Environmental Challenges and Opportunities of the Evolving North American Electricity Market

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Background Paper

A Review: "Environmental Challenges and Opportunities of the North American Electricity Market"

A Symposium Organized by the Commission for Environmental Cooperation of North America

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A Review: "Environmental Challenges and Opportunities of the North American Electricity Market"

A Symposium Organized by the Commission for Environmental Cooperation of North America

by Joseph M. Dukert[1]

More than half of all the electricity in the industrialized world is produced and used in North America. The economic convergence of Canada, Mexico, and the United States under the North American Free Trade Agreement (NAFTA) is combining with recently liberalized regulatory trends in all three countries to open up and encourage regional trade across national borders in this form of energy. There are great incentives for this trade to increase in decades to come; yet a fundamental question concerns the manner in which these exchanges (probably integral to economic well being and desirable living standards) have also affected and will affect the natural air-water-and-land environment of the three countries, as well as public health.

The President of the United States, the Prime Minister of Canada, and the President of Mexico underscored these ideas in their joint statement after their first meeting in April. It lauded fresh trilateral efforts to support "efficient energy markets that help our governments meet the energy needs of our peoples." The leaders went on to stress "the importance of energy conservation, development of alternative energy sources, and our common commitment to addressing environmental impacts of energy use."[2] But the problem lies in how best to accomplish all this simultaneously in respect to the continent's fastest-growing form of *end-use* energy—electricity.

At a recent symposium organized by the Commission for Environmental Cooperation of North America (CEC) there seemed to be remarkable agreement across a fairly broad political spectrum that *some* government interventions are needed—most likely in the form of emission standards, transparent regulatory hearings in which better-informed public participation is possible, and sincere effort to make the present different rules that affect the electricity sector in the three countries more compatible, so as to discourage domestic or international "pollution havens." But private funds are also essential—both to accommodate demand growth and to incorporate suitable pollution controls; and these experts were still not sure how to spur adequate investment without shackling the power of the free market…or even exactly where such investment "should" go.

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[2] North American Leaders' Statement: Jean Chretien, Prime Minister of Canada; Vicente Fox, President of Mexico; and George W. Bush, President of the United States, Quebec City, 22 April 2001 (released by the White House).

The high quality of presentations and discussion at the meeting revealed some of the complexities of these questions; and the groundbreaking work of the CEC Secretariat in starting to assemble an environmental-effects profile of the new continental energy market (see Table 1) should be of enormous value to government and private-sector policy leaders in all three countries as they edge toward trilaterally coordinated efforts to balance costs (in time, funds, and resources) with separate national sovereignties, supply concerns, and basic environmental goals. And it is noteworthy that so many participants expressed a desire to focus on market-based approaches to reducing emissions (such as emissions trading) as an effective and economically efficient way of limiting environmental and human health impacts associated with undesirable releases—including "global warming gases."

Table 1—Emissions of Main Criteria Indicators from the Electricity Generating Sector in North America (1998*)

	CO_2 equivalent (tonnes)	**Annual SO_2** (tonnes)	**Annual NO_x** (tonnes)	**Annual Hg** (kg)
Canada	122,000,000	648,411	289,137	1,774.8
Mexico	90,095,882	1,683,199	244,380	1,117.1
United States	2,331,958,813	12,291,107	5,825,982	29,241

*Some data are estimates and not all data come from 1998. See Section Three of symposium working paper 2 for further discussion. For even fuller treatment, consult symposium working paper 3, "Estimating Future Air Pollution from New Electric Power Generation," 22 October 2001.

The CEC and its Council are entities created under the environmental side agreement to NAFTA. The Council acts as the governing body of the CEC and is composed of the cabinet-level or equivalent official responsible for environmental affairs in each of the three NAFTA countries. Its focus in this instance on electricity arises from the fact that in the United States, for example, this sector is still accountable for almost 70 percent of all sulfur dioxide emissions (responsible in large measure for "acid rain" and haze), 25 percent of nitrogen oxide releases (a major contributor to smog, as well as acid rain), one-quarter of total toxic mercury emissions, and roughly 35 percent of all the carbon dioxide human activities put into the atmosphere (to the consternation of those wary of this predominant contributor to potential "global climate change").

