, and the problem of methylmercury resulting from reservoir construction, and the broad ecological and social consequences of the creation of large reservoirs on the Canadian Shield.*" (p.18)	For the Crees or any other native people, it is simply normal to be "concerned" by projects. Hydro-Quebec's obligatory condition for any new hydro project is that it has to be "*well received by local communities*" [16]. Accordingly, current hydro-projects on Quebec's North Shore or at James Bay are implemented in partnership with the local indigenous people. As for mitigative, health and compensation measures for mercury in reservoirs, there are specific provisions in a Convention signed with the Crees in 1986 [17]. Apart from economic development, The James Bay Convention and its subsequent additions have conferred some exclusive hunting and fishing rights to the native peoples and even substantial financial support for the practice of the traditional activities of hunting, fishing and trapping [18].
"*The construction of high tension transmission lines can result in habitat loss as land may have to be cleared to allow for the construction of transmission lines. It is not only the loss of habitat which can cause environmental impacts, but transmission lines can also fragment habitats.*" (p.8)	The exact opposite has been shown for northern transmission lines' right-of-ways in Québec where biodiversity for vascular plants and small mammals is higher than what is found in the natural surrounding habitats [19]. This relatively high biodiversity is attributable to what is called the "edge effect". On the second part of the statement, negative effects ensuing from the fragmentation of habitats may have been shown for highways and roads. Nothing of the sort has been shown for transmission lines, which constitute much quieter and nature-friendly milieux than roads. This statement of the Working Paper is not supported by any reference.
"*While somewhat controversial, there is also evidence that transmission lines can have harmful effects on people who live in close proximity to them from electromagnetic radiation they emit.*" (p. 8)	Again, this statement is not supported by any reference and it has the tone of ear-say. The World Health Organization goes beyond ear-say and bases its opinion on the whole body of knowledge available : "*Despite many studies, the evidence for any effect remains highly controversial. However, it is clear that if EMF does have an effect on cancer, then any increase in risk will be small. The available evidence contains many inconsistencies, but no large increases in risk have been found for any cancer in children or adults. It is possible that exposure to EMF in the home may slightly increase the risk of childhood leukaemia and exposure at work could slightly increase the risks of leukaemia and brain tumors in adults. Other explanations for these findings are possible. Large-scale studies are currently underway in several countries to help resolve these issues*" [20]. EMF measurements conducted in Québec show that outside high voltage line right-of-way, the public is never exposed beyond the limits recommended by the International

[16] Hydro-Québec (2001), Strategic Plan 2002-2006.

[17] Hydro-Québec (1994), *La Grande Hydroelectric Complex; Mercury and Hydroelectric Development*, Information sheets produced by Hydraulique et Environnement, Groupe Production, Sheet # 7.

[18] Hydro-Québec (1996), *La Grande Hydroelectric Complex; The james Bay and Northern Québec Agreement and Subsequent Agreements*, Information sheets produced by Hydraulique et Environnement, Groupe Production, Sheet # 3.

[19] FORAMEC (2000), *Caractérisation de la biodiversité dans les emprises de lignes de transport d'énergie électrique situées en forêt boréale*, Rapport d'ensemble 1998-2000, présenté à TransÉnergie, Direction Expertise et Support technique de Transport, Lignes et Câbles et Environnement.

[20] World health Organization (1999), *Electromagnetic Fields*, Public Health, No.32.

[21] Hydro-Québec (1995), Electric and Magnetic Fields and Human Health.This document was produced as part of Hydro-Québec's Action Plan on the biological effects of electric and magnetic fields.

