Developing Sustainable Energy Policy Workshop 2006

PARTICIPANTS PERSPECTIVE STATEMENTS

Pierre Rivard

Chairman, Hydrogenics

Over the years, Canada has emerged as a global leader in hydrogen and fuel cell technology and products, offering a long term solution to climate change effects caused by energy-related carbon emissions. This 'made in Canada' solution, which has had the benefit of government program support over many years, is quickly maturing from the laboratory to real world applications, starting with early adopting markets. A primary issue faced by this technology, as it seeks commercialization, is the fact that it is a disruptive technology, forced to play on a field that is not level against entrenched incumbent technologies. Policy can play a key role in levelling that field and stimulating demand for hydrogen and fuel cell products, in a way that achieves outcomes while sharing the risk across all levels of government, industry and early adopting customers. Policy-driven instruments are also required to help ensure that R&D for hydrogen and fuel cells is adequately financed, in proportion to other energy technologies. Meanwhile, various global jurisdictions are aggressively funding new programs and initiatives. Canada's leadership in this field may soon come into question, potentially having a direct impact on the extent to which the country, its people and industry stakeholders can benefit.

Bryan Swift

Director of Environmental Activities, General Motors Canada

GM has established an aggressive near, mid and long-term plan to develop and bring to market technologies to improve fuel efficiency, reduce emissions and provide additional value and benefits to our customers. This includes enhancements to conventional internal combustion engine technology such as Active Fuel Management (AFM), alternative and flex-fuel vehicles. GM currently has hybrid electric drive technology for buses and full-size pickup trucks and an affordable small hybrid SUV in the market today, with introductions of a wider range of hybrid products planned over the next few years. Another key factor influencing total CO2 emissions from a vehicle is the type of fuel used. For example, the use of E85 ethanol from cellulose reduces CO2 emissions by up to 86 percent vs. gasoline in a well-to-wheels comparison. GM currently has 1.5 million flex fuel vehicles on the road in North America and will have nearly 2 million by the end of 2006. Longer term, GM is investing in hydrogen fuel cell development, which offers the opportunity to eventually eliminate CO2 and pollutant air emissions from motor vehicles, when hydrogen from renewable sources is available. This is a balanced approach to marketplace competitiveness and environmental responsibility through technological leadership.

Maurice Hladik

Director of Marketing, Iogen Corporation

Cellulose Ethanol is Ready to Go.

Over the past 30 years Iogen has been developing the technology to convert biomass such as wheat straw, corn stover, switchgrass, hardwood or other biomass materials into cellulose ethanol.

Since April 2004 the company has been producing ethanol from wheat straw by the tanker truck load at their six story, first of its kind demonstration facility in Ottawa.

Funding to date for the R & D has primarily come from the private sector, including, Royal Dutch Shell, Petro Canada, and Goldman Sachs. Canadian government funding has also been instrumental in developing the technology.

Substantial quantities of straw have been contracted in both Western Canada and also in Idaho for a first commercial cellulose ethanol facility with construction start up anticipated in late 2007.

Beyond this, Iogen and a handful of other companies in the field expect the full roll out of the industry to be underway in half a decade. The US Department of Energy is predicting that by 2025, 25% of transportation fuels in the US will come from biomass. This is about 50 billion gallons of ethanol or nearly ten times current corn ethanol production.

Canada will also be an important player as will other countries with extensive agriculture or large marginally productive land masses.

Mike Brown

Executive Director and Chairman, Chrysalix Energy Ltd.

While I am a strong believer in the ability of capital markets to anticipate change, and I have worked in those markets with climate change as a sub theme for nearly 20 years, it is obvious that such anticipation has not occurred to date. I believe this is in part because capital markets are by necessity driven by maximizing returns especially from equity investment, and there is little consciousness in major institutions of what is about to happen. It's too far distant, too "iffy' (the skeptics have done their work very well), and the US has seemingly turned a blind eye. Kyoto has failed (and would be scientifically irrelevant even if it succeeded). Environmental groups have no new news: just more of the same, and they are discounted extensively.

In fact, I believe that if the only factors at work were human, there would be little chance of turning this huge ship around without a string of cataclysmic disasters. But it seems that in the last few months even, the threat of the permafrost letting go has become more than a worry, and new estimates of its scale, while studied hardly at all, are so overwhelming that within the next few years when more good work is done, and when this is combined with other revelations (such as from the Intergovernmental Panel on Climate Change (IPCC) report due in February), it will all be quite hard to ignore.

Somewhere in there a "breakdown of denial" might take place, meaning that the preponderant concern in a preponderance of countries will be to recognize the inevitability and ghastly outcome. Politicians are not standing up well to the opportunity to lead; but I believe there is a strong likelihood that events will overtake them, and we can expect a massive change in attitudes towards taxes, regulations, and fiscal policies to tackle the issue, notwithstanding the concern there will be about present standards of living.

I think there's a chance that investing institutions will see this could happen, and will change course. There would be impacts on the cash flows & profits of just about anything focused on producing or using carbon. California's groundbreaking new laws (and lawsuits) will proliferate, changing the WTO and other rules to cause countries to comply. Banks will worry about portfolios full of loans to exploit difficult-to-produce oil, and so forth. Innovation will take root on massive scales.

In other words, the greed threshold of big money players will become part of the equation. Hedge funds will arbitrage their way through the detritus of what are about to become yesterday's companies - the ones who don't adapt. Subsidies will abound. Project financing will be easier to obtain for solar/wind farms or the introduction of new technology and so forth. It will be wrenching, but the capitalist money system, which has stood up to challenges like this so well, will possibly do it again. If it doesn't then there is little chance for my grandchildren's' children to live a normal life.

Graham Campbell

Director General, Office of Energy Research and Development, Natural Resources Canada

Emerging Transportation Technologies: Considerations to Guide Energy R& D

The transportation sector is characterized by very rapidly-growing demand, locally-evident environmental impacts, and a rapid pace of technology turnover. In Canada, the multiple point sources that make up this sector contribute over 25% of our emissions account.

Many new technology pathways are opening up, which offer promising solutions. NRCan's current portfolio is broad - biofuels, particulates, hydrogen and fuel cells, covering the "Hydrogen, Hybrids and Husks'" topics in this conference - and also work on lightweight materials.

Filling in the canvas are two other emerging technologies - Plug-in Hybrids and pure Electric Vehicles. Well-to-Wheel analyses are positive, provided the charging current comes from low-emission sources. But the technologies are not quite ready, except for certain niche applications - for example, batteries are costly, heavy and have inadequate capacity at present. R and D challenges are significant, warranting new investment.

Taken together, this emerging suite of new technologies offers the promise of a greener transportation future, characterized by a greener and far more diversified suite of fuels and platforms.

Faced with this opportunity, the challenge for the R and D manager is to bring technology solutions to a state of readiness, through development and pre-commercialization work on a portfolio of emerging technologies matched to prospects in domestic and foreign markets.