Supporters of hydroelectricity and nuclear power argue accurately that those sources eliminate the bulk of such problems; but they raise other issues—such as massive land-use, threats to biodiversity from flooding, residual dangers from radioactive releases (especially in the light of recent terrorist attacks in North America), and the lingering reality that no permanent disposal site has yet been approved for spent nuclear fuel and transuranic wastes. To quote the brief introductory discussion paper prepared for the symposium, "Even wind farms, depending on their location, may raise aesthetic issues and concerns for avian wildlife."[3]

[3] North American Commission for Environmental Cooperation (CEC), "Discussion Paper: Environmental Challenges and Opportunities of the Evolving North American Electricity," 5 November 2001, p. 4. (This and other documents related to the symposium are available on the Internet at <http://www.cec.org>, but

A number of speakers and commentors lauded the "hydrogen economy" in principle; but several were quick to admit that it is not yet close at hand. Unfortunately, this clean fuel remains energetically costly-to-produce and hard-to-store. Perhaps its best use at first will be in vehicles with "on board reformers" to chemically transform a relatively commonplace liquid such as gasoline into the gaseous input needed by efficient and environmentally benign "fuel cells." The alternative of building a new pipeline network tailored specifically to the special requirements of hydrogen for either mobile or stationary applications would not be quickly, easily, or cheaply accomplished.

Solar power, despite its limitation as an intermittent rather than a continuous source, has universal acceptance; but even very optimistic projections of economic availability for the next decade or two in North America are measured in a few *tens* of gigawatts[4] at most.[5] In 2000, the United States called on its own nearly 800 gigawatts of existing generating capacity (primarily coal-fired) to meet most of the domestic demand for about 3.6 million gigawatt-hours (GWH).[6] Mexico's demand during the same year was considerably less than one-twentieth as great, but Canada's usage is higher per capita than that of the United States. Despite a population less than one-third that of Mexico, Canada consumed three and one-half times as much electricity as Mexico did.

Most symposium participants agreed implicitly that energy efficiency measures to reduce the overall *demand* for electricity hold better prospects in the near-term than "renewable energy" for a clean supply future in North America. But there was also open skepticism that sellers of electricity would be interested in "demand side management" without some tangible incentives. And it seemed clear that volatile (and recently low) energy prices do not present a favorable setting for either the developmental capital or the consumer enthusiasm for energy-sparing equipment and habits that are needed to approach efficiency's theoretical potential. The solution recommended most often was to expand upon ongoing discussions among the three countries to promote and label such items as "environmentally friendly"—a technique that is producing results in the "Energy Star" program. Where consumption standards exist (e.g., for air conditioners and refrigerators), discussion among participants favored strengthening and extending rather than relaxing or making exceptions.

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they are still undergoing a public comment process and further refinement before being presented to the Council in final form early in 2002.)

[4] A gigawatt (GW) equals 1,000 megawatts (MW) or one million kilowatts.

[5] At least one attendee enunciated a possible scenario for faster growth of photovoltaics – based on the idea that once "flexible" solar cells start to be incorporated directly into building structures (roofs, windows, and outside walls) they might become a "disruptive technology" – transforming our whole outlook and virtually exploding in capability. Considering the time factor of market penetration and the enormous amount of existing building infrastructure, however, such a development must be decades away.

[6] Professor William Moomaw, of the Fletcher School at Tufts University, disagreed with the degree of emphasis placed on the supply side in the National Energy Policy proposals developed by Vice President Dick Cheney and his task force; and he especially decried the fact that US leadership in wind generation had been taken over by smaller European countries. But he also described an extensive research project by one of his graduate students, which traced the basic reason to vacillation in government support for wind rather than a total lack of tax credits. Moomaw concluded that potential investors might almost consider uncertainty about economic assumptions for the future worse than no government help at all.

Energy efficiency and "clean energy" both deserve attention *now*—which translates into at least facilitative government support, as well as encouragement for research, development, and probably deployment (perhaps through official procurement policies that could accept longer "payback periods" for the up-front capital investments required in the interest of "internalizing externalities"[7] of environmental quality as a "public good"). Whenever this is done, it might be preferable to identify the action unmistakably as a deliberate act of public policy—with the reasoning behind it well advertised.

Elizabeth May, executive director of the Sierra Club of Canada, was perhaps the most assertive champion of renewable energy at the symposium. Mary Nichols, Secretary of State for California, noted that her state had succeeded in deriving an impressive 12 percent of its domestically generated electricity in 2000 from renewables (counting hydroelectric power only from units less than 30 MW each) and had sharply reduced demand for electricity during 2001 in response to power shortages and soaring wholesale prices. But she credited years of groundwork for making this possible.