	Commission on Non-Ionizing Radiation protection (ICNIRP) [21, 22, 23, 24]. Standards based on the precautionary principle are considered for home appliances and wiring and for some occupational situations. There remains no reasonable grounds for scaring people about ill-effects related to properly planned transmission lines. Furthermore, there is no exposure to EMF for the large lines going from Northern projects to cities (because of the very low population densities there); and in urban areas, population exposure from defective home wiring and appliances would be the same no matter the generation option.
"*Unfortunately, despite these efforts, LCA [Life-Cycle Assessment] has not been used to examine upstream, downstream, operational or secondary effects of large-scale dams themselves.(...) Given the difficulty in making these comparisons [with fossil fueled options], a recent report from the World Commission on Dams noted that, taken together, the impacts of dams on ecosystems are profound, complex, varied, multiple and mostly negative.*" (p. 19) "*The extent of that emission and environmental impact displacement is difficult to forecast. However, based on an analysis of current levels of exports from Canada to the US – that is approximately 9 percent of total generation – further broken down by provinces, fuel sources and emission factors, a back of the envelope estimate suggests that emissions in 1999 related to total Canadian exports were the equivalent of 3.6 million tonnes of CO2 emissions, 28.3 thousand tonnes of SO2 and 9.7 thousand tonnes of NOx*". (p. 60)	Hydro-Québec routinely does thorough LCAs [25] and cumulative impact studies to compare and assess its generation options. All aspects (social, economic, ecological, hydrological, etc.) at all levels (upstream, downstream, operational, secondary effects) of its projects have been done in a *state of the art* way in for the past 30 years [26]. To conclude against dams in the most pessimistic way "*given the difficulty in making these comparisons*" is not a reasonable argument and demonstrates nothing but prejudice. This statement is false. It is based on the untenable assumption that the electricity exported creates its own additional demand and replaces no U.S. domestic power production. To these gross, back of the envelope estimates, we can oppose net, precise and independently audited results. In 1998, Hydro-Québec's net exports to the US allowed the avoidance of 14,4 million tonnes of CO2, 60,4 thousand tonnes of SO2 and 23,5 thousand tonnes of NOx by U.S.-based power producers [27, 28].
"*In October, Hydro Quebec announced plans to build a natural gas plant south of Montreal, with a generation capacity of approximately 800 MW. A portion of this generating capacity will be destined to the US market.*" (p.50) "*It is worth noting once again that trade in electricity in North America began in the mid-1970s, when US buyers turned away from imported oil to cheaper Canadian hydropower. This opening of new export potential in turn prompted several large Canadian utilities – notably Hydro Quebec, the continent's largest exporter – to expand hydropower generation to meet increased foreign*	Construction of hydroelectric plants can anticipate demand, export residual volumes of electricity and then progressively repatriate those exports as domestic demand grows [29]. But Hydro-Québec has never built plants that were dedicated solely for export. In contradiction with the gratuitous assertions of the Working Paper, Hydro-Québec's net exports of electricity are expected to shrink to about nothing in the coming years due to the fact that all Québec's generation capacity will go to meet the power needs of Québec's own domestic market [30]. The natural gas plant in question is the best available technology in

[22] MSSS (2000), Consensus sur l'évaluation et la gestion des risques associés à l'exposition aux CÉM provenant des lignes électriques, 34 p., mai 2000.

[23] Mandeville, R. et al (2000), Bioelectromagnetics, 21 : 84-93, 2000.

[24] Mandeville, R. et al (2000), Bioelectromagnetics, 21 : 432-438, 2000.

[25] Hydro-Québec (2000), *Comparing Environmental Impacts of Power Generation Options : Land Requirements; Energy Payback; Biodiversity; Acid Precipitation; Greenhouse Gas Emisssions*. These information sheets are available on the Internet Site of H-Q.

[26] Hydro-Québec (2001), Justification environnementale des choix énergétiques pour le Québec, Septembre 2001. Hydro-Québec (1998), *La Grande Hydroelectric Complex; Environmental Studies in the James Bay Region Since 1971*, Information sheets produced by Hydraulique et Environnement, Groupe Production, Sheet # 15.Benson, N.G. (1992), *James Bay: An Unprecedented Environmental Assessment Program*, Forces, No. 97 (Spring 1992): 84-85. Carpentier, J.M. (1992), *The Environment at James Bay: A Comprehensive Ecological Approach*, Forces, No. 97 (Spring 1992): 73-75. Hydro-Québec (2001), *Synthèse des connaissances environnementales acquises en milieu nordique de 1970 à 2000.*

[27] Comparison between average emissions of Hydro-Québec and those of the producers in its export markets were audited and certified by: Deloitte & Touche, LLP, Chartered Accountants (2001), *Auditor's report on energy supply sources and air emissions from Hydro-Québec*, 1 Place Ville-Marie, Suite 3000, Montréal, H3B 4T9, Fax.: (514) 390-4109.

[28] Hydro-Québec (2001), *L'environnement: Plus qu'un engagement*, Rapport de performance environnementale 2000.

[29] Electricity from large-scale hydro plants reaches the market in too big chunks to be immediately absorbed entirely by a relatively small market such as Québec's. It's only rational management to export residual volumes while waiting for the local market to progressively absorb it.