Jaret Henhoeffer

General Manager, Perth Community Futures

Setting the stage – key assumptions based on a multitude of sources:

- Global demand for energy will continue to grow at historical rates (see India and China projected demand rates).
- Supply of 'low-cost' fossil fuels for transportation and conversion to electricity will peak this century (some argue has already peaked depending on coal, natural gas or oil)
- Result is an increase in the price of energy globally – this long-term trend will experience significant ups and downs depending on new discoveries, global events affecting energy (ex. war in Middle East), etc…
- Investments in alternative energy research and large-scale production will dramatically reduce the price of renewables and other new forms of energy (ex. European investments in wind have brought price/kwh from $0.30 to $0.06-0.10 in recent decades). One should not dismiss truly 'clean' fossil fuels – ex. gasification of coal produces a much cleaner source of energy, however it is only economical at higher energy prices – coal reserves in North America are relatively abundant versus oil/natural gas.
- Historical and future competitiveness and success of societies is reliant on their ability to provide affordable, sustainable energy – ie. Ontario is increasingly facing a potential disadvantage to Alberta (oil and growing

renewables), and Quebec (significant elevation drops for low-cost hydroelectric generation close to major metropolitan areas (ex. Montreal/Quebec City corridor) – as a result, the price of energy is becoming as significant as labour shortage and US$ in determining the success of Ontario's manufacturing job retention (and is becoming critical in attraction)

- Ontario has significant potential advantages in renewables – land, wind, highly efficient agriculture industry and majority of productive arable acreage in Canada (for production of energy crops and receiving of waste processed to organic fertilizer or similar), proximity to market, manufacturing/engineering expertise – that could translate into market leadership in North America
- Renewable Energy and Biofuels markets are hot on Bay Street, Wall Street and large energy conglomerates (income funds, LSVCCs, EPCOR, TRANSALTA, BP, etc

Political considerations:

- Kyoto in Canada – provincial and federal positions
- Green vote current and future size
- Provincial vs. federal vs. municipal jurisdictions
- Historical policy and regional differences – ex. NEP, Hibernia, CRCE
- Cross ministry implications – ex. environment, agriculture, energy, economic development and trade, research and innovation, all must be pursuing consistent policy/programs/messages

Political Opportunity:

It is the opinion of this writer that there exists a unique, time sensitive opportunity for the right politician(s) to deliver a major national/provincial breakthrough in this area. The scale would be equivalent to JFK's 'we must put a man on the moon this decade' type of magnitude… the public is ready, governments are already going in this direction on an ad-hoc basis (ex. ethanol growth fund and mandate, shutting down coal, restructuring energy and encouraging renewables through SOC and other actions, investing in biogas through OMAFRA RED program).

The key to success in this case would be in making your jurisdiction on the forefront around the globe in bio-fuels/renewable energy and environmental industry – ie. California and Eastern Europe have been branded hotspots for environmental policy and economy – the results include jobs in Denmark in the wind industry that exceed the automotive jobs in Ontario (on a comparable per capita basis), improved farm profitability in Germany, Austria and Denmark due to 'set-aside' energy crop payments, high-growth of ethanol industry in US starting to impact corn prices.

Another good example is Sweden's commitment and plan to be fossil fuel free by 2015, a plan that they are set to achieve and have been working on since mid 70's.

The vision (and key metrics of success) would include:

- Ability to attract and retain the best scientists, researchers, engineers and commercialization people on the planet to Ontario
- Willingness to invest resources into R&D (like nuclear industry investment years ago)
- Commercialization start-ups and successes
- Good jobs created – ex. new solar plants, biogas plants, ethanol, biodiesel and spin-off jobs (similar to automotive creates spin-offs in local manufacturing and down the value chain – ex. transmission connections, design, automation, mtce and operations)
- Agriculture industry revenues (wind, biomass, corn for ethanol, biodiesel fuels, flax replacing fiberglass)

Tools to implement:

- Funding for R&D – real funding not just dribs and drabs – creation of highly visible around the globe centres of excellence like Perimeter Institute is in physics
- Funding to fund early stages of industry development – this is critical, when Denmark committed to paying well above market prices they ate the higher energy costs with a vision of creating a wind industry complete with jobs and ever lower costs/kwh as the energy developed – other countries came along behind but their willingness to fund it led to early industry leadership and jobs
- Funding for agriculture to produce energy – agriculture industry is looking for ways to be profitable long-term and seeking additional and changed funding mechanisms, rather than year to year emergency programs and never ending changes to funding programs by each new government, fund agriculture to grow energy and be environmental stewards (corn/sweet potato for ethanol,
- Kenola/rapeseed for biodiesel, silage for biogas, etc….) – this fundamental shift removes the negative 'subsidy/handout' to farmers perception that is not good for government or the farmer and instead positions them as solutions to environmental and energy problems in the future
- Regulatory changes at various ministries and prioritization to speed up the policy and procedures to enable the change to happen – two examples – the Ministry of Environment is only painfully slowly moving to support waste to energy technologies and biogas technologies that are standard in Europe and recognized as solutions to problems like the Toronto garbage to Michigan debate. A second example is the 'pro-nuclear and centralized electrical generation' culture that permeates Hydro One and bureaucracy at Ministry of Energy – that utilizes long queues, high service costs, an

unwillingness to consider line upgrades and more as tactics to stall, delay and discourage smaller generators, private generators and renewable energy generators despite the gov't mandate to make it happen.

About the Author:

Jaret Henhoeffer is the General Manager of the Perth Community Futures, a rural commercialization and economic development non-profit, a founder and Vice-Chair of Countryside Energy, Director of STEMERGY (an emerging bio-fibre and bio-fuels company), Director of Mornington Communications, and more.

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Dave Riddell

Associate Vice-President (Physical Plant and Capital Planning),
University of Western Ontario

Energy Conservation Initiatives: Where energy is taken seriously

Energy consumption at the University of Western ranks very low in the statistical evaluation at 1.87 GigaJoules per square meter versus 2.19 provincially and 40 GigaJoules per student versus 56 provincially.

- Encompassed in facility growth of 11% annually over the past 4 years has been a targeted approach to efficiency that has seen energy consumption growth of only 8.5%
- Ownership and monitoring of energy usage and costs is important in Physical Plant Facility Design and operational organization
- Outreach and communication programs are targeted towards academic faculty and students
- Current program underway for residential energy saving challenge involving promotion, monitoring and measurement of consumption in student residences
- Installation of sub-meters on buildings (chilled water, electricity) for consumption analysis. Monitoring means more than numbers with measurement values providing direction to targeted areas of efficiency and reduction of usage
- Maintenance standards have been created to enhance applications to higher efficiency i.e. high efficiency motors, T5/8 lighting, electronic ballasts
- New construction specifications set to Green Buildings and LEEDS criteria and implementation of energy efficiency technologies
- State of the Art technologies are investigated and applied where applicable:
- Hartmann Loop technology for district cooling proving the methodology and control mechanisms to achieve greater than 45% energy savings

- All new construction is designed to exceed ASHRAE 90.1 requirements
- Adoption of heat recovery systems, especially where high volumes of fresh air is required
- T5 lighting technology specified in new construction applications
- Rotational load control and load displacement capacity targeted for end uses where client disruption can be minimized: heating, lighting, cooling, ventilation.
- Western Environmental System (WES) features thousands of monitoring and control points throughout the campus allowing precise monitoring, measurement, and scheduling of HVAC systems, including night set back and summer/winter changeover
- Energy management plans are established in cooperation with energy experts and cooperation with government and utility programs: current targets include 10% yearly energy use reduction Involving summer critical periods for 15% and shoulder and winter months averaging 7 -8 %
- Central utility plant metering provides measurement data of basic utilities and evaluation of plant efficiencies and processes for district heating and cooling
- Strategic development and growth undertaken capturing a theme emphasizing the notion of a Western Energy Efficiency Park
- Western offers courses related to sustainability and is involved in considerable research related to Green Technology
- On-Site co-generation is being evaluated

Tyler Hayes

PhD Candidate, Geophysics & Scientific Computing,
University of Western Ontario

When travelling abroad one encounters the works of our Roman forefathers throughout Europe, many of which are still in use today. From aqueducts, bridges, coliseums, and roads, their legacy is found everywhere. To the Romans, civilization was made possible by these roads, allowing each succeeding Caesar to further add to the glory of Rome. Two thousand years later, and we are still building roads for future generations. Although the roads we build are not hewn from living stone, they will yet lead future generations to a better society.