"Distributed generation" was a phrase heard with some frequency at the symposium, but its meaning varied. Essentially, it applies to the production of electricity apart from the customary grid that connects central power sources to demand centers. It can range from systems of combined heat, power, and air conditioning fueled by natural gas (demonstrated effectively in schools and industry, but still not widely adopted) to solar collectors on a single residence. In many cases, assemblies of solar or wind generators may be located in remote areas; but generally they need to be linked to the grid to have value. Encouraged in part by a CEC-sponsored survey of top Mexican industrial leaders that showed receptivity to renewable energy (even with a certain cost penalty, which the business executives doubted they would be able to pass along to customers), several agencies of the federal government have arranged to promulgate new rules which will guarantee the right of such new installations to access the state-controlled grid—either to deliver electricity to distant sponsors or to sell excess power on an intermittent basis.

Meanwhile, the sense of the group appeared to be that international electricity trade *could* help by increasing efficiency, but that the benefit was not automatic. The working paper postulated that trade advantages would accrue generally to generation facilities where fuel-input would be relatively cheap (coal and large-scale hydro are normally the winners here) and where it seemed easiest to comply with the land-use and emissions regulations being enforced.

Great progress has been made in "cleaning up" the electricity industry, and technology is either on the shelf or under development to accomplish much more in this respect in

[7] "Externalities" are either costs or benefits that accrue to the public in general but are not reflected in the normal market price, as determined by supply and demand. One example of a negative externality is the release of pollutants beyond a socially determined "acceptable" level; government caps on emissions usually compel generators to go to extra expense in reducing them—with the cost normally passed along to consumers. Electricity customers who are willing to pay a premium rate for "clean" power internalize individually what they perceive as a positive externality.

future installations. Yet, statistically, its current contribution to air quality problems comes in large measure from the vast generation infrastructure already operating in this country—with hundreds of plants "grandfathered" into exemptions from the federal "clean air" legislation now in force. Furthermore, the fastest growth in generation (in percentage terms) is expected in Mexico—where the recent international economic slowdown is expected to delay but not countermand that country's original plan to meet projections of total electricity demand 66 percent greater at the end of this decade than at its start and peak demand 71 percent higher.[8] Numerous Mexicans at the symposium (including former Secretary of Energy Jesús Reyes Heroles) contended candidly that any attempt to enforce uniform emissions standards on plants in all three countries posed serious economic problems in attracting the necessary capital for construction. There were repeated references during several panels to a specific case where two additional units in Baja California (designed to use natural gas imported from the United States) are being planned with different types of pollution-control equipment. The differing approaches have raised concerns with California officials, who have objected for this reason to the entire project.

In all, more than 100 knowledgeable and involved persons took part in the San Diego symposium, including businessmen, engineers, academics, environmental officials, and a former US Deputy Secretary of Energy (T.J. Glautier). About half were from the United States. Close to one-third were Canadian; and the opening remarks were made by that country's Minister of Environment, David Anderson, who called clean air "truly a North American problem" and pollution "a health issue," but cautioned that there was a "need for a safe, secure and sustainable energy supply" in the interest of "substantial financial benefits"…and that uncertainty remains over projected demand and fuel choices. He called for "regional strategies and strategies for key industrial sectors."

Phil Sharp, a 10-term Congressman from Indiana who chaired two key House subcommittees and who was a leader in shaping two of the most important pieces of US energy legislation ever enacted[9], presided at the symposium. Sharp, now a senior research fellow at Harvard's John F. Kennedy School of Government, kept a light but firm rein on the discussions to steer through a comprehensive agenda. He also chaired a trinational group of advisors[10] who met immediately after the symposium to continue work on a series of policy and process recommendations that will eventually reach the CEC Council, which consists of Canada's Anderson, US Environmental Protection Administrator Christie Todd Whitman, and Mexico's Minister for the Environment, Victor Lichtinger.

The following are a few major themes that arose from the symposium:

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[8] Working paper 2, Table 8, p. 22. CEC's working projections have been for a rise of 21 percent in US demand and a 14 percent increase in Canada at the same time.