[30] Hydro-Québec (2001), Strategic Plan 2002-2006.

demand." (p. 59)	the natural-gas-fired-combined-cycle plants option. It is being planned and can be assessed, authorized and commissioned readily as an insurance policy to absolutely avoid any possibility of a California-type energy crisis in Québec. If the recourse to gas turbines has become necessary, it is because the commissioning of new hydro projects has been hampered by strong political and administrative deadlock, by up to three to eight years of studies and authorizations gathering, all that added to the unavoidable 6 to 8 years of construction. On the other hand, most fossil-fueled generation projects do not need to be permitted under the Canadian Fisheries Act, often do not trigger the Canadian Environmental Assessment Act and can be rapidly built. They therefore can come on line in less than 4 years (studies and authorizations included).

4. The Working Paper falls victim to the unfounded belief in the *small is beautiful* philosophy

4.1. The *small is beautiful* philosophy, as applied to hydropower, is an inconsistent preference and it has no ecological foundation :

- First, some ecologists prove themselves very inconsistent in their support for the small-scale. Small-scale run-of-river hydro projects, which often qualify for *Renewables Portfolio Standards*, have traditionally been considered environment-friendly by ecologists, as opposed to the large-scale ones :

> "*We must add to these numbers* [the energy savings potential of 5 000 mgw] *the potential of small and medium scale hydroelectric plants, which is estimated at a production capacity of almost 15 000 mgw. This sector could be developed jointly with the private sector, thus enlarging the sphere of our competencies and creating jobs in an area where the world market is considerable.* "
>
> Greenpeace Québec (1993) [31]

But when Québec's government recently launched a program to allow the development, by the private sector, of the best small-scale run-of-river hydropower sites in the province, a strong opposition movement, led by major environmental groups, immediately manifested itself [32]. The small-scale hydro projects have suddenly become absolutely unacceptable for these same groups, especially since they are subsidized and they don't have reservoirs to meet demand. These opponents now even suggest that Hydro-Québec should instead build a couple of large-scale projects :

> "*If sold in Québec, the electricity of the small dams will be more expensive than that produced by Hydro-Québec. (...) But the state-owned utility* [Hydro-Québec which will buy and sell that small-scale production] *asserts that it will make it profitable by selling it on external markets, profitable only during summer because the Americans use a lot of air conditioning. So, without reservoirs, those small run-of-river plants won't be able to store the energy to sell it when it is profitable. (...)* ***If Hydro-Québec really needs those additional megawatts, let it build itself one or two large-scale projects instead of the small-scale ones.*** *(...) All Quebecers should have their say in the management of our natural ressources. But the PQ politics offers the choice to the local communities. This is*

[31] Greenpeace (1993), *Moins de béton, plus d'imagination*, Mémoire de Greenpeace Québec Présenté par François Tanguay, responsable du dossier Énergie, Commission parlementaire pour l'évaluation de Plan de développement 1993 d'Hydro-Québec.

[32] The 25 opposing groups included Greenpeace-Québec, Eau Secours, Aventure Éco-tourisme and the Québec Union for the Conservation of Nature. Sources : June 2001, *Formation d'un vaste regroupement québécois d'organismes opposés au nouveau*

parceling of interests. Quebecers should decide collectively if we need these plants and, if so, where we should build them."

Jean-François Blain, spoke-person for the *Eau Secours* coalition [33]

Small-scale has traditionally been the preferred option of these interest groups until the authorities became serious and practical about it. All this proves very inconsistent.

- Second, the *small is beautiful* preference has no theoretical foundation. A very simple geometrical model suffice to show that there is no inherent ecological virtue in the small scale. On the contrary, there are environmental economies of scale to get from large-scale hydro. Figure 1 illustrates this principle [34].

This model is of course very theoretical. But so is also the belief in the superiority of small-scale sites and plants. Furthermore, this geometric theoretical rule is supported by statistical analysis. Table 2 below shows that the average reservoir area per MW of existing hydro capacity may increase up to 8 times for small projects :

Table 2 : Average Size of Hydro Reservoir per Unit of Capacity [35]

Size of plants (MW)	Number of plants in category	Average size of reservoir per unit of power (hectare / MW)
3 000 to 18 200	19	32
2 000 to 2 999	16	40
1 000 to 1 999	36	36
500 to 999	25	80
250 to 499	37	69
100 to 249	33	96
2 to 99	33	249

The main virtue of small-scale hydro is political and institutional : it is easier to license and easier to accept for local communities; and it can be built more rapidly. The truth is that there are good sites for small-scale hydroelectric plants and good sites for large-scale ones. There are also bad sites and bad projects for either. The practice of sound environmental impact assessment (EIA) should guide our

programme de centrales hydroélectriques privées: http://www.canot-kayak.qc.ca/. Le Devoir, 14 décembre 2001, *Des rivières mises en adoption*, page A-2.