General Comments on the Panels

The agenda for the workshop contains five crucial components to affect positive change: market-based solutions for reducing carbon, energy policy proposals which include the climate as a guiding principle, hedging our energy sources through effective diversification, a pragmatic discussion of alternative fuel sources, and re-examining our pre-conceived, non-sustainable notions of energy use. Each of which, on its own, cannot be considered a panacea for the ills of a

feverish planet yet, when acting together, will realize the necessary synergies for real change.

The broad scope of the panel discussions ensures that the resultant policies, although provincial in application, will be global in impact.

Specific Comments on the Panels

Bringing the panellists and the participants together is only the first step on the path to a low-carbon society. The second step requires that we deliver informed and effective policy. To create informed and effective policy, vigilance is required so that we do not stumble and arrive at iatrogenic solutions, a cure worse than the disease.

Effective diversification of our energy sources requires that we find solutions indigenous to the region. Wind-farms, for example, can be quite effective in complementing other, pre-existing low emission energy solutions; however, creating wind-farms for the sake of appearing “green” misses the point.

Creating wind-farms where coal plants must run on standby as a back-up on calm days is equally egregious. Unless a wind-farm can be shown to be truly viable for the region, we should avoid their construction. When discussing alternative fuel sources we must strive to keep the goal in mind, i.e., to reduce carbon emissions. Making an alternative source of carbon to burn has strayed from the path.

Although bio-fuels may reduce foreign dependence on oil, we must ask ourselves if it effectively reduces carbon emissions, both directly and indirectly, and is it even viable at the provincial scale? There are no easy solutions. One thing is clear, society must change its habits and endeavour to become a truly sustainable society today, lest we bequeath to our sons a daughters a culture of waste tomorrow.

Epilogue

The motto of Western is Veritas et Utilitas. If our Roman forefathers who built an empire with roads were around today to witness these paths being built to affect policy change, they would have thought our motto was Veritatem et Utilitatem Efficacem Reddere: To Put Truth and Usefulness Into Effect.

Valete!

Patrick J. Boyer
Chair of Education, Breakout Educational Network

Powershift: Electricity Politics and the Transformation of Ontario is the title of my forthcoming book from Breakout Educational Network which will examine responsible government and democratic accountability using Ontario Hydro, from its inception in 1905 through its successor companies today, as a century-long case study in the strengths and limits of parliamentary self-government.

A 'powershift' occurs when institutions and the behaviours born of them change so fundamentally that we are forced, for the sake of continuity in society and perhaps even for survival, to find new ways of functioning economically and operating politically.

Such a fundamental change is now remaking the province of Ontario.

This powershift has involved a number of stages with the emergence of an electricity economy, followed by the development of new structures to govern this phenomenon, leading to transformation over time of the traditional role of the province's parliamentary institutions and their decreasing capacity to maintain democratic accountability over this system, resulting increasingly in immeasurable environmental risks and uncertain economic operation of Ontario's electricity economy in general and Ontario Hydro in particular, finally culminating in the system's demise through a blend on one hand of Hydro's own long-term self-destructive activity and on the other hand of externally-imposed havoc driven by a government's ideology that disliked public ownership and eschewed market regulation.

It took a century.

Over that time, the two institutions at the epicenter of this powershift were The Hydro-Electric Power Commission of Ontario and the Ontario Provincial Parliament. Changes – sometimes dramatic, sometimes imperceptibly gradual – in the behaviours associated with these interconnected institutions governed the course of economic, social, political and even cultural conduct for most Ontarians over most of the twentieth century.

The more people took actions in relation to one or other of these institution's structures and requirements, the more their behaviours became deep-seated, from a reliance on electricity increasing to the point of total dependency, to reliance on elected representatives to provide the democratic accountability for Hydro inherent in our system of Responsible Government. In both we see a degree of reliance that became detrimental, since it was based on a trust that exceeded realism.

Yet because our lives do take shape around these institutions and the thought patterns and expectations we develop in relation to them, breaking up Hydro did not entail merely some corporate reorganization. It touched the actions, thinking, expectations, planning – the very lives – of some 14 million people.

The triumphs of Hydro became the triumphs of Ontario itself. The province could not have become the success story it epitomized throughout the twentieth century without its electricity economy. During these years Ontario Hydro and the Provincial Parliament fitted together like a hand in a glove, but most of the time it was hard to tell which was wearing the other. Each institution believed it was running the province, when in fact, ultimately, neither was. The good intentions gone disastrously wrong could only have reached their extended forms of environmental, economic and commercial madness in a system without accountability.

Hydro is gone.

Ontarians now are in the midst of finding new ways to function economically and operate politically in the bleak uncertainties of the post-Hydro era. Individually and collectively, we are more beholden to the electricity economy than ever. Our imperative is to have electricity. Reliable supplies of low-cost power were available under Hydro for so long that few could imagine a day – which is where we are now – when it could not be taken for granted.

The book *Powershift* considers three dimensions of this phenomenon. First, with electricity supplies not matching demand while the stranded debt from Ontario Hydro continues to grow despite monthly debt retirement contributions from customers, Ontarians will have to *power down and pay up*. This is the **personal dimension** of powershift that citizens face individually and in their organizations. A conservation and energy efficiency drive, combined with higher financial payments as well as 'paying up' for environmental consequences of energy use especially in the nuclear field, will see Ontarians forfeit our status of greatest per capita electricity users on the planet.

Second, the transition in Ontario from times when large supplies of low-cost electricity fuelled economic development and gave industries a competitive edge, to the present state of electricity costs often being higher in Ontario than elsewhere, is one of several factors contributing to a powershift for Ontario in relation to other jurisdictions. This is all about *relative strength*, and is the **economic dimension** of powershift for a province becoming less and less the dominant juggernaut of the Canadian economy and political system it was for much of the 20th Century.

A third aspect of powershift relates to the transformation over time of the institutions and practices for operating what the Constitution requires as Responsible Government. While the long-term consequences of a public monopoly having immunity from legislative oversight, public audit, legal redress and

democratic accountability show up most dramatically in the case of Ontario Hydro, closer examination shows that Hydro's increasing crises were in fact the symptom of a much deeper problem.

That problem is entwined with Ontario's unique political culture, the extensive structure of a system of 'parallel government' in the province (through crown corporations, agencies and special purpose bodies), and a behavioural incapacity to function in an accountable way that is systemic rather than sporadic. A systemic form of accountability involving the citizens' elected representatives can normalize overseeing and reporting on operations so that breakthroughs and mistakes alike can be recognized early and course corrections made in a timely fashion – either before opportunities are lost or mistakes compounded. This requires a more mature form of parliamentary democracy to evolve in Ontario, and this is the **political dimension** of powershift.