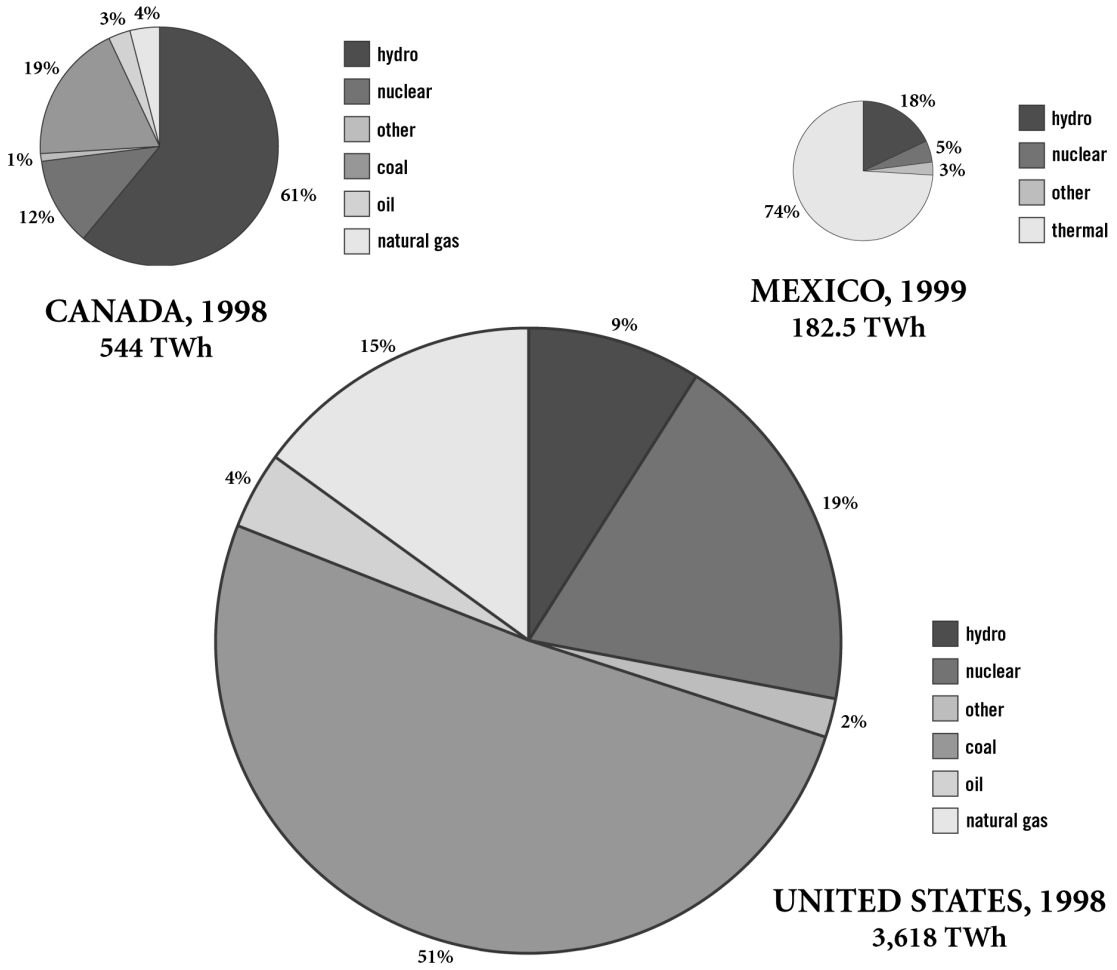
[9] The Clean Air Act Amendments of 1990 and the National Energy Policy Act of 1992.

[10] The composition of the Advisory Group and references to their prior work can be found at the website cited earlier—<http://www.cec.org>.

NAFTA Includes Three Very Different Countries

National energy policies for most countries are similar in their general aims. These boil down to adequacy, reliability, security, and affordability of supply along with acceptable protections for public health, safety, and the environment. But the details of those goals (and how they can be achieved) depend to a large extent on the characteristics of each individual country and the circumstances in which it finds itself at a given time. Without being quite so direct, speaker after speaker at the symposium pointed to telling differences in this respect among the three NAFTA partners—noting that Mexico thus sees a need for the largest percentage growth in electricity demand but is in the poorest position to finance such expansion from domestic resources alone—and therefore might be most tempted to hold down the expense associated with the cleanest fuels and best available pollution control equipment.

Figure 1 – Net Electricity Generation by Fuel Type in Canada, Mexico and the United States



Adapted from data supplied by the Canadian Electricity Association. 'Other' Includes Biomass Combustion and Renewable Energy.