[33] Métro, 10 octobre 2001, *Pour quelques poignées de mégawatts*, pages 10-11.

[34] The model and figure 1 come from : Drapeau, J.-P. and Y. Guérard (1993), *Rehabilitating Hydroelectricity and Refuting the Lies*, Brief presented to the parliamentary committee responsible for studying Hydro-Québec's proposed 1993 Development Plan, GRAME.

[35] Source of data : Goodland, Robert (1995), *How to Distinguish Better Hydros from Worse : the Environmental Sustainability Challenge for the Hydro Industry*, The World Bank.

decisions on a case by case basis [36]: it is their fundamental purpose. The *small versus large-scale* debate is simply not relevant to the goal of sustainable development.

4.2. The *small is beautiful* philosophy, as applied to hydropower, has also become a pretext used as a non-tariff barrier raised against large-scale hydropower projects

This aspect was discussed in section 2 above. The Background Paper *NAFTA Provisions and the Electricity Sector* makes it very clear and its interpretation should prevail and be maintained.

If the exclusion of large-scale hydro is simply the result of an ill-founded belief in an inherent superiority of the small scale, a belief that is then used as a pretext for protectionism, we refer the reader to the demonstration of section 4.1.

If, rather, the exclusion of existing large-scale hydro from Renewables Portfolio Standards ensues from a fear of seeing the RPS quotas flooded by existing hydro capacity, then a rational and efficient compromise solution may be designed. We then refer the reader to the suggestion contained in section 7 of the present brief.

4.3. The belief in the *small is beautiful* philosophy is no more valid in the distributed generation area than it is for hydropower.

Unfortunately, the Working Paper seems to fall victim to the illusion in that area as well : "*Other factors that could influence the environmental outcomes in future years include technological advances in clean energy, including hydrogen based fuel cells and the extent to which distributed generation develops on the continent*" [37].

- First, numbers show that distributed generation with micro-turbines or fuel cells is no more efficient – or is much less efficient, especially with the micro-turbines –, regarding GHG emissions, than combined cycle [natural] gas turbine plants. Table 3 shows these numbers [38].
- Second , the efficiency of distributed generation in lowering greenhouse gas (GHG) emissions, as compared to GHG emissions of a coal-fired power plant, lies essentially on its use of natural gas. If powered with petroleum instead of natural gas – which is a very likely scenario, particularly in an off-

[36] On a case by case basis but, of course, without forgetting the study of the possible cumulative effects.
[37] CEC (2001), Working Paper, Footnote # 59.
[38] Greene, N. and R. Hammerschlag (2000), *Small and Clean is Beautiful : Exploring the Emissions from Distributed Generation and Pollution Prevention Policies*, The Electricity Journal, June 2000.

grid context [39] –, the fuel cell loses its advantage even if compared with conventional coal fired power plants : that is because the proportion of hydrogen to carbon atoms, which is about 4 / 1 in natural gas which is essentially composed of methane (CH_4), falls to about only 2 / 1 with fuels such as gasoline, diesel or heating oil [40, 41].

- Greenpeace and other proponents of fuel cells and hydrogen [as seen as a green energy] deny these fundamental contradictions by implying that the hydrogen will be cleanly produced with wind and solar farms. So-called *green* fuel cells are nothing but batteries for solar and wind power and should be advertised as such. Fuel cells are only a conversion process and should not be recognized as a source of *green* energy. It must be noted here that hydroelectric reservoirs can store solar and wind energy for a much lower price – and with greater efficiency – than hydrogen production can do (and for large areas in the context of an open continental market).

In short, instead of being a way out of the *key question* mentioned on page 29 of the Working paper , distributed resources are themselves facing that very same key question: "*The key question from an environmental perspective is : will planned expansion (or switch in Mexico) to natural gas take place, or will increases over time in natural gas prices pull investments away from gas, and towards other fuel sources*". Distributed generation can be an interesting environment-friendly alternative to coal fired power plants if, and only if, they can rely on cheap and abundant natural gas supplies. It then remains a simple question of the superior quality of natural gas as compared with that of coal regarding intrinsic GHG emissions potential. It goes for distributed generation units as it goes for gas-fired-turbines plants : natural gas pollutes less than coal . If however, as was shown above, distributed generation units were running on oil, their greenhouse gas emissions would then present little or no gain as compared to those of coal-fired power plants. Smallness and decentralization of the electricity generation units are a simple esthetic preference that presents no obvious environmental benefit. It could in theory reduce the need for new transmission and distribution lines if it offered the level of reliability that centralized generation do provide; but it would also require added capacity for the transport and distribution of natural gas. As shown above, the preference for distributed generation could become counter-productive if gas prices

[39] Barlow, Russ (1999), *Residential Fuell Cells : Hope or Hype ?*, Home Power No. 72, August/September 1999, pp. 20-29.

