DISTRIBUTION: General
J/10-01/SR-rev.1
ORIGINAL: English

Commission for Environmental Cooperation of North America

Joint Public Advisory Committee Regular Session 10-01
North America's Energy Market: Aligning Policies and Managing Carbon

24 March 2010
Vancouver, British Columbia

Summary Record[1]

The Joint Public Advisory Committee (JPAC) of the Commission for Environmental Cooperation (CEC) of North America held a public meeting on 24 March 2010, in Vancouver, British Columbia (BC), Canada. The purpose of the meeting was to examine barriers to harmonization and comparability of renewable energy standards and definitions among North America's three countries, as well as to discuss opportunities and challenges for carbon capture storage technologies.

This Summary Record reports on each agenda item, records all decisions made by the Committee and identifies action items and responsibilities. (See Annex A for the agenda and Annex B for the list of participants.)

Previous summary records, advice from JPAC to Council and other JPAC-related documents may be obtained from the JPAC liaison officer or through the CEC's website at <http://www.cec.org>.

Welcome and Opening Remarks, by JPAC Chair Glen Wright

The JPAC Chair welcomed participants to the public meeting, noting that it would be streamed live (via webcast) and available in English, Spanish and French. He provided an overview of the Commission for Environmental Cooperation (CEC) and outlined the role of the Joint Public Advisory Committee to seek public input on key environmental issues and prepare Advice for Council (senior ministers of the environment).

Mr. Wright reviewed the agenda for the public meeting, noting that the morning session would start with an overview of the electricity sector in North America, followed by panel discussions f the challenges associated with energy policy coordination in the three countries. The impact of the Renewable Portfolio Standard in California on the run-of-river hydro projects in BC of over 30 megawatts would be presented as an example of this challenge. The afternoon session would focus on carbon capture and storage and the progress achieved with associated technologies.

[1] Disclaimer: Readers should be advised that although this summary was prepared with care it has not been reviewed nor approved by the interveners and therefore may not accurately reflect their statements.

Introductory Remarks, by CEC Acting Executive Director Evan Lloyd

Mr. Lloyd described the context of this meeting on the North American energy market and the related carbon-management challenges and opportunities to the role of the Commission for Environmental Cooperation. He noted that the CEC was established as an adjunct to the North American Free Trade Agreement (NAFTA). Its mission is to facilitate collaboration and public participation to foster conservation, protection and enhancement of the North American environment for the benefit of present and future generations, in the context of increasing economic, trade and social links among Canada, Mexico and the United States.

A new strategic direction for the CEC has recently established priorities in three areas:

- Climate Change and the Transition to a Low-carbon Economy
- Greening North America's Economy
- Healthy Communities and Ecosystems

The CEC assists the three countries by identifying areas where national efforts in support of these priorities can be amplified or expedited by means of trilateral cooperation, enhancing policy coordination and collaboration with respect to appropriate levels of environmental standards and management.

Mr. Lloyd noted that British Columbia presents a case study of the impacts of global climate change and one government's attempt to mitigate its direct consequences. Temperature warming in some areas of BC is more than twice the global average, resulting in significant negative consequences that include the loss of much of BC's forest assets due to the mountain pine beetle infestation; a record number of wildfires and floods; and billions of dollars in economic losses and social dislocation.

BC has responded with development of policy that enacts an array of regulatory and other measures, including:

- a broad-based carbon tax,
- a legislative requirement for core government and the broader public sector to be carbon-neutral by 2010,
- a commitment that all new public buildings be built to the Green Building Council's LEED Gold Standard,
- a zero–net deforestation policy, in order to optimize the full carbon and storage value of the province's forests, and
- a new, green electricity regulatory regime, to spur development of the province's abundant renewable energy reserves.

BC was the first Canadian province to partner in the Western Climate Initiative and has signed binding agreements and joined formal organizations with multiple government partners, covering emissions trading systems, transmission planning, and fuel standards.

Mr. Lloyd noted that a significant barrier to the growth of a North American market for clean and renewable electrical power is the inconsistent and incompatible policies that extend across all three countries.

Overview of the Electricity Market in North America—Presentation by Craig Sabine, Manager, Energy and Climate, ICF International

To begin his overview of the electricity market in North America, Mr. Sabine observed that while electricity makes our lives easier and more comfortable, it is a complex entity requiring capital, intensive infrastructure, energy markets, regulatory oversight, and oversight of environmental impacts. Electricity is unique, as it is a highly valued commodity that cannot be stored. This creates a challenge in balancing supply and demand, as the generation of electricity must occur at the same time the electricity is needed. Electricity is a major industry (US$325 billion).

Mr. Sabine described how electricity is produced and how it requires external energy from sources such as hydro, steam, coal, oil, natural gas, nuclear, wind, biomass, and solar. Canada has 130 gigawatts (GW) of generating capacity, with an output of 570–600 terawatt-hours. Seventy-five percent of the electricity produced in Canada is from non-emitting sources (60% hydro and 10% nuclear). The US has an output of 4,000 terawatt-hours, with 75% of this electricity produced from fossil fuels (of which 50% is from coal). In Mexico, 80% of electricity is produced from fossil fuels (including from conventional thermal), with some hydro produced in the northwest and significant geothermal in the Baja area.

There is significant regionalization of power production in Canada and the US. BC, Manitoba and Quebec are almost all supplied by hydro, while in Alberta, Saskatchewan and the Maritimes there is a significant usage of fossil fuels. In the US, there is extensive use of fossil fuels, with significant hydro production in the northwest. Replacement of the burning of fossil fuels relies upon utilizing the advantage of the areas rich in renewable resources and non-emitting resources.

There are three major power transmission grids in North America: the Eastern Interconnect (east of Manitoba and the Mississippi), the Western Interconnect (western states and provinces), and the Electric Reliability Council of Texas (ERCT). These “interconnects” are not synchronous and therefore there are limits on the trade of energy between these systems. There is significant capacity to move power north-south but limited capacity to move power east-west. For example, BC has a significant interconnection tie with the northwestern US; Manitoba has a transmission tie with the US; Ontario and eastern Canada as well; and Alberta is building a transmission tie into the US.

With regard to energy policies, Canada and the US are moving to deregulate the energy market and toward a more competitive market structure. New York, New England and Alberta have wholesale energy markets. Mexico has a state-owned electrical utility.

Policies such as renewable portfolio standards (RPSs), which demand that utilities generate a certain portion of electricity from renewable sources, have been developed at the state level in the US, to promote positive outcomes in the environment. At this time, there is no federal policy

covering RPSs and they involve different rules in each of the states that have them, with some being mandatory while others request voluntary compliance. In addition, there are different eligibility criteria for what constitutes renewable energy. California has a stringent standard that requires 33% of energy to be renewable by 2020.

Mr. Sabine explained that carbon policy (climate change policy) and energy policy are essentially one and the same in regard to the production of greenhouse gases (GHGs). Therefore, climate change policy and energy policy need to be connected. While federal jurisdictions are working to sort out these policies, state and provincial jurisdictions have proceeded to pursue initiatives to address climate change, such as the Western Climate Initiative. This initiative involves California and the western states along with BC, Ontario, Manitoba and Quebec, with a number of jurisdictions having observer status—including Mexico.

Alberta has developed an intensity-based GHG policy, with trading and monetization of carbon at approximately $15/tonne. BC has various policy initiatives, one being a carbon tax; however, the Western Climate Initiative is likely to use a cap-and-trade system. The Midwest Governors' Association and the Regional Greenhouse Gas Initiative in the northeastern US are also working to develop climate change initiatives.

In addition to carbon initiatives, there will likely be federal initiatives developed to deal with effluents from electrical generators, fossils, SO_2 and NO_x. An achievable control policy dealing with a maximum for mercury will likely be developed by 2015.

Environmental policy has an impact on electricity supply, as it changes both costs and competitiveness. For example, if carbon is monetized, it becomes another operating cost, and at $15/tonne, gas becomes competitive with coal. At $60/tonne, carbon capture and storage may become more cost-effective than gas plants. With these evolutions in costs, the overall carbon intensity of the system would be reduced dramatically when driven by a combination of the aforementioned environmental policies.

In summary, environmental policy may change the mix of electricity generation and energy policies, and how they are aligned will affect the environment.