Canada and Mexico are now net exporters of all forms of energy combined, while the United States is a net importer. On the other hand, future prospects will be influenced by the great variations in population, wealth, and per-capita consumption of energy. Mexico's population of roughly 100 million is far greater than Canada's 31 million, but still well below the 280 million plus in the United States. Mexico's relatively young population is rising most rapidly; and its gross domestic product is also projected to rise at the fastest rate—nearly twice as fast as Canada's and half again as rapidly as that in the United States. But all this alone might be misleading, because Mexico starts from a much lower base of electricity availability. The annual GDP per capita for the three countries in 2000 was: United States $28,600; Canada $24,600; and Mexico a mere $3,800.

Much more could be said along these lines,[11] but this is a discussion of energy and environment, not demographics. So this segment can be concluded with a few references to Figure 1 (above) and back to Table 1 (above).

A major reason why Canada showed up so well in the tabular comparison of emissions from the generating sector is that it relies so heavily on hydroelectricity. One reason for Mexico's poor showing is that it has not yet completed its multi-year program to switch from a relatively "dirty" grade of fuel oil to relatively clean-burning natural gas (although Mexican attendees were also worried that their country is now a modest net *importer* of natural gas and could suffer shortages in the future if prices surge again and capital is not found to tap domestic gas resources). The United States depends on abundant coal for about half of its domestically generated electricity, although burning coal under a conventional boiler releases far more carbon dioxide than either oil or natural gas; and the Working Document raised the possibility that a sizable fraction of new US plants may choose this harder-to-clean fuel on the basis of cost alone.

Efficient cross-border trade in electricity holds the potential to be a factor in reconciling energy needs with environmental concerns by enabling North America to get along with fewer new units, but the argument surfaced repeatedly that this need not be the case in a free market unless there is also a workable system of caps on emissions. One speaker noted specifically that Canada's comparative advantage for future power trade lies mainly with "big" hydro (which brings sharp environmental objections from some) and cheap coal in Alberta—the province seen in the Secretariat's projections as the most likely to boost undesirable emissions in the future.[12] Timothy Egan, a senior advisor to the Canadian Electricity Association, told the symposium that about 20 percent of the electricity generated in Canada during 2000 came from facilities scheduled for retirement

[11] For example, a serious effort at improving energy efficiency must consider the breakdown of consumption patterns for various types of energy by end-use sector (residential, commercial, industrial, and transportation). A significant barrier to joint assessment has been discrepancies among the three countries in the quality and manner of data collection and publication in consistent and accessible formats. Some of these may be resolved by a new "Energy Picture of North America" being prepared by the trilateral Energy Working Group established by the three countries' energy ministers—especially if it incorporates even preliminary environmental data such as that being developed by CEC. Other subgroups of the EWG are focused on electricity trade, natural gas, regulation, energy efficiency, and the potential transfer of science and technology.

[12] Discussion paper, Table 4, p. 7.

and replacement within the next 20 years—adding to a projected increase of more than 20 percent in demand that would have to be met by new construction. His personal guess was that Canada's exports of power to the United States would not increase much during that time-frame, and that in fact its own imports of electricity would rise.

A startling sidelight was the mention by a couple of participants that a new "virtual" country was emerging along both sides of the US-Mexican border—not in a political or sovereignty-threatening sense, but demographically. It was estimated recently that within 20 years 40 percent of Mexico's population might be concentrated in this region, while urban areas adjacent to the border on the US side are also among the fastest-growing in the nation. The two economies there are increasingly intertwined, and so are actual and potential environmental problems. New and upgraded cross-border power links will surely be required.

Fortunately, there seems to be room for regional cooperation in addressing such congested trouble spots that could be more effective than solutions conceived in far-away national capitals. One of the most heartening reports at the symposium was a presentation by D. Rick Van Schoik, managing director of the Southwest Center for Environmental Research and Policy in San Diego. It described three "Border Institutes" that had been held to help pin down commonalities in airsheds and water needs[13] while spotlighting differences in emissions and ambient standards, enforcement, and efforts at remediation. This is one region where solar, wind and geothermal energy make the most sense; but aggressive programs of energy conservation and energy efficiency are also in order. Border governors have begun to play a role, and so have nongovernmental organizations. Here and elsewhere (including the far western US-Canadian border) there have been discussions of binational trading programs in pollution-reduction "credits" that might start on a regional basis.