[40] Source: Institute of Information & Computing Sciences (2001), Subject : Gasoline FAQ, http://www.cs.ruu.nl/wais/html/na-dir/autos/gasoline-faq/part1.html . Final EA 6A- 1 Volume 2 Appendix 6A Composition of Crude Oil and Refined Products Crude oils can vary greatly in composition, viscosity, density, and flammability: http://www.epa.gov/Region06/6en/xp/lppapp6a.pdf .

[41] If powered with coal, fuel cells would emit at least twice the amount of CO2 compared to as if with natural gas. Source: Fulkerson, W., R. Judkins and M. Sangvi (1990), *L'énergie des combustibles fossiles*, Pour la science, No 157, nov. 1990, pages 98 à 106.

went up and induced a shift towards oil supplies. On the whole, there is no environmental reason for smallness and decentralization to be promoted or favored by the NAFTA environmental body (the CEC).

5. EIA must become serious with the cumulative effects and with the level of service provided for all generation options

Concerning Environmental Impact Assessment (EIA) harmonization, we insist on the fact that these studies are a product of science and that their conclusions, corrective prescriptions and forecasts can be monitored and verified. These assessments are sophisticated and based on expertise. They contradict ideologically biased and simplistic assumptions such as the ones found in sections 4 and 6 (pages 28 and 43): "... *size matters : the magnitude of environmental damages from future hydropower will largely be a function of the size of those projects.* (...) *any large-scale energy project is likely to be at odds with the goal of sustainable development*." These simplistic statements ignore the first lesson of the most basic *cumulative effects* study in an EIA : that you can't compare the impact of a large-scale 400 MW electricity plant (be it coal-fired, gas-fired or hydraulic) with the impact of a small-scale 2 MW unit (be it a gas-fired micro-turbine or a hydroelectric plant). Logic compels one to compare options or projects on the basis of a similar energy production and level of service. Because it neglects this basic knowledge, the Paper is misleading concerning the small versus large-scale debate as well as the Cumulative effects issue in section 7. This is the more troubling since the small-scale projects often avoid a formal EIA and its cumulative effects study. The sub-section *Long-range and cross boundary impacts and their assessment* in section 7 does raise the issue of projects that avoid formal EIA and their related public consultations but it fails to link this issue to the small-scale projects : the installation of a micro-turbine will never be examined in the context of a formal EIA. The Working Paper should have stressed the necessity of generic EIA, including thorough examination of cumulative effects, for small-scale and decentralized units.

Also, the Working Paper appears very weak in another aspect of option comparisons, always opposing dams with reservoirs to dams with small or no reservoirs. This is a major inconsistency since a report by the IEA, often cited in the Working Paper, states clearly that comparisons of electricity generation options must always take into account the reliability and flexibility of the energy services provided. For example, *"Windpower (...) Needs a backup system with immediate response, generally hydropower with reservoir*" [42]. Everything else being equal, smaller reservoirs will provide smaller electric services. Smaller reservoirs means that more thermal plants are required to meet peak demand and fluctuations in demand.

[42] IEA (2000), Hydropower and the Environment, Present Context and Guidelines for Future Action, Volume II, Main Report, IEA Hydropower Agreement, p. 55.

Another area of concern is the current inequity in EIA and authorizations gathering among the generation options. In Québec, the recent recourse to gas turbines has become necessary because new hydro projects have been hampered by strong political and administrative deadlock, by up to three to eight years of studies and authorizations gathering, all this added to the unavoidable 5 to 8 years of the construction period. On the other hand, most of the time, fossil-fueled generation projects do not need to be permitted under the Canadian Fisheries Act and often do not even trigger the Canadian Environmental Assessment Act. The same kind of inequity is found in the US. If the EIA procedures in Canada and the U.S. were as severe for fossil-fuel-fired options than they are for hydroelectricity – if, for example, they had to assess the environmental impact of the cumulative effects of their greenhouse gas emissions – their studies and authorization processes would last for decades. This inequity in EIA requirements could be considered, at the continental scale, as a non tariff barrier penalizing a category of producers and consumers and hampering the development of renewables. CEC's Working Paper should have addressed that very real EIA issue and should have proposed ways of solutions.