Ontarians going forward will either choose a new theory of representation suited to a contemporary self-governing democracy, or will support a major overhaul to upgrade existing functions of elected representatives and parliamentary institutions so we can realize in practice of democratic accountability its much-vaunted theory. Anyone familiar with the energy sector in Ontario will understand, profoundly, why the status quo on the political front is not sustainable, why a powershift in the political institutions and practices of the province is in the cards.

The thesis of *Powershift* relates to the Low-Carbon Society Workshop in two ways. One is that the necessary shift by citizens in patterns of electricity use, both individually and in the organizations they run or work for, may be greatly facilitated by development of viable, more energy-efficient and cost-effective low-carbon energy resources.

The second is that the political dimension of Ontario's current powershift frames the prospects for actually achieving a Low Carbon Society here. The relationship between citizens and elected representatives in the practice of Responsible Government is highly relevant, because sooner or later government in particular and citizens in general become involved with new proposals from scientists and new propositions from entrepreneurs who seek to apply the science and sell the product.

Moreover, research and development of new technologies for energy use, in Canadian society and under our political system, invariably involve a role for government and citizens. It is therefore important for anyone seeking to advance the low-carbon agenda to include citizens and institutions of democratic self-government in their scenarios for getting to a low-carbon future from here – since having the vehicle is little use if there are no passengers.

Andrew T. B. Stuart
Chairman, Sustainability Shift Inc.

A Perspective on Developing Sustainable Energy Policy

There are tremendous opportunities and challenges facing the world and Canada today. Among the highest of these include a path to sustainable energy – the topic of our workshop. There will be much wisdom provided by many and we are pleased to contribute a perspective.

Choices which societies make have profound impact on their long term success. Selecting a sustainable energy pathway is one of these choices. Few may argue against the need at some point for a sustainable energy pathway to be realized. To some, change from the status quo may seem premature, yet to others not implementing timely change brings profound negative consequences. Governments, as stewards of society, have a key role to play. Failure to achieve a sustainable energy system will have longer term economic, environmental and social results that can be described as chaotic at best and possibly disastrous.

As the non-OECD nations enhance their per capita energy consumption towards that of the OECD countries, world energy demand will grow substantially. This highlights the essential need for investments in energy conservation and efficiency as well as investments in new supply to make up for depleted resources or energy supply systems in need of refurbishment or replacement.

Such investments (in efficiency and new supply) might not be made at a significant enough rate unless an acceptable return of capital is obtained. As we continue to develop and consume the low cost sources of supply, newer sources of supply generally have higher costs requiring higher prices. We have witnessed this in the resource industries such as oil in the past few years.

We feel a Sustainable Energy Policy cannot exist independently of perhaps the most significant event that is approaching us: the peak in the rate of production and supply of relatively low cost oil. There tend to be two camps in this field:

a. those who believe we will be at peak rate in low cost oil recovery at approximately 50% of the total reserve (e.g., Colin Campbell, Hubbert's peak; peak expected within a decade).
b. those who believe we can continue to increase the rate of extraction of reserves until over 80% of the reserve has been consumed (US Geological Service, peak expected within 30 years) and that new technologies will keep long term prices low.

A recent US DOE study suggests that $1 trillion per year will need to be invested in developing additional energy starting twenty years before this peak occurs, in order to create supplies in a manner that will prevent social unrest and economic harm.

We believe that the price of energy and its perceived future price will be the key triggers to enable financing of the necessary investments in conservation, efficiency and new supply. Such triggers, however, are not alone sufficient to ensure that sustainability will be achieved, in parallel with the indicated massive investment, particularly as to new supply choices. If government stands back on this, the "business as usual" case will be the result.

As examples, adding carbon capture and sequestration technologies (or use of non-fossil primary sources) to the many large scale hydrogen production plants required to upgrade our oil sands or produce fertilizers, enhancing ethanol addition to gasoline, enhancing biodiesel content, establishment of a distributed hydrogen fuel infrastructure and other such sustainability thrusts will not happen or be accelerated without a clear signal from government to enable such steps to be taken. Advances in sustainable technologies will not happen without clarity of the markets needed to reduce adequately the investment risk. Implementing projects with sustainable features may add direct costs over lower costs but less sustainable options and therefore less likely to be implemented without a clear statement to stakeholders of the value proposition.

Citizens, civil society groups and enlightened corporations can all take action on these issues. Such actions include education, efficiency enhancements and research and demonstration, but government must play a critical role in defining the rules of the game and the priorities. Failure to provide the right signal in time for mass investments in conservation, efficiency and new supply, will constitute a lost major opportunity from which the world will not easily recover.

Vinay Sharma

Vice-President, Customer Service and Strategic Planning, London Hydro

London Hydro- a Community Partner in Energy Conservation Programs

The spring of 2005 marked London Hydro's return to energy conservation and demand-side management activities following the Ontario Energy Board's approval of its Conservation and Demand Management (CDM) Plan. While it took several months to re-establish its leadership reputation, recent successes clearly demonstrate that the organization has again hit its stride. Recent and significant conservation achievements that captured much media attention include:

- Conversion of incandescent-based traffic and pedestrian signals to energy-efficient state-of-the-art light-emitting diode (LED) technology at all 394 intersections throughout the City. By the time the project was complete, 11,329 incandescent bulbs (with electrical input ratings ranging from 60 to 135 W) were replaced with LED modules (with input ratings ranging from 5 to 22 W). The calculated energy savings resulting from this project amount to 4,025,404 kW•h per year, representing the average energy requirements of almost 450 homes.
- The Chill Out residential appliance recycling program influenced the replacement or early retirement of more than 13,000 refrigerators and freezers in apartment buildings, social housing units and residential dwellings. The Chill Out program was all-encompassing and highly successful – it is poised to be the yardstick by which the success of other "fridge" programs will be measured. The overall energy savings is presently being analyzed, but is estimated to be on the order of 9,900,000 kW•h per year – sufficient to supply 1,100 homes.

Initiatives presently underway include our compact fluorescent light (CFL) for Incandescent Exchange program (initially targeted to apartment buildings and social housing units), and a number of significant lighting upgrade projects for commercial and industrial customers that incorporate a variety of advanced lighting technologies and concepts such as daylight harvesting, dimming controls, etc. All are destined to be highly successful, but it is too early in the program to measure the anticipated success in terms of specific energy savings (other than to indicate it will be in the millions of kW•h's).

Other exciting, but smaller scale, conservation programs that will be unveiled in the months to come include our Energy Awareness in the Classroom initiative, a series of focused energy workshops targeted to commercial and industrial customers, a gray-water heat recovery program, and a grassroots CFL Campaign in conjunction with Scouts Canada.

London Hydro, like most local distribution companies, has established a relationship with customers and is well positioned as an effective delivery agent for energy conservation and demand management programs. However, there are three barriers that we believe government/regulators should address in order to create an ongoing and sustainable conservation culture.