Public Health is the Major "Driver," and Regional Cooperation Makes Sense

The symposium did not dwell on "scare scenarios" of environmental impacts. In fact, John McDonald, Secretary of the International Air Quality Advisory Board (IAQAB) of the International Joint Commission,[14] noted that the total emissions of nitrogen oxides for Canada and the United States had declined since 1990 and would probably continue to attenuate. But he also pointed out that projections for declines in this pollutant along the US-Canadian border had turned around because of an anticipated higher demand for electricity, "grandfathered" facilities, and growth in motor vehicle use. For that reason, he called NO_x the "focal pollutant for the decade" in the eyes of IAQAB.

[13] Especially in arid regions of the southwestern United States and northern Mexico, water is critically tied to electricity. Van Schoik reported that California devotes 6.5% of all its energy to supplying water and treating wastewater. Several Mexicans explained that "dry" cooling condensers for power plants are preferable environmentally, but far more costly than other types. Mexico's Environmental Minister, Victor Lichtinger, has called water and deforestation—which is related—his country's two foremost environmental challenges.

[14] A binational body established by the United States and Canada.

According to CEC's Secretariat, "Emissions of NO_x, SO_2, and hydrocarbons from fossil fuel combustion…are a major public health concern because of their links to lung damage and premature mortality. Toxic mercury deposited in lakes and streams has led to fish consumption advisories across North America."[15]

This raises the dilemma of oversimplification versus community and societal awareness. I was impressed that Nancy Kete, director of the Climate, Energy and Pollution Program of World Resources Institute (and an acknowledged expert in the field) said she had learned an "enormous amount" during the day and a half at La Jolla before she spoke . . . and was reluctant to offer advice on a certain topic raised by one questioner because she was not thoroughly familiar with the specifics. These are complex issues, which often have no "perfect" solution. One report about ongoing studies of cumulative effects and long-distance transport affecting a national park revealed that careful scientifically controlled measurements surprised researchers at how far some emissions travel and how depositions from various distant sources can interact. In another instance, a panelist admitted that her early apprehensions about increased emissions from older plants in the Midwest had been borne out, but not for the reasons she had predicted. Her earlier assumption had been that such plants would step up generation in order to sell electricity to distant customers; instead, they were kept on line to supply burgeoning demand in their own service areas.[16]

Optimal solutions are often local or regional, rather than continental in scope. A growing number of states, provinces, and institutions—including the International Joint Commission along the northern US border and the North American Development Bank to the south—are starting to become familiar with the procedures of Transboundary Environmental Impact Assessment (TEIA). British Columbia and the State of Washington have signed such an agreement, and the 10 US/Mexican border states have declared their intention to notify each other of projects that might affect neighboring jurisdictions adversely. Obviously, there is room for bilateral consultation and negotiation in the trilateral North American arrangement. Another healthy development consists of agreements among almost all the US states east of the Mississippi on regional programs in respect to NO_x.

Potential damage is not limited to air and water quality, but also includes land impacts—which are further complicated in the case of Canada by native land claims. Power dams cause high passions on both sides (Minister Anderson and some others took care to refer repeatedly only to "low-impact" renewables, while others used the term "environmentally preferable renewables"); and the relative costs and benefits of hydroelectric enclosures are especially tough to gauge quantitatively. CEC documents explain that "lifecycle assessment" should in fairness compare the impacts of variously sized dams with all

[15] Working paper 2, p. 14.

[16] Higher-than-expected economic growth and demand for electricity were the major reasons that actual emissions exceeded the "worst case" projections made by the Federal Energy Regulatory Commission (FERC) in analyzing its own proposal for "Order 888." Details are given in background paper 4, "A Retrospective Review of FERC's Environmental Impact Statement on Open Transmission Access," prepared for the CEC by Synapse Energy Economics and The Global Development and Environment Institute at Tufts University.

those traceable to fossil fuels (including mining or drilling), but offer no more specifics than an observation about "remarkable progress in environmental valuation techniques in the past decade, as a means to gaining insight into some kinds of comparable environmental effects from different sources of electricity."[17]