6. Demand-Side Management : further gains in efficiency may be more difficult than expected. Hydroelectricity may help in that respect

In the second paragraph of section 6, the Working Paper states that "*the environmental projections* [for the demand in electricity during the next ten years] *noted in Section Three above reflect a supply-intensive vision of energy needs*". This statement may not be exact. For example, Hydro-Québec forecasts that, from 2002 to 2011, *carryover effects* – natural savings ensuing from clients' initiatives, from new standards for appliances and materials, from technological innovations but also from retrofit and replacement of old buildings by newer, more efficient ones – will progressively and spontaneously make it possible to save 2,6 TWh a year in avoided electricity demand. The *carryover effects* do not need any particular effort on the part of Hydro-Québec but the projections for demand take full and explicit account of these natural savings. Hydro-Québec nonetheless forecasts an 11 % growth in total demand for electricity over the period (2002-2011) [43]. We suspect that similar forecasting methods apply to the projections noted in section 3 of the Working Paper. The *Demand Side Energy Efficiency Opportunities* exposed in section 6 are part of these natural savings – like already existing eco-labeling or more stringent standards for lighting and appliances – and may already have been taken into account, at least in part, in demand projections of section 3. If we are right on this, additional gains in energy efficiency may be much more difficult to achieve than what is implied in section 6 of the Working Paper. This is due to the law of diminishing returns : further gains are harder and more expensive to achieve than former ones because, unless there is an improbable technological breakthrough, you already have taped the potential of the cheapest and easiest technologies.

The *carryover effects* of natural savings, as compared to DSM programs implemented by electricity distributors, will have a substantial impact on future electricity demand. For example, from 1990 to the year 2000, Hydro-Québec invested half a billion Canadian dollars (300 million US $) in a full-fledged DSM program that made it possible to save 2.5 TWh of energy per year [44]. But, as stated in the paragraph above, Hydro-Québec also forecasts that, from 2002 to 2011, the *carryover effects* will save another 2,6 TWh a year in avoided electricity demand and that will happen at no cost for the utility or its clients. So the two approaches will have the same impact but at very different costs. These results should be taken into account when one looks for the most effective approaches to the goal of demand side management. It can

[43] Hydro-Québec (2001), *Strategic Plan 2002-2006*. Hydro-Québec Distribution (2001), *Demande d'approbation du plan d'approvisionnement 2002-2011 du distributeur*, Présenté à la Régie de l'énergie du Québec, R-3470-2001, HQD-2, Document 1, pages 16-18.

[44] Hydro-Québec (2001), *Strategic Plan 2002-2006*.

be suspected that the carryover effects show results that are much more robust than those of DSM programs initiated by public utilities. Moreover, more stringent efficiency standards have other comparative advantages :

- They avoid the time-consuming negotiations and discussions on *state of the art* DSM procedures. They avoid the need for complex mechanisms such as Shared Savings Mechanisms (SSM) and Lost Revenue Adjustment Mechanisms (LRAM) which aim at encouraging the distributors to implement DSM programs.
- They avoid the problem of sub-optimal subsidies to the participating customers and the problem of free-riders.
- They are insensitive to the problems of deregulation and restructuring of the electric industry which have plagued DSM initiatives and Integrated Resource Planning logic during the last decade.
- They can be acted upon on a large scale (national, international) by the imposition of standards on manufacturing, emissions or processes.

They are also more likely than classic DSM programs to be successfully transferred towards Mexico which do need energy efficiency but not necessarily all the problems encountered by utility-led DSM initiatives in a regulated / deregulated context. However, the accounting and real performance of the *carryover effects* is difficult to judge correctly : one can blow up its apparent impact simply by over-estimating the demand growth in the base case scenario. Strongly increased efforts in R&D and the promulgation of ever-higher performance standards, upstream and at a supranational level, may prove more resilient than scattered DSM initiatives at the public utilities level, notably for Mexico. To produce real incremental results however, such upstream strategy would need some monitoring and measuring standards as well as some institution to do it. It would also need stowing with the possible recourse to some economic instrument (subsidy for R&D, technology transfer, explicit price signal). NAFTA could play here a positive environmental function. The Working Paper should be more explicit on this.