Panel I: Energy Policy Coordination in North America

Panel Moderator: Nancy Sutherland, JPAC Member for Canada

Ms. Sutherland noted there are significant hurdles associated with developing common definitions and the abandonment of trade barriers in relation to the greening of electricity. Energy policy is integral and critical to all aspects of NAFTA.

Presentation by Miguel Breceda Lapeyre, Coordinator, Energy Program, Universidad Nacional Autónoma de México

Energy policy coordination among the three countries involves many challenges, such as developing common objectives, increasing energy prices, the different approaches with regard to

energy safety and security, and a different mix of energy supply, imports and exports in each jurisdiction. There is also the challenge to the three countries of modifying regulations and policies to allow for better coordination, and the challenge to federal governments of developing policies that meet the local needs.

There is a need to understand whether policy differences among the three countries could contribute to barriers in developing a coordinated approach. The speaker referred to a background paper he had prepared for the session and submitted to the CEC that recommends developing a comparable tax for carbon capture.[2] It also includes a strategy for a North American grid. It was suggested that common objectives to update the energy profile in North America need to include collaboration by experts in the three countries. Canada is a self-sufficient country in terms of energy sources, the US depends on imported oil, and Mexico is self-sufficient in crude oil but imports 40% of its gas and diesel.

In the US and Canada, there is an interconnection between federal and state/provincial jurisdictions, whereas in Mexico, the regulatory framework is set by the President. The objectives of the three countries vary in regard to energy supply, with Canada wanting to retain self-sufficiency, the US wanting to gain more self-sufficiency, while Mexico will need to rely on its crude oil for the next 10 years. Both Canada and the US want to become exporters of clean energy while Mexico wants to consume this clean energy.

Both Canada and the US are committed to developing carbon capture and storage technologies, while Mexico is not very involved in this regard. There is a need to ask whether energy policies associated with carbon capture and storage converge or clash, in order to develop a common policy. There are cultural, social and institutional barriers as well as trade barriers. Different standards exist at the federal level versus in state/provincial jurisdictions.

In regard to prices, Mexico must bear in mind international prices defined in the US. Regarding competitiveness, Mexico is increasing the use of gas and needs to import more natural gas and possibly crude oil, like the US.

Technical barriers occur with deficiencies in diesel in Mexico. The clean energy market may also present a challenge. Geothermal is used in Mexico. Mexico could provide labor and manufacturing components for clean energy. Nuclear will not likely be used in Mexico, as the expected energy capacity will meet demand for the next 10 years.

Presentation by Jan Hamrin, Secretary General, Environmental Tracking Network of North America (ETNNA)

Ms. Hamrin reviewed the areas of agreement and differences in regard to renewable energy and associated technologies. She noted there is no conflict regarding cross-border imports and exports of energy and there are clear definitions in the voluntary market in relation to renewable

[2] Breceda-Lapeyre, Miguel. *Consideraciones preliminares para la elaboración de una Política Energética Conjunta de los países del TLCAN*. (Feb. 24, 2010). The text of this paper (Spanish only) will be found on the CEC website among the documents related to this Vancouver JPAC regular session.

energy certificates. There are apparent conflicts in compliance markets concerning the renewable energy certificates as part of the renewable portfolio standards.

Carbon allowances and offsets are clearly defined in international agreements, while the carbon reduction levels, particularly at the local level, can be an area of differences.

The definitions of both renewable sources of energy (solar, wind, biomass, geothermal, hydro) and non-renewable sources (fossil fuels such as coal, oil, natural gas, and uranium) are clear and there is no disagreement. The purpose of renewable electricity policies must be considered in order to determine which renewable energy technologies are eligible for specific policy incentives. For example, policies could be developed to specifically promote the use of newer emerging technologies in the market.

Energy policy treatment depends on program goals, which will be different in each region as a result of local resources. Program goals include overall electricity development, economic development, environmental benefits and specific resource/technology development. Regarding economic development, there is a need to balance cross-border and global trade with the local economy. Renewable portfolio standards were specifically developed to encourage the market for new and emerging technologies and assist with competitiveness of these new technologies. The technologies eligible for incentives change as these develop. Different regions have various incentives depending on their mix of resources.

With carbon policy, goals and rules encourage clean power generation because a lot of GHGs come from the electricity sector. “Additional” projects that contribute to the reduction of GHGs are eligible for incentives. Also, some renewable technologies may not be eligible because they are receiving incentives in other programs.

Market power and market share are barriers. As well, there is a lack of coordination of policies with like purposes. These policies need to be compatible even if they are not identical. Currently, there is an inability to separate policy goals from the definition of renewable energy. Eligibility needs to be consistent with policy goals.

The lack of co-ordination among accounting systems is a further challenge and can result in double counting in dealing with renewables and carbon. Projects under RPFs are not classified as “additional” under carbon policy. Consistent terminology is required to ensure that the same thing is being referred to in policy, legislation, etc. Much of the confusion has come from a lack of understanding of what policies cover, when determining if renewable energy technology is eligible for an incentive.

Presentation by Dr. Marlo Reynolds, Executive Director, Pembina Institute

In light of the scale of trade of energy in North America, there is a need to better co-ordinate energy strategy. In Canada, there is tension between federal and provincial jurisdictions in regard to energy. It is important to link energy debates, in order to increase the understanding of energy-related issues across the country. While linkage is important, harmonization is not necessary and has been used as an excuse in Canada for not taking action at the federal level.

Compatible allowances are required for cap and trade. There will be political challenges in trying to create harmonization on price. However, harmonization on price is not always needed. Domestic policy can correct any leakage. There is a marginal cost of abatement in Canada. It is higher, primarily due to the pace and scale of the oil sands in Alberta. There will be key questions around the integrity of systems, if there is not the same level of robust accounting systems in all jurisdictions. In Alberta, technology fund payments are used to achieve compliance, and these create challenges for creating linkages and compatibility across jurisdictions.

There are huge discrepancies in renewable energy policy between Canada and the US. The US will be outspending Canada 18 to 1 in investments on renewable energy in 2010. Co-ordination can be achieved among standards for efficiency of consumer products, compatible metering, and compatible standards applicable to electric vehicles. Dr. Reynolds suggested that the CEC could focus on the impact of electric vehicles on transportation.

Standardization is needed in the labeling of what qualifies as "low-impact" renewable energy, and energy efficiency in homes. Common targets in North America for low-impact renewable energy should be considered.

Carbon capture and sequestration (CCS) is important. The Clean Energy Dialogue between Canada and the US has resulted in little sharing of intellectual property and knowledge pertaining to CCS. Private investment will be instrumental in the evolution of CCS and it will be dependent on the price of carbon.

In summary, increasing dialogue with nonprofit organizations in the environmental movement may shape energy in the future. Political will is the biggest barrier. Linkage is important, while harmonization should not get in the way of moving forward. JPAC should consider the electric car and natural gas in relation to energy supply and identify what other issues will have an impact on energy in North America.

Questions, response and comments

- I am surprised that wind technology is considered "emerging." The southern states are more interested in a low-carbon standard versus renewable portfolio standards.
  - Response: If we did not have RPSs in the US, solar or wind technologies would not be built, unlike hydro, nuclear and natural gas. There could there be a market for these new technologies without government intervention. Wind is a mature technology but there is no mature market.

- Under the Clean Energy Dialogue between Canada and the US in June, there was agreement that harmonization is impossible and we need to be "compatible." I disagree that there is no progress with CCS.
  - Response: I agree with the term "compatible" but what exactly does this mean? Canada cannot copy and paste legislation from the US. Canada went to Copenhagen with a target and came back with a weaker target by aligning with the US.

- There is no need for these two countries to be aligned. There is a need to define "compatible," "harmonization" and "linkage."

- CCS is an end-of-pipe solution with no additional co-benefits. It will need private investment.

- I support harmonization of policy in regard to toxins but not in regard to energy.

- We need to understand the political landscape in each country, particularly in Mexico. What do we do in the context of disharmonized political landscapes and energy markets?
  - Response: Regional energy policies can work—for example, natural gas. Harmonizing policies from the past is not the answer. There are connections that could be made to incite investment from the private sector. However, investors don't like risk, and uncertainty in policies is an inhibiting factor.

- In the short term, we should agree upon certain objectives. If Mexico's reserves are dwindling, it will need to import crude oil along with the US.

- If Canada and the US want to be exporters of clean energy, they should bring in Mexico as a partner. It will be a challenge to define a major energy policy for the three countries.