An exception to the rule of regional problems and regional solutions is the widely perceived threat of global climate change, linked most often to the release of carbon dioxide and other "warming gases" into the atmosphere anywhere on earth. Here Nancy Kete painted a very bleak picture. She showed graphs indicating that even adherence to the targets of the Kyoto Protocol (which are limited to "developed" countries,[18] and which most observers do not believe are attainable in the referenced time frame) would not be sufficient to avert eventual disaster without follow-ups. She spoke of *all* continental glaciers disappearing—with huge resultant changes in national shorelines. But she added that the three NAFTA partners are far from agreement on how to proceed: Mexico, which has no binding target for emission reductions, was one of the first countries to ratify the Protocol. Canada's Prime Minister has promised ratification, but industry in his country is strongly opposed to the move. The Bush administration has said that the United States will definitely not ratify, but it has promised a domestic and/or hemispheric approach to the potential problem of climate change—while US industry is split on domestic policies that might be most appropriate.

A combination of New England governors and provincial premiers from Eastern Canada has called for major cuts in carbon dioxide releases in their area; and several US states are moving toward a "four-pollutant strategy," which would add CO_2 to the list of emissions that should be curbed. But little concrete action has been taken to turn these resolutions into effective action, so for the time being the spotty efforts may only add to uncertainty and some confusion.

"Harmonizing" Raises Issues, but So Do Uncoordinated Paths

The question of what constitutes "renewable" or "clean" energy goes beyond semantic squabbling. Another significant contribution at the symposium was the release of a 28-page background paper[19] that describes and comments on the legal regime for electricity imports under the rules of NAFTA and the World Trade Organization. Case law has yet to be developed, and this document cannot be taken as the final word; but it should be "must" reading for many groups and individuals associated with international electricity exchanges in North America—including the 85 utilities in 29 states who have in place or are planning to introduce "green pricing" programs for customers and the growing number of states that specify minimum percentages of electricity sold or consumed within their borders which must come from "renewable" resources.

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[17] Working paper 2, section on "Impacts from Hydropower," pp. 16 ff.

[18] Mexico, although officially a member of the Organization for Economic Cooperation and Development (OECD) is specifically exempt from the "Annex One" provisions of the Kyoto Protocol, which would require both Canada and the United States to account for measured reductions from their respective average emissions of defined "global warming gases" in 1990 by 2008–2012.

[19] Gary Horlick, Christiane Schuchhardt and Howard Mann, background paper 5: "NAFTA Provisions and the Electricity Sector."

Gary Horlick, co-author of the background paper, mentioned the possibility that *de facto* discrimination might be charged against renewable resource provisions that exclude certain sources of electricity (such as large-scale hydro) on the grounds that they violate "national treatment" guarantees, even though he gave the impression that suits are not very likely because the stakes for an individual litigant might not justify their complexities and expense. So far no trade-and-environment disputes have occurred within NAFTA in relation to electricity, but his advice was that foreknowledge offers some protection. This translates into an admonition to "know the rules."

Few people probably realize how varied the definitions of "renewables" are right now. One state appears to extend special favorable treatment only to "new solar energy resources." Others exclude hydro beyond a certain size, while still others fail to include geothermal energy, landfill gases, and so on. A sticking point occurs when Country A appears to dictate that Country B must tailor its generation practices to suit a certain pattern, even though its tradable product (electricity) is indistinguishable in regard to source and is to be treated as a "good" under the provisions of the US-Canada Free Trade Agreement and NAFTA.

Intent is immaterial. The fact remains that disparate environmental regulations *can* lead to trade disputes under NAFTA.

Robert A. Reinstein, an international trade consultant who as a US negotiator was jointly responsible (with his Canadian opposite number) for numerous liberalizing breakthroughs in the Canada-US FTA's energy chapter, offered a down-to-earth suggestion. Since most state authorities are probably not aiming at discrimination, it might be wise to bring them together and have them exchange explanations of precisely what the goals of their "renewable" definitions are.[20] Coordination to some degree might satisfy many of them; and it could limit confusion and inconvenience.

Reinstein's advice is worth applying more broadly. Opposite sides in energy-environment debates too often talk past one another. "Getting prices right" is a mantra for both economists and environmentalists[21]; but calm discussion might reduce disagreement in a given situation about who decides what's "right." This calls for greater public understanding as well, and that presupposes more success in objective public education. The CEC has produced valuable databases that can be used in such an effort, but "outreach" programs are needed too. At the local and regional level, this goes beyond generalities; it requires timely announcements of proposed projects and regulations, as well as workable processes for public involvement.