On the pessimistic side again, if the opening of the continental market has a tendency to lower the prices of electricity, they will have an equal tendency to lower the potential savings of DSM. Because conservation potential is higher when prices are high. We would have hoped that the Working Paper document seriously this aspect and propose ways out of the current difficulties.

The first paragraph of section 6 of the Working Paper may contain some wishful thinking and counter-productive prejudice :

"One of the clear lessons of energy efficiency after more than a quarter century of performance is a simple one : it is cheaper to save energy through efficiency gains than it is to build and operate new plants."

First, this statement is simplistic : if adding new capacity is relatively cheap and implementing energy conservation measures is relatively expensive, the statement is false. Which is often the case. Of course, if environmental costs were fully internalized in electricity tariffs, the statement would become more truthful. This is less often the case. And the Working Paper does not indicate where, how and to what extent NAFTA could contribute to the internalization of environmental costs.

Second, the statement ignores the intrinsic energy efficiency gains that come from adding electric capacity from renewable sources. Québec's historical case can illustrate our point. From 1979 to 1999, while the total number of households was increasing by 47 %, total energy consumption of the housing sector decreased by 12,5 % [45]. The major part of this impressive result was achieved essentially by switching from oil – which had an end-use efficiency of about 60-65 % in home-heating [46] – to hydroelectricity – which has an end-use efficiency of 100 %. And this switch was possible because Hydro-Québec more than doubled its installed hydroelectric production capacity. In short, hydroelectric development does constitute, in itself, a powerful end-use efficiency measure. The more *economically feasible* hydroelectricity will be important in NAFTA countries' energy mix, the more their energy end-use and energy supply side efficiencies will improve. Section 6 of the Working Paper completely ignores this very fundamental fact and chooses instead to indiscriminately oppose DSM to any kind of additional capacity.

Section 5, page 36 of the Working Paper, notes the possibility of a rebound effect ensuing from subsidies to renewables and conservation: "*a price depressing effect on markets, which in turn lead to an increase in total CO_2 emissions*". This could also contribute to a more pessimistic prognosis of the potential of DSM. There may be a way out of this catch. The way out is based on two major facts : First, as is demonstrated in the above paragraph, *additional hydroelectric capacity dedicated to the replacement of fossil fuels* improves the overall efficiency of the energy systems (from generation to end-uses). Second, it does not benefit from any subsidy at all; hydro projects are even often used as a way to help regional development and to assist economic sectors such as agriculture and water supply management : this is the exact opposite of being subsidized. Accordingly, it would then not be subject to the rebound effect. No subsidies are needed; the removal of non-tariff barriers such as discriminatory RPS

[45] Ministère des Ressources naturelles (2001), L'Énergie au Québec, pages 14-16.

and the alleviation of political and administrative deadlocks would suffice. In this way, a combination of added renewables capacity and electrification of some end-uses could help DSM to live-up to its expectations. This way out of a classic catch could be explored at the continental level. The Working Paper chooses instead to ponder on the relative merits of large and small scales of electricity generating units.

7. Large-scale Hydro is indisputably renewable and should be part of RPS; solutions satisfying for all are possible

Section 6 of the Working Paper completely neglects the superior efficiency of hydroelectricity from generation to end uses.

What is even more worrying is that the sub-section on renewable energy, while it fairly stresses the question of the definition of what is *renewable*, it fails to follow the issue to its limit : that the so-called Renewables Portfolio Standards, if they do exclude large hydro, will in fact severely limit the potential of renewables instead of increasing it. NAFTA is not an interest group and should not even accept to discuss the renewability of large-scale hydroelectricity: it is indisputably renewable (if words must keep their meaning) [47]. Its frequent exclusion from the so-called *Renewables Portfolio Standards* is rationally indefensible. It severely limits the potential contribution of renewables in the continental market instead of increasing it. Finally, it violates NAFTA's principles. As it is clearly shown in the Background Paper, this current approach to choose and pick renewables according to local interests has produced a set of State portfolios that are all different. An approach where all renewables are included fairly would reduce such disparities.

There may be possible compromise solutions on this very contentious issue. For example, if the RPS is to encourage the development of more renewable energy, such an RPS could include only those hydro projects that were built after 1999. With this approach, existing hydro would not be competing with new windpower. The competition would be between new windpower and new hydro (which is much more expensive than existing hydro). This would widen the opportunities for renewable development, increasing the efficiency of the RPS [48]. Hydro-Québec had already made that same suggestion in an earlier paper

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[46] Essentially, heat losses occur through the chimney.