- We need to recognize this is a complicated topic, in regard to trinational coordination. Challenges include terminology in three languages, the way in which energy is generated in each country, institutional co-ordination, internal public policies and enforcement of environmental laws.

- What is your opinion regarding competitiveness in the NGOs? You talked about leakage rates. Are people willing to accept legislation to deal with the larger issue?
  - Response: If Canada had a higher carbon price, the two sectors that would be affected are mineral smelting and cement manufacturing, and leakage would occur from an environmental perspective if they moved south of the border. If the correction is a modified price to carbon, then the environmental movement would live with this.

Questions from the floor

- We consider the discussion of energy markets important, as it relates to trade and the environment. Also, what happens in one country affects what happens in the others. Are all forms of renewable energy sustainable? Should we start thinking about renewable as well as sustainability?

- Recognizing the importance of additional transmission to enhance international trade in electricity, what policy ideas would you suggest that would enable the private sector to contribute?

- You mentioned that as technologies move from emerging to mature, they should move out of eligibility for RPS. This seems contrary to the goal of reducing carbon emissions.

- The North American energy market includes political factors. How will other sectors react?

- What is the best recommendation on the role JPAC should play?

- My question is concerning the use of market forces to achieve the objective of energy self-sufficiency. Should we be thinking of this in terms of continental self-sufficiency versus country-by-country?

- In responding to climate change, how do we price carbon?

- How do we foster greater free trade, recognizing that each region will have its own competitive advantage?

Questions from the website

- Are there any plans for shared research and development?

- Why don't we create a concept based on the type of energy developed in each country?

- If there is so much natural gas, why are we not using it to the max?

- If carbon sequestration is so popular, why are we not using it more on a mass scale?

- My question is about policy issues with the environment as they relate to transparency and accountability in BC. The public hasn't been able to get involved in determining the future of energy policy. How do you see policy without government accountability?

- What is the role of natural gas with regard to GHG emissions?

- I see a great use for transmission lines from out in the ocean to the coast.

- Consideration should be given to providing an allowance of energy per citizen.

In light of time restrictions, it was suggested that, to the extent possible, responses to these questions would be provided on the website.

Panel II: California's Renewable Energy Standards and British Columbia's Hydroelectricity: A Policy Disconnection?

Presentation by Jan Hamrin, Secretary General, Environmental Tracking Network of North America (ETNNA)

Ms. Hamrin provided an overview of the US legal jurisdictions, noting the states can set their own policies as long as they don't encroach on interstate commerce. The Federal Regulatory Commission has responsibility for setting wholesale rates and for approval of recovery of transmission costs in states. Renewable energy standards are being developed at the federal level. States can go beyond federal standards but not below.

Eligibility of hydro projects to the California Renewable Portfolio Standard program was reviewed. Qualification applies to small hydro—less than 30 MW—although incremental hydro from efficiency improvements after January 2008 can qualify small projects incorporated under otherwise ineligible large projects, as well as independent small projects. In addition, eligible operations should not cause adverse impact on beneficial uses of other operations (in compliance with the Low Impact Hydropower Institute certification). RPS programs exist in 28 other states and they all vary as to how they handle hydro. Smaller hydro facilities have been built more recently and are subject to more restrictions than older, larger hydro facilities.

The purposes of an RPS are to create a market for emerging renewables, to reduce GHGs, to promote economic development and to ensure energy diversity and reliability.

Compliance to a hydro RPS faces a number of challenges. Large quantities of hydropower cause problems for other renewable energy technologies, due to resource variability. Run-of-river hydropower projects can have the obstacle of size. Other issues include transmission, the RPS premium for mature technology, and environmental impacts.

Ms. Hamrin reviewed mitigating policies, including the California Loading Order, which establishes the order of resource acquisition of new, renewable and clean fossil technologies. Other policies include emission limits on power acquisitions, the California GHG Cap & Trade Policy and the potential Western Regional GHG Reduction Program. These mitigating, clean energy policies are not necessarily tied to the RPS program. RPS energy is not eligible for carbon credits.

Presentation by Paul Wieringa, Executive Director, Electricity & Alternative Energy, Ministry of Energy, Mines and Petroleum Resources, BC

Mr. Wieringa noted that there is a mutual commitment to climate action and clean energy, with BC and California participating in a number of shared initiatives. These include the Western Climate Initiative, which they co-chair, the International Carbon Action Partnership, the 2009 Governor's Climate Summit Declaration (western states), and the Pacific Coast Collaborative.

The BC Climate Action Plan requires a reduction in emissions of 33% below 2007 levels by 2020 and of 80% by 2050. As well, there is a requirement to be carbon neutral and to adopt a low-carbon fuel requirement. The building code in BC is being strengthened, with a move toward green buildings.

The BC plan requires 90% of the province's electricity to be generated by clean energy. For use of natural gas, there is a requirement to offset GHG emissions, and for coal, there is a

requirement to use carbon-capture-and-storage (CCS) technology. BC's policy includes the goal of achieving self-sufficiency in electricity generation and use by 2016.

BC has introduced a carbon tax, which starts at $10 per tonne and will increase to $30 per tonne by 2012, with the intent of providing incentives to reduce the use of carbon-intensive fuels.

Electricity generation in BC is 89% from hydro, 4% from biomass and 6% from natural gas, with no use of coal-fire generation. The first wind plant was introduced in 2009, a second is in construction. The goals of BC energy include maintaining low rates, ensuring new projects have net-zero GHG emissions, introducing smart metering by 2012, achieving self-sufficiency by 2016, energy efficiency, conservation, new rate structures, and LEED gold standards for new government buildings.

In BC, there are stringent environmental requirements for hydroelectric facilities, including an environmental assessment, a water license and up to 50 permits from 14 regulatory bodies.

RPS requirements in BC focus on wind, solar, biomass and geothermal and do not include hydro.

The mutual objectives of BC and California include generating clean and renewable electricity and reducing GHG emissions. There is a synergy between BC and California with regard to the use of hydro, with BC exporting electricity to California in the summer and importing it in the winter.

Presentation by Donald McInnes, Vice-chair and CEO, Plutonic Power

Mr. McInnes provided an overview of the run-of-river hydro projects in BC, noting that 47 are investor-owned. He stated that these non-storage hydro facilities are one of the cleanest sources of electricity and have a minimal environmental footprint. BC hydro is the buyer and the facilities are able to store energy in dams and subsequently dispatch it on demand. The more dispatchable energy that qualifies as clean energy, the more solar and wind technologies can be integrated, thereby assisting California and other states to meet their RPS objectives.

Mr. McInnes reviewed the Plutonic Power projects, noting that the two facilities produce a total of 220 MW each from diverting water at a higher level and subsequently returning it at a lower level—with no negative impact on fish habitats. A rigorous process was used in developing these projects, involving 17 different federal and provincial organizations, in order to obtain the environmental assessment certificate. In addition, 54 federal, provincial and local licenses as well as 1600 permits were required. Plutonic Power involved three aboriginal groups in the development of these projects.

Presentation by Dr. Lawrence Pitt, Associate Director, Pacific Institute for Climate Solutions

Dr. Pitt introduced the concept of unintended policy consequences, with the example of how California emission standards of the 1970s led to the introduction in vehicles of the catalytic converter, which required use of unleaded fuel. Subsequently, unleaded fuels proved to be less

efficient and consequently resulted in increased petroleum consumption. It was suggested that the fault was not with the introduction of fuel standards but with the timeframe set to implement these standards. Japan permitted a longer time for vehicles to meet new emission standards, allowing manufacturers to develop the solution of fuel-efficient, lean-burn engines that produced the intended results.

Dr. Pitt raised the questions of whether the cumulative impact of small hydro is linear (sum of all) or non-linear, and whether the impacts are similar for large hydro versus many small hydro plants. Wind energy is an example of operation where cumulative impact may have a deleterious affect: the use of wind turbines to meet 10% of the global energy demand by 2100 could cause significant warming—exceeding one degree Celsius (research based on models).

The three interconnects were reviewed and it was suggested that within the next 10 years, all three networks may be linked through technology. The production of energy by Wisconsin Energy Conservation Corporation (WECC) was discussed, along with the role of BC in this production. Large-scale hydro helps to firm and shape volatile renewable electricity, delivering it when it is needed and providing the flexibility to incorporate a variety of energy sources. This area is worthy of further review.