1. **Start/stop nature of initiatives:** In order to create a sustainable conservation culture, a long-term program funding model needs to be developed. The current, so called third tranche CDM program only spans a couple of years, and the newly announced provincial $400 M CDM funding pool reportedly has only longevity of about three years. It is difficult for London Hydro and other distributors to create and commit resources in terms of staffing and systems to delivering sustained CDM programs due to uncertainties of the funding three years from now.

2. **Simplify the regulatory process:** Also the conservation program leads to erosion of revenue of the distribution utilities like London Hydro. Although the regulator has designed instruments such as the Lost Revenue Adjustment Mechanism (LRAM) and Shared Savings Mechanism (SSM) to offset such erosions, invocation of such tools, however, is fraught with complex regulatory review and intervention, which is quite a costly affair in itself. The regulatory review and intervention is often a greater distraction of managers and experts, who should be otherwise focused on delivering valuable programs to customers. Our advice would be to simplify the regulatory process and establish a straight forward procedure of adjusting the distributors' rates on an annual basis, (or some frequent basis), without paying granular attention to the erosion of revenue due to CDM programs. In essence the annual rate adjustment based on cost of service modeling will do away with complex LRAM and SSM analysis and review.
3. **Streamline the role of various agencies:** Due to different but related mandates of various agencies including Ontario Energy Board, the Ontario Power Authority and the Ministry of Energy, often the decision making gets mired between authorities among them, and stakeholders such as distributors are left to interpret various "legal dictums" (directives, regulations, and codes) issued by respective agencies. This leads to more confusion and uncertainties affecting the development and delivery of successful energy conservation program to customers.

London Hydro has amply demonstrated its success in being a good community partner. We successfully delivered energy management programs through our SAVES and SAVES Plus programs prior to restructuring of the electricity sector and then again via our third-tranche investments in current CDM programs. We will continue to be a strong partner within the London community, in shaping the future of an energy conservation culture.

Phil Dick

Investment Development Officer, Investment Development Unit, Food Industry Competitiveness Branch, Innovation and Competitiveness Division, Ontario Ministry of Agriculture, Food and Rural Affairs

Outline of Energy Perspectives for Low Carbon Workshop

While it is essential to support the development of new technology and innovation, it is even more important to link these technologies to a broader behaviour change in the existing economy. In many cases, innovative technologies are technology platforms for which the "old economy", including extractive sectors, manufacturing, agriculture, the food industry and commerce, are simply not ready. One can generalize that a Low Carbon Society ideal is

muddled with a concept of conservation, but "conservation" is an outcome of non-use and contradicts any consumptive processes that are essential to economic activity.

Hence the paradox of economic use gives rise to the practice of "by-product and waste management". These "by-products and wastes" include:

- heat (from combustion, processing and energy generation)
- biomass (from agriculture, food processing and forestry)
- off-gasses from industrial and waste management processes
- slag and tailings (from mining and aggregate extraction)
- industrial scrap
- municipal and consumer wastes

In some provinces these underused or un-utilized resources are managed as wastes with strict guidelines that scrutinize handling or management of "wastes" through Certificates of Approval and Waste Management Site Approvals. Processes like energy efficiency and waste conversion tend to be caught within provincial regulations (as in Ontario under Reg 347) and deterred because of a regulatory environment that deters rather than enhances sustainable actions. Energy efficiency projects that include combustion must re-open Certificates of Approval, often at a cost that is higher than the value of the project. Where these kinds of projects do not have proof of technology in-country, there have been cases where approval-periods have dragged through three calendar years.

Readiness for new technology platforms in the old economy has several pre-requisites. They are as follows:

Step 1: Energy Efficiency in the "Old Economy"

The implementation of new platform technologies is expensive, but right-sizing systems based on sustainable loads where the intensity of carbon-use is optimized, will reduce the capital requirements of implementation.

There are a number of proven actions that are related to energy efficiency, many already in place with Natural Resources Canada (NARCan). They are as follows:

- Energy Management Training (NRCan's Office of Energy Efficiency has a remarkably good program, which should be continued and enhanced.) Education and awareness is crucial for the development of the skill sets needed to manage energy. There are too few people in corporate management and the labour force that can take actions that reduce carbon consumption while improving economic performance. Yet there is a conclusive body of science-based evidence that proves the links between energy efficiency, sustainability and improved profitability.

- Energy Audits and Process Integration Studies (NRCan activities in this area should be continued and enhanced)
- Canadian Industrial Program for Energy Conservation (CIPEC) this voluntary program should be continued and enhanced.
- Technology Demonstration projects. This is a gap, which should be funded in every region and province in order to create hands-on awareness. Process integration or "Pinch" demonstrations; boiler upgrade demonstrations; energy-from-waste, gasification and biodigestion demonstrations; energy demand management demonstrations and water efficiency demonstrations need to occur in order to gain broader adoption in industry and acceptance by environmental regulators.
- Industry/Sector Benchmarking. This is a gap that is not addressed.

Step 2: National Standards for Sustainability and Carbon Footprints

Energy-efficiency, by-product/co-product use, emissions/heat recovery and recycling are keystones to improved economic performance. Regulations need to permit and to enhance these actions, rather than be obstructive.

An example of an obstructive regulatory environment is Ontario's Reg. 347 with its circular definition of waste and a clause in Section 9 regarding "significant changes of process". The unintended impact of a control-based regulation in Ontario that forces all activity through the same screen has been to reduce the potential for energy efficiency, sustainability and innovative actions in Ontario.

For instance, Ontario has some 3200 commercial boilers in industry and another 1000 to 2000 in use in agriculture. These boilers run, on average, at about 60% efficiency, which is 33% less efficient than their potential. (Enbridge, Union Gas, Spirax Sarco, 2006) These boilers represent 15% to 20% of Ontario's annual 600-billion cubic foot gas load. (Enbridge, Union Gas, Ag Energy Coop, 2006). Mandated efficiency would save 30-billion cubic feet per year. Fuel switching to bio-oils and other renewables would create further offsets. These actions would improve industrial efficiency, profitability and increase potential income tax revenues, as the medium to long-term price/supply of natural gas is a concern due to the development of Alberta's bitumen reserves.

Agriculture, the food processing sector and the forestry sector also have huge reserves of biomass that is currently not in use as a fuel source. Other jurisdictions like Germany expect to produce up to 17% of their energy demand through biomass in a way that enhances, rather than conflicts with food production. Some energy crops like red clover have multiple benefits (honey production, natural ammonia fixation and soil tilth enhancement.)

The food industry alone has more than 5 billion kg per year of food-by-products that could be converted to bio-energy, offsetting more than 500 mega tonnes of CO2 –equivalents (through methane or bio-oil combustion). Also, as ethanol plants come online, the by-product distillers' grain (DG) becomes a bigger issue.

At present, Ontario lacks the animal herd to consume the currently available DG. By using DG as a methane source, the energy efficiency of ethanol plants is increased and reduces natural gas inputs by up to 75%.

Perhaps as much as 50 percent of the biomass harvested in the forestry sector is left on the forest floor. In jurisdictions like Finland, forestry biomass is harvested to offset methane emissions, reduce excessive forest fire risks and provide energy. The use of by-product black liquor as an energy source enables pulp and paper operations to produce more energy than they consume from "wastes". (Cogen Canada, 2006)

There are uncounted opportunities for carbon-neutral bio-fuel utilization that should be encouraged, enhanced, mandated and demonstrated rather than avoided because of regulatory impediments.