[47] Gagnon, L. and C. Bélanger (1998), *Windpower : More Renewable than Hydropower ?* Hydro Review, August 1998.

[48] Adopting a separate RPS for existing renewable facilities would also be justified to ensure that existing renewables continue to avoid air pollution in a given region, at a reasonable cost. In this case, hydro can provide large reductions in air emissions, because of its large capacity and low costs.

presented to the Commission for Environmental Cooperation[49]. We were disappointed that this proposition was not even mentioned nor discussed in any of the working or background papers prepared for the present consultation.

However, the recognition of hydropower facilities of any size as sources of renewable energy should not be perceived as preventing the development of any type of renewable technology. For instance, a local government may choose to help windpower technology with R&D subsidies or other programs collected through a public charge whereas mature hydro technologies would not necessarily need such a support. There is often a confusion between the purposes of subsidies, public charges or Trust Funds on one hand, and the purpose of an RPS on the other hand. This confusion may explain the exclusive and protective approaches adopted up to now. The RPS purpose is to encourage the development of renewable facilities whereas the trust fund should focus on supporting technological development of emerging technologies. If these respective purposes would be made clear, including the lowest cost renewables in RPS would not be considered an unfair competition relative to more expensive ones such as windpower. On the contrary, the RPS could then serve to enlarge the total share of renewables in the market, facilitating the emergence of new technologies while helping the more mature renewable technologies in their competition with fossil-fueled options. The R&D of a specified renewable energy option could then be financed by a Trust Fund.

8. Québec and Canada are not pollution havens

As Canadians and Québécois, we object strongly and feel offended by the insinuations, contained in the last five paragraphs of the Working Paper (pages 60-61), insinuations to the effect that we could be deriving a "*comparative advantage in the production of toxic intensive industries*" from our "*lax environmental regulations*" and "*lower ... environmental standards for the operation of large-scale reservoirs*" (see section 8 of this brief). Basically, it implies that Canada is a pollution haven :

> "*However, there is evidence that some companies may use environmental regulatory differences strategically, to lower operating costs. Although the pollution haven argument in general has not found robust empirical backing, there are instances (...) similarly (...) Alberta or Québec (...)*"

[49] Hydro-Québec, External Regulatory Affairs, (2000), *Environment and Electricity Restructuring in North America*, Paper presented to the North American Commission for Environmental Cooperation, June 2000, pp. 22-23.

The Canadian and Québécois environmental regulations are as serious and thorough as those found in neighboring jurisdictions – as is the overall performance in the field and in toxic pollutants emissions numbers.

For hydroelectric projects at James bay and in Northern Québec (a territory representing two-thirds of Québec's province area), the promoter has to cope with 3 to 5 evaluating committees all of them including an important representation of native populations (for both the planning of the environmental assessments and then to examine their final results), 2 levels of governments and their many agencies and own laws. These EIA have cost millions of dollars, as have mitigative, monitoring and compensation measures.

For example, the EIA for the Great-Whale hydroelectric project has cost 80 million dollars and lasted 15 years. The total cost of EIA and engineering studies – these engineering studies do search for the optimal environmental and economic design – for the Great-Whale project amounted to an impressive total of 500 million dollars. No other project in North-America has ever put such efforts, time and expenses to minimize its environmental impact.

All aspects (social, economic, ecological, hydrological, etc.) at all levels (upstream, downstream, operational, secondary effects) of these projects have been studied in a *state of the art* way for the past 30 years [50] (see section 3 of this brief). With the monitoring and mitigative measures for mercury, our environmental practices are even internalizing here costs that are avoided by neighboring jurisdictions.

Each project has to pass the stringent requirement of "*no net loss of fish habitat productive capacity*" of the Canadian Fisheries Act.

The unfounded and frivolous assertions of the CEC Working Paper must be removed.

[50] Hydro-Québec (2001), Justification environnementale des choix énergétiques pour le Québec, Septembre 2001. Hydro-Québec (1998), *La Grande Hydroelectric Complex; Environmental Studies in the James Bay Region Since 1971*, Information sheets produced by Hydraulique et Environnement, Groupe Production, Sheet # 15.Benson, N.G. (1992), *James Bay: An Unprecedented Environmental Assessment Program*, Forces, No. 97 (Spring 1992): 84-85. Carpentier, J.M. (1992), *The Environment at James Bay: A Comprehensive Ecological Approach*, Forces, No. 97 (Spring 1992): 73-75. Hydro-Québec (2001), *Synthèse des connaissances environnementales acquises en milieu nordique de 1970 à 2000*.