Cautious projections regarding the future hydrologic regime indicate that over the next 100 years, the jet stream will shift north. It was suggested that Seattle and areas to the south will experience fewer storms and less rain while areas to the north will experience more rain and snow. This variability in weather can have a positive impact on hydro, with the greater precipitation to be captured in the north.

In summary, Dr. Pitt suggested consideration of unintended consequences and cumulative impacts, as well as the system impacts of volatile renewables. He also asked whether the goal of energy policy is renewable energy or low carbon emission energy. Future hydrologic regime changes as a result of climate change should be considered.

Questions, response and comments

- If more states and provinces adopt renewable portfolio standards, will it be problematic for smaller power projects?
  - Response: BC is moving toward self-sufficiency, which will promote the ongoing development of smaller projects regardless of the use of RPFs in jurisdictions such as California.

    The federal government in 1988 established an ISO 14000 standard called Ecologo, and it is my view that if the project qualifies under ISO, it should qualify for RPS regardless of the megawatt capacity. The ultimate price of carbon will ensure that non-storage hydro is competitive.

- What is the economic impact and how do we account for the source of emissions?
  - Response: BC has a carbon tax on coal and has no coal facilities in the province, yet it imports power from base-load coal through a 600-megawatt line from Alberta, during

times when it is less expensive. At the same time, renewable hydro from BC may be held in reserve or sold into other markets such as California.

This issue is highlighted in the debates at the Western Climate Initiative and there is a lot of emphasis on having carbon tax accounted for at source.

- 1. Are there any benefits/incentives to hydro projects for landowners? In the case of Mexico, the locals do not benefit.

  2. What is the cost for water use by humans and should there be a fluctuation in price when it is used for other purposes?

  3. In terms of the cost/benefit curve, how profitable is hydro compared to other sources?
  - Response: 1. In BC, 97% of the land is owned by the federal or provincial government so there is little impact on the private land owner. However, most developers enter into an agreement with the Aboriginal groups because of unsettled land claims. This includes a form of revenue-sharing which results in direct economic benefit to them.

    2. We pay a water tax to the provincial government and encourage the government to share some of the tax with the Aboriginal groups. This would bring some investment certainty, as opposed to the results from having developers negotiate separately.

    3. In terms of the cost of energy, the biggest single cost for hydro, wind and nuclear is the cost to build and service the debt. With regard to natural gas, at $4, it is difficult to compete.

- Hydro projects under 50 megawatts do not have to have an environmental assessment. The BC Ministry of the Environment has been gutted and there is no provincial planning to assess the cumulative impacts of all projects.

- There is also a concern about hydro projects having negative impacts on fish, grizzly bears, and mountain goats. As well, the vast majority of permits for hydro projects are not related to the environment.

- California will not have more than 25% of RPS projects sourced outside of the state. A lot of facilities are being built, so what should the system be planning for to avoid the stranded costs?
  - Response: We are moving in the right direction by looking at the resources and the resource potential. I can't comment on individual projects. We need to do more planning on the resource that is economical to be developed, as well as do good planning for transmission.

- The Plutonic Power projects have been planned to protect the environment, including the ecological use of water. We saw facilities that will either minimize the impact or compensate for any environmental impact.

- With regard to Paul Weiringa's comments, the impact that humans are generating is based on how many people, how much we use and what kind of technologies we use. It is important that this be considered.

- I acknowledge that carbon tax in BC is good, but the environmental assessment in BC is weak. I disagree with the assertion that Plutonic Power's Toba plant is a small-hydro project; perhaps the RPS stricture of less than 30 megawatts should be the standard used in BC. When will the BC government get serious about the cumulative effects issue and allow citizens to get involved in land-use planning?
  - Response: There has been a lot of debate on the methodology to assess cumulative effect impact. There is also a Section 5 enquiry, which looks at where to put transmission, and the consequent impacts.

- As we see a higher penetration of variable renewables, can you comment on how we share energy among various loads, and the importance of having reliable controllable transmission between loads?
  - Response: There is a need to balance the exchange of energy between jurisdictions—for example, summer peak in California and winter peak in BC. Also, not all renewable energy sources are variable. To the extent that variable resources imported to California are firmed and shaped, the less there is for California to deal with. The more that can be done at the source of generation to help shape the energy delivery to meet the demands of the importer, the more a higher price is justified.

Questions from the website

- Can you comment on the trade and technical barriers with regard to coordinating trade and energy policy in North America, as well as solutions?
  - Response: It is important to have consistent terminology. States and provinces will not enact policies to encourage generation in another jurisdiction. Policy makers will focus on development of resources within their jurisdiction. Reducing GHGs is a global issue and we should help other jurisdictions to develop clean energy technologies without having negative impacts locally. Overall, we need to look at a portfolio of policies based on our goals. RPS is not a solution for climate change. It can contribute to reducing GHG but it is only a component part of a complex issue. Having consistent terminology and consistent accounting systems will be helpful.

Panel III: Carbon Capture and Storage in Canada, Mexico and the United States

Panel Moderator: Laurent Benarrous, JPAC Member for Canada

Presentation, "Trinational Overview on Carbon Capture and Storage," by Robert Wright, Senior Advisor, US Department of Energy

Mr. Wright provided an overview of carbon capture and storage (CCS) initiatives, noting that there is a need to establish a price for carbon (by tax, cap and trade) before carbon capture and storage can be pursued to any degree. He also noted that the US is taking a "no regrets"

approach, to bring technology to a state where it can be deployed while waiting for climate change legislation to be passed.

The Department of Energy in the US is addressing carbon capture and storage through initiatives in research and development, demonstration, and deployment. Research and development includes capture and compression, storage, monitoring, accounting, injection tests, prediction models risk analysis, and work on technologies that do not yet exist. Demonstration initiatives include research demos (regional partnerships) as well as commercial demonstrations (clean coal power initiative). Deployment will include documentation of best practices, the development of a CO_2 regulatory regime, and advanced technology demonstrations.

Mr. Wright reviewed the spending associated with carbon capture and storage, noting that 39% is associated with private investment. To date, US$1billion has been spent on research, with 60% allocated to regional partnerships.

Phase 1 in the regional partnership produced a regional atlas that identified sources and sinks. As well, a methodology was developed to identify the types and capacities of these sinks. It was determined there are hundreds of years of storage potential. There is a need to match sources of CO_2 with locations of sinks and to build pipelines, where necessary, to connect them. Sources of CO_2 in Canada are near the border with the US, where sinks are located, creating a cross-border opportunity to jointly address carbon capture and storage. The North American Carbon Storage Atlas has been very useful, and ongoing work is needed to develop a minimal data set.

Initiatives under the Clean Energy Dialogue between Canada and the US were reviewed, and they include: the North American Carbon Atlas partnership; CO_2 injection and storage testing; next-generation technologies; development of compatible rules, standards and practices; knowledge-sharing on large-scale CCS demonstration projects; and strategies for public engagement. A roundtable discussion will occur on 10 May (by invitation only), as well as a specific session on Canada/US initiatives, at a CCS conference in Pittsburg.

Initiatives under phase 2 of the regional partnership involve injections of up to 10,000 tonnes of CO_2 into a formation, with 23 different tests. Phase 3 will involve injecting up to 1 million tonnes of CO_2, which will result in output that is in a range closer to that of a typical power plant.

CCS is happening today, although not in an integrated power plant. Initiatives in other countries were reviewed. Norway has imposed a carbon tax on emissions, of $50 per tonne.

Mr. Wright provided an overview of how the stimulus funding is being used to support CCS initiatives, noting that CCS will make a significant contribution to mitigating climate change.

Presentation, "Terrestrial Forest Carbon Sequestration in Canada," by Werner Kurz, Senior Research Scientist, Natural Resources Canada

Mr. Kurz reviewed the role of forests in carbon sequestration and storage, noting that 50% of the dry weight of wood is carbon. He observed that the level of CO_2 has increased by 39% over pre-industrial levels and wondered how this increase in carbon will affect the environment. While

forests remove carbon and store it in wood, forests also release carbon through decomposition and fire. Therefore, there is a need to take an integrated systems approach with carbon and climate change when looking at forests. Land use must also be looked at in a systematic way. If more forests are converted into agriculture, there will be an increase in emissions.

There are competing views with regard to forest management: one is to stop logging, which "robs the carbon bank," and the other is to use wood to tackle climate change. The age of forests must be considered: middle-aged forests have the greatest rate of carbon removal, while the older forests have the greatest rate of storage. Society needs to understand the implications of making choices with regard to forest management.