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[20] Reinstein's suggestion coincidentally parallels an effort at solving the same problem offered recently by the US Energy Association—namely to petition the National Association of Regulatory Utility Commissioners, the National Governors' Association, the North American Electricity Reliability Organization, and the Federal Electricity Regulatory Commission to address the issue. See USEA, "Toward an International Energy Trade and Development Strategy," Washington, October 2001, p. 22.

[21] This does not imply that economists cannot be environmentalists and vice-versa. Let us hope that more and more people active in debates about energy and environment will be knowledgeable in both fields.

The CEC's working paper 2 calls utility green-pricing programs the "most successful market-based system" tried thus far,[22] but they are really still only in the laboratory stage. The CEC cites a recent study by the US National Renewable Energy Laboratory that found such programs are responsible for 110 MW of installed *capacity* for new renewables, with 172 MW more firmly planned, but these are largely wind systems (intermittent sources) and the total is very modest compared with 800 *gigawatts* installed across the United States. Voluntary programs are important and desirable as a means of raising public consciousness, if nothing else, but there is a limit to what they can accomplish because of what economists recognize as the "free rider" problem. Why do we suppose that individuals will cooperate in internalizing externalities on the basis of what is "right" any more than public utilities or independent power producers will (or do)?

When all is said and done, free markets in electricity (including the transmission of power across borders) are ultimately best for economic efficiency. They should be encouraged to the greatest extent feasible. But the interests of public health and the natural environment should also be protected by reasonable standards—agreed upon by the societies involved.

This is why unbiased public education on the issues (as difficult as that may be to inculcate) is so critical. One remark from the symposium that stands out was a bravely frank observation by John Beale, Deputy Assistant Administrator of the US EPA: "Government moves when it is forced to move."

Conclusions and a Look Ahead

Thus far NAFTA itself has had merely a marginal effect on the growth in electricity trade that has taken place. The symposium never tried to reach a conclusion about whether the agreement's overall environmental effect has been positive or negative, but the prospects of a beneficial result surely exist (as do those of serious environmental problems if care is not taken).

Concerted efforts at improving the efficiency with which North Americans use energy are a top priority in reconciling an efficient continental electricity market with environmental goals. Reducing regulatory uncertainties is critical in encouraging environment-friendly investment. This calls for closer cooperation among the three countries and between energy and environmental officials within each. But there is no "magic bullet"; and regional problems need to be investigated and resolved regionally.

What comes next?

The Secretariat of the Commission for Environmental Cooperation has developed a framework for measuring emissions from electricity generation that needs to be continued, refined, and consulted by policy makers in all three countries. Its future efforts might well be extended beyond electricity to look at transportation—also a major source

[22] Working paper 2, p. 41.

of pollutants, but one that will be harder to tackle because there are so many mobile sites to consider and the patterns of movement themselves are highly variable.

The CEC might well go deeper into the convergence of the natural gas and electricity markets and infrastructure if it can afford the time and resources. The CEC study's first-cut joint projections of generation and emissions (assuming that the latter will be proportional to the number and size of new facilities and the fuel they choose on the basis of relative cost) are useful; but additional nuances might be considered. Generation-based pollution has increased since NAFTA came into force, but for different reasons than those given by some whose initial environmental fears have proved unfounded. Cooperation with specialized entities, such as the US Department of Energy's Energy Information Administration, might be of mutual benefit to both bodies for future estimates of electricity supply growth in North America and its ramifications.

Some key members of the CEC's Electricity and Environment Advisory Board were unable to attend this symposium. However, the absence of certain members whose titles might give the impression that they could be "industry spokesmen" appeared to do little to change the fundamental discussions. This may be a sign that the topics and speakers were well chosen…and that the CEC Secretariat report did a good job of launching a broad-ranging yet probing series of exchanges with a balanced discussion paper that answered many questions while raising others.

No consensus emerged on specific approaches—such as the case of the new 800-MW natural gas-fired power plant near Mexicali in Baja California. This single case might well be used as a test of whether the devil that is in the details can be managed. Could California and Baja California reach a "mutual acceptance of standards"? Could California customers be persuaded to pay a "green" premium if the operators of the generating unit in Mexico were willing to amend their plans and incorporate the best available control technology? Is federal intervention on both sides of the border required? If so, in what form?

The symposium left numerous legitimate questions unanswered. But progress was made, and that deserves kudos.