The adoption of low carbon technologies with an energy-efficient focus would ensconce the culture of adoption by the "old economy".

Appendix:

A rough estimate of the economic impact of the "green" innovations of the kinds of things discussed previously are as follows:

1. **Energy efficiency upgrades**
   Cost over 5 years: $200 million to $1 billion
   Energy savings per year: same as investment
   Net benefit to federal revenues: $40 to $200 million
   Net benefit to provincial revenues $34 to $140 million

   Note: avoided energy use could be exported for no loss to federal and energy producing jurisdiction revenues!!!

2. **Green Energy Demonstrations: $2-billion**
   Creates 2000 jobs and $200 million value added per year

   Other opportunities (another infrastructure project I am working on):

   Development of regional multi-modal rail terminals to transload truck freight (based on Guelph Junction Railway Multimodal Transload Project)

   Cost per terminal: $25 - 50 million
   Potential market for dedicated terminals in Canada: 20+
   Attracted Construction per terminal $200 to $600 million in commercial and industrial development
   New Jobs created: 5000 to 12,000
   Reduction of GHG's from transportation per terminal: 80,000 tonnes
   Reduction of truck border crossings per terminal: 200,000

Canada's rail capacity could be doubled through a strategic $2-billion investment -- double tracking of CPR lines in Ontario and use of Short Line railways as traffic aggregators and transload terminals. Not all of this would have to be public money, but demonstrations are needed.

Moreover, we have a shortage of truck drivers in this country. Every truckload of export traffic takes 1 to 10 days of driver time. Regional drivers can move 1 to 5 loads per day. A more concerted effort to move consumer goods and foods to rail for medium and long-distance traffic would offset driver retirement, and improve Canada's ability to export in a more sustainable way.

Helmut Sieber

Farmer, Environmentalist & President, Canadian Agra Inc.

Executive Summary:

Sustainability, Sustainability and Sustainability – Agriculture, Renewable Energy and the Environment is an undividable system that stands for 'Sustainability'.

As our contribution to the fight against 'Global Warming and Climate Change', we have to establish a system to balance the Carbon Emissions released from our country, with the 'Actual Emission Credits' to provide the needed environmental balance – this can effectively be done through the 'catalyst', Agriculture.

The agricultural industry and farmers in particular have acted as the most important Environmentalists in making substantial contributions in a positive manner. In addition as it stands today, most renewable energy systems initiate directly and/or indirectly from agriculture (or integrate with by-products with the agriculture industry) and farmers have extensive interests in supporting such initiatives. Therefore, farms and farmers should also play a key role in establishing a truly sustainable environment in the future. Farm Incentives/Stabilization Programs should be re-instituted in a well defined manner, interlinking environmental contributions with Agriculture, to provide farmers with the necessary tools and place them in the forefront with the leaders fighting against global warming and climate change.

Through agriculture, we have to focus on Renewable Bio-Energy Systems which should be used in 'environmentally friendly' manners and applications. This will help Canada to create 'added value' to its commodities and raw materials for export. As an example, today's high transportation costs (of up to one third of the commodity price) can be massively reduced by pre-processing, using green energy, resulting in lower shipping volumes and creating a more valuable product per ton. This establishes a much better ratio between the values of the raw material and the transportation costs (higher margins for Canada and Canadian industries).

When a system is established to sell pre-processed commodities/raw materials with Carbon Green Credits on a global basis (currently under development –using Green Energy), Canada will become much more competitive than any of the other countries, which is due to Canada's unique parameters related to the substantial amount of commodities and arable land available compared to its relatively small population (of less than 33 million people), meaning that Canada would contribute the most Carbon Credits per capita globally. Therefore, Canada is in a very unique position in the fight against global warming and climate change. In addition, value added pre-processing will stimulate new Canadian investments in Canada within the average range of $ 80 to $120 per ton of commodity (based on an average processing plant investment of approx. $ 60 million to $100 million) and an additional $ 20 to $ 50 per ton annually in operating revenue as well as new employment opportunities for Canadians.

This is one more reason why Canada has to be one of the leaders in providing 'Green Principles' to deal with the most urgent matter, 'Global Warming and Climate Change'. Through this implementation, the current 'Canadian Government Surplus would, at the minimum, more than triple, while Canada is also contributing the most Carbon Green Emission Credits per capita.

Other global effects:

Population - We have to take into consideration that over the past 50 years the social and economic parameters of this world have substantially changed. In 1950 the population was about 2.2 billion; in 2000 the population was 6.5 billion. In 2025 the population will reach 8.5 billion. Therefore, it is essential to look at new and innovative ways to provide our population with the necessary green energy, food requirements and environmental balance. Some of the innovative ways include the extraction of both green energy and food from the same source of raw material (creating a combination of primary and by-products).

Raw materials & commodities – The origin of raw materials and commodities have made a substantial shift from European and African countries to the North and South American continent. The majority of value adding was until recently done in Europe and North America. Added value/processing/manufacturing - In today's time we see a major shift in the final destination of raw materials and commodities which are transferred from worldwide locations to Asian countries, such as China and India, to be processed/manufactured for a fraction of the cost in the West.

Consumers - The finished goods eventually have to end up where the consumers are (Asia) and have to be in a carbon emission balanced context. Therefore, Canada, as one of the major global commodity suppliers has an enormous opportunity to make pre-processed commodities/raw materials, with CarbonGreen Credits, available to Asian countries.

Joint Ventures - We have to encourage our industries to enter into joint ventures with Asian companies to use Canadian pre-processed raw materials (with attached carbon green credits from Canadian pre-processing) in order to maximize on our valuable environmentally friendly produced raw materials.

Immigration Policy and International 'Know-How'- For more than 30 years, Canada with its 'outstanding immigration policy' was at the forefront of encouraging young immigrants to come to Canada, who brought technologies and know-how to this country. In addition, Canada has been able to increase its population by more than 73% since 1980. Therefore, we have to welcome and assist these "newcomers" with their know-how and technologies and integrate them to create a uniquely Canadian knowledge base.

World Carbon Market - The worldwide market for Carbon Credits grew to an estimated US $21.5 billion during the first three quarters of 2006, doubling its value in 2005, confirmed by a new report from the World Bank and the International Emissions Trading Association. The $21.5 billion in credits trade represents 1 trillion tons of carbon dioxide equivalent, or 130% of Canada's total annual emissions."

In addition, it is expected that plans for an emissions cap and trade programs in various worldwide locations are likely to be formalized in steps, within 36 months, and could lend to further stability once integrated with existing schemes. This includes the Kyoto Protocol's Clean Development Mechanism (CDM) and Joint Implementation (JI) schemes, which allow developed countries to earn emissions credits by investing in projects in developing countries, while JI incorporates projects located in other industrialized countries. Prices for these credits rose to an average of US $10.50 per ton, up from $7.10 in 2005. Private sector buyers, in particular banks and carbon funds, led the way in purchasing CDM assets, while the public sector led in JI purchases. With prices forecasted to increase in the short term, substantial revenue can be gained by selling these credits, thus assisting Canada of channelling this revenue to new sustainable developments. Asian countries dominated the CDM market, with China contributing to 60% of the overall project-based market. Overall, energy efficiency projects grew from virtually zero to account for 14 percent of total CDM volumes. Renewable energy accounted for 12 percent of the CDM market, with wind energy tripling to 6 percent.