Mitigating options were reviewed, including reducing deforestation and increasing carbon density.

With regard to carbon-neutral bioenergy, current accounting rules consider emission to occur when biomass is transferred out of the forest. While regrowth removes emitted carbon from the atmosphere, consideration must be given to how long it takes for this removal to occur.

Large-scale increases in demand for woody biomass need to be regarded in the light of a full accounting of changes in policy covering carbon stocks in forests.

The forest sector is well positioned to contribute to carbon mitigation, and a sustainable forest management strategy is essential.

Presentation by José Miguel González-Santalo, Director, Mechanical Systems, Instituto de Investigaciones Eléctricas

Reference was made to International Energy Agency (IEA) studies that concluded we cannot afford not to act on climate change.[3] CCS has to be part of the portfolio of mitigation actions, as it will contribute approximately 20% of the required emissions reduction by 2050.

CCS capture technologies at the pilot plant level were reviewed, including post-combustion, precombustion and oxycombustion. It was noted that none of these technologies captures all the CO_2, leaving 10% outstanding. As well, all of these technologies imply an increase in the cost of electricity.

The emission levels in Mexico are created by power generation, fuel production, industry, transportation and other sources and amount to six tonnes/person/year, of which four tonnes/person/year are generated directly or indirectly from the burning of fossil fuels. As a developing country, Mexico will have to increase its energy consumption in order to increase standards of living. The estimated increase ranges from 2,000 to 8,000 kilowatt-

[3] See <http://www.iea.org/subjectqueries/keyresult.asp?KEYWORD_ID=4106> for an entry into IEA work in this area.

hours/person/year. Energy security requires fuel diversification, and coal and nuclear are the main options for base load. Renewables will not be significant before 2050.

In Mexico, CCS will be needed in the power sector, the energy sector and the industrial sector. The CCS initiatives in Mexico were reviewed: these include memberships in the Carbon Sequestration Leadership Forum (CSLF) and the Global CCS Institute (GCCSI), analysis of a post-combustion CO_2 capture for a coal-fired unit, work by research institutions (the *Instituto de Investigaciones Eléctricas* [IIE] and the *Instituto Mexicano del Petróleo* [IMP]) on CCS technology development and application to enhanced oil recovery (EOR), as well as participation in world-wide co-operation projects (CSLF, North American Energy Working Group [NAEWG]).

Initiatives related to the North American Carbon Atlas were reviewed.

Presentation by Dale Friesen, Vice-president, Aboriginal Relations, Health and Safety, ATCO Group

Mr. Friesen provided an overview of the electricity produced by various technologies, compared conventional coal versus clean coal and identified sequestration locations in BC and Alberta. Reference was made to the government-funded CCS projects in Canada.

Challenges associated with CCS include lower efficiency, liability, regulatory uncertainty, and costs.

The issue of who is liable and for how long was raised and a common view is that "if you inject it, you are responsible for it." Overall, the probabilities of leakage are low.

The economics were discussed and it was determined that costs are about 200% of those of plants fired by supercritical coal. In order to be economical, carbon prices need to be in the range of $70/tonne. The power industry needs to be able to recover both the costs of producing electricity as well as the costs of CCS. It is necessary to evaluate carbon price in relation to electricity price when determining which technologies to use.

Reference was made to the Weyburn Electrical Enhanced Oil Project, where CO_2 was transported from the US to use in enhanced oil recovery. Matching sources and sinks is important in order to ensure efficiency. Green corridors could be developed, and opportunities between Canada and the US were reviewed.

In summary, although 75% of Canadian power is from non-emitting sources, we still have emission reduction targets to achieve. CCS will be one of the solutions. Canadian governments at all levels have committed $1billion to CCS, with five projects underway. Next steps include continuation of discussions on the continental transboundary in relation to CO_2, as well as how green transmission fits into this discussion.

Questions, response and comments

- Rodolpho Lacy: This meeting is to learn more about new technologies and steps to reduce carbon. There is considerable public frustration as there was no agreement in Copenhagen and it appears governments are not taking appropriate responsibility. What is the likelihood of implementing CCS technologies in a more aggressive way? What is the recommendation for government?

- Robert Wright: The US President has established an Interagency Task Force focusing on what it will take to cause deployment of CCS as soon as possible. It will report in six months on three areas of technology, and provide recommendations on policy, regulation and legislation as well as incentives/drivers.

- In the last decade, the US spent $8 billion on CCS initiatives. How much of the Economic Recovery Fund will be used to support CCS projects? What about discrepancies in relation to the information presented by Dale Friesen?
  - Response: The American Recovery and Reinvestment Act will allocate $3.4 billion to CCS and it must be spent by 2014. All climate change technology initiatives have a total budget of $6–$7 billion.

- What do you think about CCS markets for forest projects? Is there feasibility to use this technology in the future?
  - Response: There are opportunities for forestry offsets. Mexico is engaged in discussions on the REDD program (Reducing Emissions from Deforestation and Forest Degradation). Consideration is also being given to how reductions in deforestation can be used as offset funds. Forest projects are complex and raise questions of permanence, leakage, high costs of developing the baseline, and monitoring success. Good progress is being made with the development of protocols. The risk issue is being explored, including the pooling of risks and insuring risks against future losses. Other forest-based technologies may not be easily monetized. Offsets and monetization may not always be the best options.

    The world needs to understand that deforestation is a significant issue.

- Does the Mexican congress understand CCS and would they allocate investment for it?
  - Response: In Mexico, the scientific community is not convinced about the need for CCS. We need all choices and we want to create capacity building. It is controversial whether the Congress will allocate funding. There is some capacity to allocate some resources to specific initiatives but it will take some time to develop a majority consensus. The goals of Mexico would be more aggressive with international support.

Questions from the website

- At what point and how will the private sector be required to integrate CCS in the construction or retrofitting of power production?
  - Response: Significant spending is required in order for the private sector to get involved in CCS. The private sector will only get involved in CCS when the price of carbon is established and this will require the passing of climate change legislation.

    CCS needs to be part of an overall portfolio in order to reach the goal.

- From a North American perspective, what are the opportunities and mechanisms to stimulate reforestation and reduce degradation and what are the opportunities to promote REDD in other countries?
  - Response: Deforestation is a focus in Canada, where there is a loss of 50,000 hectares per year due to deforestation, and an output of 20 megatonnes of emissions. Numbers for these factors are likely higher in the US and Mexico. Reducing deforestation worldwide is recognized as a necessary action as deforestation contributes 18% of total emissions. How best to address deforestation and its impact is being discussed, including the transition toward a sustainable forest management system that assists communities who experience an economic impact as a result of this transition. The worldwide recognition of the challenges associated with deforestation has been important and progress in addressing them is expected.

- Where is natural gas in the equation?
  - Response: CCS will need to be used in natural gas production. None of the companies is willing to sign long-term contracts, due to the variability of the price of natural gas.

- Is there common technology that can be implemented now?
  - Response: The two approaches that can be looked at today are efficiency improvements on the supply side and efficiency on the demand side.

    There is no one silver-bullet technology. We must compare the costs of CO_2 abatement across all technologies. We need to look at all mitigation measures and think beyond carbon in climate mitigation.

- The low-carbon approach to deforestation was interesting. We may take a different view of nuclear if we take into account not just that it is non-emitting but also components such as mining, refining, transportation etc. This speaks to the need for common definitions across the three countries.

Closing Remarks by the JPAC Chair, Glen Wright

Mr. Wright gave closing remarks, noting it was a substantive day, with good input. The update on carbon capture and storage was important in light of 200 years of available coal and the expensive infrastructure associated with coal. It was encouraging to hear about the progress on CCS technology.

The morning discussions on electricity were interesting in light of the fact that society cannot function without an adequate supply of electricity. It is pivotal to the future solutions associated with climate. The forest management presentation was also very informative.

There was good participation from the public both in person and on the Web, which was most appreciated. It is the intention of JPAC to continue to pursue webcast technology. This is the third event that involved webcast technology and we will continue to refine our use of it in future events to promote broader participation.

Mr. Wright thanked Nancy Sutherland and Laurent Benarrous for assisting with moderating the panels and thanked the staff of CEC for their excellent work in organizing the event. He also expressed his appreciation for the work of the audio-visual and translation staff. The presence of government staff from all three countries who attended the meeting was also acknowledged.

The input received today will be used to frame a Letter of Advice to Council.

All presentations will be available on the CEC website and questions can be posed on the website for follow up.

JPAC members were asked to reconvene for a private meeting, following a short break.

The public meeting was adjourned.

Annex A

Commission for Environmental Cooperation of North America

Joint Public Advisory Committee Regular Session 10-01
North America's Energy Market: Aligning Policies and Managing Carbon

The Fairmont Pacific Rim
1038 Canada Place
Vancouver, British Columbia
Tel. (604) 695-5300 • Fax: (604) 695-5301

The objectives of the meeting will be to examine barriers to harmonization and comparability of renewable energy standards and definitions among North America's three countries, as well as to discuss opportunities and challenges for carbon capture and storage technologies.

Draft Provisional Agenda

Wednesday, 24 March 2010

Location:

8:30–8:40 **Welcome and opening remarks,** by the JPAC Chair, Glen Wright

8:40–8:50 **Introductory remarks,** by the CEC Acting Executive Director, Evan Lloyd

8:50–9:10 **Overview of the Electricity Market in North America,** by Craig Sabine, Manager, Energy and Climate, ICF International

- Generation and transmission of electricity in North America
- North American inter-connectivity: exports and imports of electrical power

9:10–10:10 **Energy Policy Coordination in North America**

- Policy coordination and the impact of mismatched policies
- Trade barriers
- Technical barriers

Presenters:
Miguel Breceda Lapeyre, Coordinator, Energy Program, Universidad Autónoma de la Ciudad de México
Jan Hamrin, Secretary General, Environmental Tracking Network of North America (ETNNA)
Marlo Raynolds, Executive Director, Pembina Institute

10:10–10:50 **Panel discussion and Q&A**

10:50–11:00 Break

11:00–12:00 California's Renewable Energy Standards and British Columbia's Hydroelectricity: A Policy Disconnect?

California, by the terms of its Renewable Portfolio Standard, excludes the use of hydroelectric power from projects greater than 30 MW. This would exclude importing energy from some potential hydroelectric projects, such as run-of-river systems, poised to comprise a major portion of British Columbia's "green energy" initiative. This is a significant issue, encompassing both environmental and trade considerations.

Presenters:

Jan Hamrin, Secretary General, Environmental Tracking Network of North America (ETNNA)
Paul Wieringa, Executive Director, Electricity & Alternative Energy Division, Ministry of Energy, Mines and Petroleum Resources, BC
Donald McInnes, Vice Chair and CEO, Plutonic Power
Lawrence Pitt, Associate Director, Pacific Institute for Climate Solutions

12:00–13:00 Panel discussion and Q&A

13:00–14:00 Networking lunch [provided]

14:00–15:00 Carbon Capture and Storage in Canada, Mexico and the United States

Presenters:

- **Trinational overview on carbon capture and storage (CCS)**, by Robert Wright, Senior Advisor, US Department of Energy
- **Terrestrial forest carbon sequestration in Canada** by Werner Kurz, Senior Research Scientist, Natural Resources Canada
- **Presentation** by José Miguel González-Santaló, Director, Mechanical Systems, Instituto de Investigaciones Eléctricas
- **Presentation** by Dale Friesen, Vice President, Aboriginal Relations, Health and Safety, ATCO Group

15:00–16:45 Opportunities and challenges: Panel discussion and Q&A

16:45–17:00 Break

17:00–17:30 JPAC follow-up and administrative matters

- JPAC priorities for 2010 and next meetings

17:30 End of session

Joint Public Advisory Committee Regular Session 10-01
North America's Energy Market: Aligning Policies and Managing Carbon
Vancouver, British Columbia, Canada
24 March 2010
List of Participants

PUBLIC

Adams, Paul
Consultant
Paul Adams Consulting
55 - 678 Citadel Drive
Port Coquitlam, BC V3C 6M7
Canada
Tel: 604 220 2892
Fax: 604 945 4604
e-mail: ptbadams@gmail.com

Allan, Andrew
District Environmental Manager
Peter Kiewit Sons Co.
1410 1111 West Georgia St.
Vancouver, BC V6E 4M3
Canada
Tel: 604 317 6886
e-mail: andrew.allan@kiewit.com

Angove, Linda
Consultant
3045 New St., No. 60
Burlington, ON L7N 3V9
Canada
Tel: 905 634 7377
e-mail: lm.angove@rogers.com

Ballan, Mikael
Design Consultant
Whole Earth Technologies
5555 Short St
Burnaby, BC V5J 1M1
Canada
Tel: 604 438 5099
e-mai: wholeearthtech@shaw.ca

Barlee, Patricia Gwen
Policy Director
Wilderness Committee
341 Water Street
Vancouver, BC V6B 1B8
Canada
Tel: 604 683 8220
Fax: 604 683 8229
e-mail: gwen@wildernesscommittee.com

Bengin, Dale
Policy Advisor
National Round Table on the Environment and the Economy
344 Slater Street, Suite 200
Ottawa, ON K1R 7Y3
Canada
Tel: 613 992 7189
Fax: 613 992 7385
e-mail: admin@nrtee-trnee.ca

Berry, Matthew
Trade Policy Officer
Foreign Affairs and International Trade Canada
2608 St. Andrews St.
Ottawa, ON K1N 5G7
Canada
Tel: 613 944 1569
e-mail: matthew.berry@international.gc.ca

Best, Chris
Manager, Market Services
Trans Canada
450 - 1st Street SW
Calgary, AB T3P 5H1
Canada
Tel: 403 920 2081
Fax: 403 920 2362
e-mail: chris_best@transcanada.com

Brendon, Joe
Project Manager
Syntaris Power
#600 - 999 West Hastings Street
Vancouver, BC V6C 2W2
Canada
Tel: 778 329 9629 x 209
e-mail: bjoe@syntaris.com

Burton, Cynthia
Partner
The Progressive Group
Suite 2694 - 1055 Dunsmuir St
Vancouver, BC V7X 1L3
Canada
Tel: 604 684 1149
Fax: 604 687 0405
e-mail: cynthia.burton@shaw.ca

Cassidy, Paul
Partner
Blake, Cassels & Graydon LLP
595 Burrard Street Suite 2600
Three Bentall Centre
Vancouver, BC V7X 1L3
Canada
Tel: 604 631 3390
Fax: 604 631 3309
e-mail: sylvia.worth@blakes.com

Davis, Steve
Director, Past President
IPPBC
2633 Mathers Avenue
West Vancouver, BC V7V 2J3
Canada
Tel: 604 926 0332
Fax: 604 926 8352
e-mail: svdavis@shaw.ca

Findlay, Ryan
MBA Graduate
UBC
1905 550 Pacific St
Vancouver, BC V6Z 3G2
Canada
e-mail: ryanmfindlay@gmail.com

Gaulin, Jeff
VP, Government Relations
TransAlta Corporation
Box 1900 Station M, 110 - 12th Ave SW
Calgary, AB T2P 2M1
Canada
Tel: 403 267 7543
Fax: 403 267 7939
e-mail: jeff_gaulin@transalta.com

Golds, Elaine
Conservation Chair
Burke Mountain Naturalists
554 Yale Road
Port Moody, BC V3H 3K3
Canada
Tel: 604 937 3483
Fax: 604 937 3483
e-mail: egolds@sfu.ca

Gorton, Jonathan
1573, 10th Avenue
Vancouver, BC
Canada
Tel: 304 816 5300
e-mail: jsgorton@gmail.com

Hardev, Juj
V.P. System Planning & Asset Management
Bonneville Power Administration
Transmission Services
5411 NE Highway 99
P.O. Box 491 – T/Ditt2
Vancouver, WA 98666-0491
USA
Tel: 360 418 8987
e-mail: hsjuj@bpa.gov

Hendrickson, Oliver
Policy Analyst
The Pembina Institute
610-55 Water Street
Vancouver, BC V6B 1A1
Canada
Tel: 604 874 8558 x 227
Fax: 604 677 4662
e-mail: oliverh@pembina.org

Higgins, Patrick
Senior Political & Economic Relations Officer
Consulate General of Canada
1501 Fourth Ave, Suite 600
Seattle, WA 98101-4328
USA
Tel: 206 770 4064
e-mail: patrick.higgins@international.gc.ca