Lawrence Centre Conference for Policy making in Low Carbon Workshop

The conference at the Richard Ivey School of Business was an excellent idea of bringing Government, Scientists, Academia, Environmentalists and Industry together to brainstorm the situation we are currently in, the measurements involved, the technologies which are available and what can be done to fast track the implementation so that Canada can become a world leader and model contributor to get Global Warming and Climate Control Change under control.

Recommendations:

1. As much as possible, adapt the guidelines developed by the European Union to build a uniquely 'Canadian Renewable Energy Industry'. For example, fixed electricity rates for bio-gas, wind and solar energy. In addition, providing a monetary incentive for off-peak electricity conversation into other fuels such as hydrogen.
2. The Provincial and the Federal Governments should collaborate to establish a fixed road tax credit allowance, based on a mandatory mixture and additives of Bio-diesel, B100 to regular diesel fuel. This should start with a mandatory 5% Bio-diesel (B5) and increase in Biodiesel amount (B10, B15, etc.) on an annual basis while retaining the same road tax credits. A similar structure should apply to Fuel Ethanol.
3. Promote, with incentives, the integration between Agriculture and Renewable Energy and specifically promote by-products which are being created through energy generation being transferred back into the food chain.
4. Promote integrated solutions of industrial quality processing plants which can work in harmony producing green energy and producing high quality food and feed products.
5. Implement a 'fully integrated basic model' of Renewable Bio-Energy systems which can be adopted country wide, within selected municipalities and operating in a private-public partnership solution.
6. Integrate the private-public partnerships, creating Carbon Green Emission Credits with the farm community, as Canada is an agricultural based country; further integrate a renewed 'Farm Stabilization Program' into the system which, at the end, is more economical for the provincial and federal government than the current systems.
7. Canada is well positioned to become the world leader in Renewable Bio-Energy Systems, based on the current available parameters we can. The technology and know-how is ready and available to be implemented. Canadian Agra has been researching European technologies for Renewable Bio-Energy Systems, starting as early as 1983. Over the years the following systems were created for a sophisticated implementation (forming Canadian know how):

   a) The Integrated Agricultural Concept
   b) The Agra ECO Industrial Park Concept
   c) The Renewable Bio-Energy Systems Concept

8. Canada shall develop a new 'World Carbon Exchange' to be based in Toronto (similar to that of 'Chicago Board of Trade' for commodities in Chicago) and Canada has to come forward with a team of experts, again a combination of government, academia, scientists and industry (focused by Agriculture, Environment, Energy and Finance) to lead the Environmental Agenda.

We are proud to have been invited to make our contribution to society and to be able to provide our thinking to the policy making panel created by Ms. Dianne Cunningham, Director of the Lawrence Centre at the Richard Ivey School of Business.

Geoff Cargill
Regional Vice President, Bell Canada
Gary Paul, Gord Reynolds
Capgemini

On behalf of Bell Canada and Capgemini we wish to thank the conference organizers for an outstanding event. We found the content thought provoking, the discussions stimulating and the networking opportunity tremendous.

Our companies and our partners recognize and appreciate the environmental and energy challenges facing Ontario and the globe. We believe that finding solutions to deliver cleaner energy, reliably and at a reasonable, competitive price is paramount.

We submit this document as an opportunity to highlight specific areas of discussion during the conference that we view as critically important and to focus on areas we believe should become part of the conservation demand management messaging from the conference. Although Bell Canada and Capgemini were represented at the conference, we will speak in this document on behalf of a consortium which includes Hewlett Packard. Bell, Cap and HP have worked closely in partnership in Energy and Utilities for 1.5 years now. Earlier this year as a consortium we spoke to the Ontario Government and the Opposition at public hearings on Bill 21. In the remarks that follow we will occasionally refer to Bell Canada, Capgemini and Hewlett Packard collectively as BCHP.

Ontario's leadership role in creating a modern energy system will serve as a model for the rest of the world to emulate while delivering, safe, clean, reliable, affordable power that will be required to build and sustain a growing modern economy in Ontario. When successful we believe the province can realize additional benefits in attracting investment and furthering innovation while creating jobs and prosperity.

Bell Canada has teamed with Capgemini and HP to collectively focus and support developing a culture of conservation and environmentally sustainable solutions. The BCHP perspective is unique based on the mix of international and domestic experience that our three companies represent when combining our efforts.

Our Corporate views closely map to Carol Stephenson's comments on day two of the conference. Carol stated that more progressive funding for Public, Private

Partnerships (examples in BC and UK) was necessary. We are willing to work together with the Public sector to, leverage and reward best practices, support clarity in regulatory policy, support the creation of mandatory standards, help deliver energy services, help mobilize capital by changing the way we invest and finally, contribute to a conservation culture that matters to citizens.

Social change

- We believe the introduction of Smart Meters, demand-side management – it's all about one thing. It's about changing societal behaviour and developing a culture of conservation; it's about changing the way we go about our daily lives and changing the way we think about energy and electricity
- Our companies have experience to bring in this field – for example HP is at the forefront of changing the way we interact with technology on a daily basis – whether its with handheld computing devices, print/photo technology or e-Services provided by a major financial institution; Capgemini helps enterprises, large and small, develop different ways to interact and interface with their clients and customers and shift them to electronic channels; Bell Canada is in both of these fields and has some parallel experiences in diverse issues like the introduction of 10-digit dialing, the delivery of television services over IP networks and the convergence of media.
- These are not direct parallels to the challenge facing Ontario in creating a conservation culture, but it is instructive to how Bell, Capgemini and HP are addressing this unique technology challenge.
- Ralph Torrie informed the conference when referring to energy productivity "super giants" that "the technology and techniques are available" and BCHP agrees; we don't view this as a technology opportunity – the technology is fairly straightforward – we view this challenge as a social marketing problem and firms like BCHP, for example, spend millions on advertising and marketing every year and know marketing.
- The device that will deliver the message to change behaviour in Ontario won't be TV ads, sophisticated PR campaigns or speeches by politicians … though all those things will help – it's the information on day-to-day electricity usage that these so-called smart-meters will provide that will change behaviour, change usage patterns and create the culture of conservation in Ontario.
- We agree with Ralph Torrie's comments that the technology does exist, but when Ralph spoke about energy productivity "super-giants" that have "barely been tapped" he cited "freight/transportation and large buildings as prime examples of energy super giants." We believe 4.5 Million smart meters installed and networked for all Ontarians represents a "MEGA super giant." And that leads to the technology, and to the team we have assembled.