Hill, Aaron
Ecologist
Watershed Watch Salmon Society
114 Rendall St.
Victoria, BC V8V 2E2
Canada
Tel: 250 380 1176
e-mail: hillfish@telus.net

Hoberg, George
Professor
Department of Forest Resources Management
University of Columbia
2045-2424 Main Mall
Vancouver, BC V6T 1Z4
Canada
Tel: 604 822 3728
Fax: 604 822 9106
e-mail: ghoberg@forestry.ubc.ca

Hodgson, Eugene
V. P. Western Region
Corpfinance International
Suite No. 2348 - 666 Burnard St.
Vancouver, BC V6C 2X8
Canada
Tel: 604 699 2464
Fax: 866 417 1719
e-mail: ehodgson@corpfinance.ca

Johnson, Stéphanie
Director, Latin and South America
Environment Canada
200 Sacre Coeur Blvd
Gatineau, QC K1A 0H3
Canada
Tel: 819 934 5189
Fax: 819 997 0199
e-mail: stephanie.johnson@ec.gc.ca

Joos, Marine
Masters Student
UBC
3317 Fleming St.
Vancouver, BC V5N 3V6
Canada
Tel: 514 971 6879
e-mail: joos.marine@gmail.com

Karuja, Paul
Executive Director
Independent Power Producing BC
1230 - 888 Dunsmuir St
Vancouver, BC V6C 3K4
Canada
Tel: 604 568 4778

Kassam, Karim
Director, Corporate & Business Development
Ballard Power Systems
9000 Glenlyon Parkway
Burnaby, BC V5J 5J8
Canada
Tel: 604 412 7921
Fax: 604 412 3100
e-mail: karim.kassam@ballard.com

Koop, Will
Coordinator
BC Tap Water Alliance
3850 W. 8th Ave
Vancouver, BC V6R 1Z4
Canada
Tel: 604 224 4717
e-mail: info@bctwa.org

Kukucha, Stephen
President
Atla Energy
1806 - 1111 West Georgia Street
Vancouver, BC V6E 4M3
Canada
Cell: 778-688-5857
e-mail: skukucha@atlaenergy.com

Lenfest, Rodney
V.P.
Sea Breeze Pacific-RTS
333 Seymour St
Vancouver, BC V6B 5O6
Canada
Tel: 604 689 2991
e-mail: RLL@TRMC.Com

Magnan, Bernard Armand
Assitant Managing
Director and Chief Economist
The Vancouver Board of Trade
400 - 999 Canada Place
Vancouver, BC V6C 3E1
Canada
Tel: 604 681 2111
Fax: 604 681 0437
e-mail: bmagnan@boardoftrade.com

Manson, Paul B.
President & CEO
Sea Breeze Power Corp.
1400 - 333 Seymour St
Vancouver, BC N6B 5A6
Canada
Tel: 604 689 2991
Fax: 604 689 2990
e-mail: paulmanson@seabreezepower.com

Marrone, John
Director General
Natural Resources Canada
1 Haanel Drive
Ottawa, ON K1A 1M1
Canada
Tel: 613 996 8201
Fax: 613 947 2318
e-mail: john.marrone@NRCan.gc.ca

McIlhenney Peters, Kristin
SFU
8950 University High St, No. 322
Burnaby, BC V5A 4Y8
Canada
e-mail: kma42@sfu.ca

McIlroy, Jessica
Project Director
Ocean Renewable Energy Group
14-225 W 14th St
North Vancouver, BC V7M 1P4
Canada
Tel: 604 992 6462
e-mail: project@oreg.ca

McJannett, Loch
Vice President
IPPBC
Suite 1230, 888 Dunsmuir Street
Vancouver, BC V6C 3K4
Canada
Tel: 604 315 1530
Fax: 604 568 4724
e-mail: lochmcjannett@ippb.com

Mersereau, Blaine
Manager
Encana Corporation
1800, 855 - 2nd Street SW
Calgary, AB T2P 2S5
Canada
Tel: 403 819 2080
e-mail: blaine.mersereau@encana.com

Miners, Jill
Student
UBC
409-1873 Spyglass Place
Vancouver, BC V5Z 4G6
Canada
e-mail: jminers@interchange.ubc.ca

Murphy, Geoff
Director, Business Office
Natural Resources Canada
1 Haanel Drive
Ottawa, ON K1A 1M1
Canada

Pacheco-Vega, Raúl
Director, Regional Western Canada
CIELAP
422 Richard St.
Vancouver, BC V6B 2Z0
Tel: 604 875 0544
e-mail : raul@cielap.org

Pataky, Julius
Vice President
Sustem Planning & Asset Management
BC Transmission Corporation (BCTC)
Suite 1100, Four Bentall Centre
1055 Dunsmuir Street
Vancouver, BC V7X 1V5
Canada
Tel: 604 699 7399
Fax: 604 699 7471
e-mail: julius.pataky@bctc.com

Reimer, Don
President
D.R. Systems Inc.
2595 McCullough Road
Nanaimo, BC V9S 4M9
Canada
Tel: 250 760 1070
Fax: 250 760 1071
e-mail: dreimer@drsystemsinc.com

Ricker, Britta
PhD Student
Simon Fraser University
Vancouver, BC
Canada
e-mail: brittaricker@gmail.com

Rogers, Robert
Principal
R. John rogers & Associates
#125-3751 Jacombs Road
Richmond, BC V6V 2R4
Canada
Tel: 604 244 1895
Fax: 604 244 1897
e-mail: jrogers@e-provent.com

Rother, Patrice
Manager
Environmental Strategy
BC Hydro – Safety, Health & Environment
6940 14th Ave.
Burnaby, BC V3N 1Y9
Canada
Tel: 604 528 2024
e-mail: patrice.rother@bchydro.com

Sanderson, Ronald
Manager
Business Development
ENMAX Corporation
350-1066 West Hastings St.
Vancouver, BC V6E 3X1
Canada
Tel: 604 443 6460
Fax: 604 443 6444
e-mail: rsanderson@enmax.com

Scott, John
VP Commercial Operations
Naikun Wind Development Inc.
1705 - 1066 West Hastings St.
Vancouver, BC V6E 3X1
Canada
Tel: 604 631 4490
Fax: 604 685 4215
e-mail: jscott@naikun.ca

Shaw, Judy
Gouvernment and Public Affairs Director
Syngenta
140 Research Lane
Guelph, ON N1G 4Z3
Canada
Tel: 519 837 5328
Fax: 519 836 4032
e-mail: judy.shaw@syngenta.com

Simmons, Terry
President
Centre for Global Policy Studies
42 - 1507 West 12th Avenue
Vancouver, BC V6N 2E2
Canada
Tel: 604 734 1700
e-mail: terry@environment-lawyer.com

Simpson, Scott
Reporter
Vancouver Sun
1-200 Granville St.
Vancouver, BC
Canada
Tel: 604 605 2178
e-mail: ssimpson@vancouversun.com

Smith, Ben
Project Officer
Natural Power
1566 West 6th Ave
Vancouver, BC V6J 1R2
Canada
Tel: 604 687 5055 x104
e-mail: bens@naturalpower.com

Stothert, Winston
Chairman, Relabas Research Inc.
1107-2222 Bellevue Ave
West Vancouver, BC V7V 1C7
Canada
Tel: 604 922 9652
Fax: 604 922 9652
e-mail: wstothert@shaw.ca

Treasure, Terry
Electrical Consulting Engineer
Sandwell Engineering Ltd
824 Massey St.
New Westminster, BC V3L 4S9
Canada
e-mail: treasure@telus.net

Trombetti, Stefania
Director, International Affairs
Natural Resources Canada
580 Booth Street
Ottawa, ON K1A 0E4
Canada
Tel: 613 996 0266
Fax: 613 943 8811
e-mail: stefania.trombetti@nrcan.gc.ca

Weimer, James
President
Weimer Consulting
4006 Yew St.
Vancouver, B.C. V6L 3B6
Tel: 778 388 2047
e-mail: jweimer@telus.net

Woodruff, Janet
Interim President
BC Transmission
1100 Four Bentall Centre
1055 Dunsmuir St
Vancouver, BC V7X 1V5
Canada
Tel: 604 699 7600
e-mail: janet.woodruff@bctc.com

PRESENTERS

Breceda Lapeyre, Miguel Gerardo
Coordinador del Programa de Energía
Universidad Autónoma de la Ciudad de México
San Lorenzo 290, Col del Valle
México, D.F. 03100
México
Tel: (52) (555 488 6661 X 15501
e-mail: mibreceda@prodigy.net.mx

Friesen, Gregory Dale
Vice President, Aboriginal Relations, Health and Safety
ATCO Group
800-919-11th Ave. S.W.
Calgary, AB T1R 1P3
Canada
Tel: 403 209 6070
Fax: 403 209 6915
e-mail: dale.friesen@atco.com

González Santaló, José Miguel
Director Tecnico
IIE
Reforma 113 Col. Palmira
Cuernavaca, Morelia 62490
México
Tel: 52 777 362 3829
Fax: 52 777 362 3830
e-mail: gsantalo@iie.org.mx

Hamrin, Janice
CEO
HMW International
359 Molino Ave
Mill Valley, CA 94941
USA
Tel: 415 388 1352
Fax: 415 388 4808
e-mail: janhamrin@hmwinternational.com

Kurz, Werner
Senior Research Scientist
Global change and Landscape Ecology
Natural Resources Canada
Canadian Forest Service
506 West Bunside Road
Victoria, BC V8Z 1M5
Tel: 250 363 6031
Fax: 250 363 0775
e-mail: wkurz@pfc.cfs.nrcan.gc.ca

McInnes, Donald
Vice Chair & CEO
Plutonic Power Corporation
Suite 600 – 888 Dunsmuir Street
Vancouver, BC V6C 3K4
Tel: 604 669 4999 ext. 1002
e-mail : janice.elliott@plutonic.ca

Pitt, Lawrence
Associate Director
Pacific Institute for Climate Solutions
Box 1700 STN
CSC University of Victoria
Victoria, B.C. V8W 2Y2
Canada
Tel: 250 852 3676
Fax: 250 853 3597
e-mail: lpitt@uvic.ca

Raynolds, Marlo
Executive Director
The Pembina Institute
219 – 19th Street NW
Calgary, AB T2N 2H9
Canada
Tel: 403 269 3344
Fax: 403 269 3377
danas@pembina.org

Wright, Robert
Senior Advisor
US Department of Energy
1000 Independence Ave., SW
Washington, DC 20585
Tel: 202 586 5000
e-mail: Robert.Wright@hq.doe.gov

Sabine, Craig
Manager
ICF International
277 Wellington St W
Toronto, ON M5V3E4
Canada
Tel: 416 341 0045
Fax: 416 341 0383
e-mail: csabine@icfi.com

Wieringa, Paul Roelof
Executive Director
Alternative Energy Branch
Ministry of Energy
Mines and Petroleum Resources
PB Box 9314 Stn Prov Govt
Victoria, BC V8W 9N1
Canada
Tel: 250 952 0243
Fax: 250 952 0258
e-mail: Paul.Wieringa@gov.bc.ca

JPAC MEMBERS

Alanís-Ortega, Gustavo
President
Centro Mexicano de Derecho Ambiental
Atlixco No. 138 Colonia Condesa
México, D.F. 06140
México
Tel: 555 286 3323 ex.13
e-mail: galanis@cemda.org.mx

Benarrous, Laurent
Vice-président exécutif
Jones Lang LaSalle
1 Place Ville Marie, Bureau 2121
Montreal, QC, H3B 2C6
Canada
Tel: 514 667 5659
Fax: 514 849 6919
e-mail: Laurent.Benarrous@am.jll.com

Correa Sandoval, Adriana Nelly
Profesor Investigador
Centro de Calidad Ambiental - ITESM Campus Monterrey
Bureau 2121
Monterrey, NL 64849
México
Tel: 52 818 328 4032
Fax: 52 818 359 6280
e-mail: ancs@itesm.mx

Desai, Dinkerrai
Environmental Coordinator
U. S. Army Material Command
Directorate of Public Works, Bldg 173
Fort Monmouth, NJ, 07703
USA
Tel: 732 532 1475
Fax: 732 532 6263
e-mail: Dinkerrai.Desai@us.Army.Mil

Gutiérrez Lacayo, Martín
Director General
Pronatura México, A. C.
Aspérgulas 22 (antes Pino)
Col. San Clemente
México, D.F. 01740
México
Tel: 555 635 5054
e-mail: martingutierrez@pronatura.org.mx

Lacy, Rodolfo
Coordinador de Programas y Proyectos
Centro Mario Molina
Paseo de los Laureles 458, despacho 406
Col. Bosques de las Lomas
México, D.F 05120
México
Tel: 559 177 1670
e-mail: rlacy@centromariomolina.org

Marquez, Rafael
Commissioner
Texas Commission on Environmental Quality
2906 Victoria Cove
Round Rock, TX, 78664
USA
Tel: 512 239 5515
e-mail: rmarquezesp@aol.com

McDonald, Patricia
Consultant
847 E. Wild Rye Drive
Jackson Hole, WY 83014
USA
Tel: 307 734 2758
Fax: 307 734 2758
e-mail: pattyamcdonald@earthlink.net

Sandoval, Carlos
President
Consejo Nacional de Industriales Ecologistas
Gabriel Mancera No. 1141, Col. del Valle
México, D.F. 03100
México
Tel: 52 555 559 3611
Fax: 52 555 575 2337
e-mail: ecologia@conieco.com.mx

Southern, Nancy
President & CEO
ATCO
16th Floor - 909, 11th Avenue SW
Calgary, AB T2R 1N6
Canada
Tel: 403 292 7434
e-mail: nancy.southern@atco.com

Wright, Glen
Chairman
PrinterOn Corporation
221 McIntyre Drive
Kitchener, ON N2R 1G1
Canada
Tel: 519 504 5363
e-mail: gwright@gpark.ca
JPAC Chair for 2010

CEC STAFF

Anghel, Cezar
Network Administrator
Commission for Environmental Cooperation
393, rue St-Jacques Ouest, suite 200
Montreal, QC H2Y 1N9
Canada
Tel: 514 350 4300
Fax: 514 350 4314
e-mail: canghel@cec.org

Lloyd, Evan
Acting Executive Director / Director of Programs
Commission for Environmental Cooperation
393, rue St-Jacques Ouest, suite 200
Montreal, QC H2Y 1N9
Canada
Tel: 514 350 4300
Fax: 514 350 4314
e-mail: mvulpescu@cec.org

Morin, Jocelyne
JPAC Assistant
Commission for Environmental Cooperation
393, rue St-Jacques Ouest, suite 200
Montreal, QC H2Y 1N9
Canada
Tel: 514 350 4300
Fax: 514 350 4314
e-mail: jmorin@cec.org

Orozco, Marcela
JPAC Liaison Officer
Commission for Environmental Cooperation
393, rue St-Jacques Ouest, suite 200
Montreal, QC H2Y 1N9
Canada
Tel: 514 350 4300
Fax: 514 350 4314
e-mail: morozco@cec.org

Paz-Miller, Liliana
Meeting Services Coordinator
Commission for Environmental Cooperation
393, rue St-Jacques Ouest, suite 200
Montreal, QC H2Y 1N9
Canada
Tel: 514 350 4300
Fax: 514 350 4314
e-mail: lpmiller@cec.org

Powell, Keith
Program Manager, Information Services
Commission for Environmental Cooperation
393, rue St-Jacques Ouest, suite 200
Montreal, QC H2Y 1N9
Canada
Tel: 514 350 4300
Fax: 514 350 4314
e-mail: kpowell@cec.org

Stoub, Jeffrey
Publications Manager
Commission for Environmental Cooperation
393, rue St-Jacques Ouest, suite 200
Montreal, QC H2Y 1N9
Canada
Tel: 514 350 4300
Fax: 514 350 4314
e-mail: jstoub@cec.org

Viadas, Eduardo
Media liaison
Commission for Environmental Cooperation
393, rue St-Jacques Ouest, suite 200
Montreal, QC H2Y 1N9
Canada
Tel: 514 350 4331
Fax: 514 350 4314
e-mail: eviadas@cec.org

LOGISTICS

Antunez, Gloria
Interpreter, Boadella English Services
e-mail: boadella@terra.com.mx

Boadella, Rosa María
Interpreter, Boadella English Services
e-mail: boadella@terra.com.mx

Cerf, Edna
Interpreter, Boadella English Services
e-mail: boadella@terra.com.mx

Copeland, Matthew
Technician, ISI Global Webcasting

Levesque, Helene
Interpreter, Boadella English Services
e-mail: boadella@terra.com.mx