- BCHP is a coalition of technology and service leaders who have agreed to work together to assist the Province (both people and government) to ensure Smart Meters are a success – assisting us all to meet the energy conservation objectives outlined by the government
- Although a complex project and a technological challenge, our global purview, very large scale project experience and technology expertise make us comfortable that it can be done successfully.
  – For example, TSX, debit/credit, nuclear systems support, 5 9's telephone reliability
  – Massive challenges but do-able
- Following the Ivey conference we remain excited by the opportunity in front of us, however we are most excited by the opportunity that lies beyond the roll-out of smart meters and by what can be leveraged by an investment in this technology.
- BCHP believes that to be successful Smart Meters will require innovation – in technology of course, but more importantly INNOVATION in how to create awareness, educate change/drive consumer and social behaviour.
- As Bonnie Schmidt suggested, imagine the potential to launch a new "public opinion." Bonnie used smoking as one example but imagine the energy productivity super giant we could create with awareness and education for 5.6 Million school children in Ontario, 15 school jurisdictions, 377 school boards, 15,475 schools and over 200,000 teachers.
- When implemented, Smart Meters will create new value for Ontarians through reduced fixed plant investments, create new commercial models and make Ontario a world leader in product/service technologies.
- What other technologies can be overlaid in the future?
- What other business lines can be added to this infrastructure?
- What can be developed in Ontario that might be exportable to the rest of the world?
- Tom Sweeney suggest the new world value leaders will be those who "through innovation add new intellectual property to the top of the value box".
- We also believe innovative choices are available to the government for governance, ownership and regulatory choices that will directly impact consumers.

Leveraging Bill 21: Creating a Culture of Conservation

This legislation and the policy decisions, procurement documents and regulations that flow from Bill 21 should have:

- Clear and consistent vision, objectives and focus
- A focus on Education and awareness for average Ontarians to both ensure they support the initiative and are willing to change their behaviour to create a conservation culture
- A sufficiently robust set of "passive" incentives and "active" actions to exist to reduce overall energy demand and change the demand curve

- For example, blue box / green box (passive vs. active/forcing actions)

- Encouragement of collaborative partnering amongst key stakeholders - Smart Meter success will require teaming across the value chain and between suppliers

- For example. Systems Integrators choosing from the "best" vendors and working with all parties to deliver complex projects (Cap) – long term relationship view (Bell with consumers, Cap with long term OS contracts)

- *An economic and policy environment that incents private sector firms to participate and support the project and balances global expertise with "home team" delivery and innovation*

- We are familiar with Government regulatory environments, both provincially & federally and dealing with the Ontario Energy Board and we believe that any initiative must remain within the Government's control, yet balance the requirements of the participating private sector
- Creating an economic and policy environment that encourages the private sector to participate and support the project and balances global expertise with "home team" delivery and innovation
- The Government must ensure that the risks and rewards of this project are in the public's interest, similarly the risk and reward for the private sector participants must be in balance. Unreasonable liabilities that will produce too much risk for publicly traded firms may not yield the participation expected. The government has an opportunity to innovate around governance and ownership models to drive maximum attention and participation from interested private sector participants
- As a service provider that deals daily with private consumer information and communications traffic, we would look to the government to provide clear policies and guidance on how the government wants this information managed and controlled and as to the liabilities associated with this information management
- Need to ensure we don't ask too much of the vendor community (unlimited liability, uncertainty about making $, etc.)

- Leverage Investments and learnings – Existing and into the Future

- Take advantage of existing technologies and infrastructure to speed time to market and reduce overall cost (perhaps Bell Canada Smart Home investments and Telecom network – where possible, leverage existing network technologies PSTN, 1X, WIMAX
- Force key market participants to cooperate on standards and infrastructure sharing
- Avoid specific technology commitments – ensure agnosticism – avoid reliance on proprietary vendor technology

- Ensures ability to leverage the "latest and greatest" technology available at lowest cost
- Reduces risk of becoming "stuck" with one vendor of meter technology (meter or back office equipment)

- Clear direction, early in the process on any outstanding issues related to privacy and access to confidential information.
- This project cannot be stalled somewhere down the road because the appropriate regulatory and technology security features are not built in to protect private information

BCHP Conclusion:

Bill 21 Legislation is only the first step in what will be a long process of changing behaviour in Ontario and creating a conservation of culture. Involving partners and supporting the PPP process early and often will enable the government to benefit from our expertise and experience – we're willing to offer it … take advantage of it.

Mohan Mathur

Board of Directors, London Hydro

Sustainable Energy Policy

Energy challenges and solutions are ultimately about consumer expectations and behaviours. Unfortunately we have long believed that we have an unlimited supply of cheap energy. Therefore, as consumers, we have been and continue to be wasteful in energy utilization. Although phenomena, such as global warming and climate changes and their link to environmental emissions, contributed in large part by energy conversion and utilization processes, is being gradually accepted, nonetheless very little effort is visible for curbing and containing these emissions as well as other solid and liquid waste.

It is timely if not already late for our governments, businesses and consumers to act responsibly towards a sustainable future. It is likely that any changes made in exploiting energy resources, changing conversion processes and altering consumer behaviour will result in increased energy costs but that will be a wise investment for us and our future generations.

In view of the above, it is evident that Canada is in a dire need of an explicitly stated, realistic energy policy that sets clear, long term directions for planners, producers and consumers alike. The policy has to be backed by a meaningful regulatory framework and a multitude of incentives that will drive the much needed cultural change in consumer expectations and behaviours.

An energy policy must emphasize sustainability, reliability and cost effectiveness. It should clearly establish the need to take into account lifetime environmental impact in the recovery of energy resources, their transportation, conversion and utilization processes. The policy should clearly establish priority on conservation and an efficient utilization of renewable resources.

Specific Recommendations:

- Invest in energy related education starting from elementary school to university levels as well as in adult education. Education is essential to develop a new value system and sensitivity to environment to eventually change the consumer expectations and behaviours.
- Accord a higher priority and provide funding for energy related research in a bid to find cleaner energy alternatives for the future. Canada could be a leader in bio-fuels, fuel cells and nuclear-hydrogen economy.
- Penalize using multiple converted energy forms such as electricity for space and water heating applications; and misusing fossil fuels such as burning oil and gas to extract oil.
- Promote full utilization of energy content of energy feed-stocks, such as using co-generation or tri-generation.
- Encourage energy conservation through improved standards in construction, manufacturing and transportation. Also, provide economic rewards for load shifting activities to businesses and homeowners such as automation of the time of energy use through the application of smart meters and multiple tariffs.
- For electricity generation, maximise the use of renewable resources and balance the supply mix with minimum possible use of carbon-based fuels. In the near term nuclear generation will continue to be an attractive component in several provinces.
- Establish an East-West Canadian electric grid to take full advantage of different time zones as well as making an optimum use of the hydro power available in some provinces.
- Reward reduced energy content in processed and manufactured goods through process and design improvements.

Jeff Fielding

CAO, City of London

Building Paths to a Low Carbon Society: A Summary of How City of London's Current Activities Tackle this Emerging Issue

Concerns about our society's reliance on fossil fuel energy has many facets - concerns about "peak oil", climate change, energy security, environmental degradation from resource extraction and processing, and air pollution from fossil

fuel use - to name a few. Rapid economic growth from countries like China and India heightens these concerns. The potential impact of peak oil has been assessed by a few Canadian municipalities and a number of environmental groups in Canada. Findings are similar in these studies. City staff brought London Municipal Council up to speed on these matters in August 2006 and will be providing further updates in 2007.

Peak oil concerns, along with existing air quality, climate change, and electricity conservation concerns, is one more reason to focus on improving the energy efficiency of all aspects of London's economic and social structure. High fossil fuel prices will also contribute to the economic impetus to drive many of the changes the City of London and many local groups are laying the foundation for today - making wise transportation choices, creating "sense of place" communities, building energy-efficient buildings, and increasing the use of renewable energy.

Local government has a significant and unique role to play in public policy with respect to energy conservation and preparing current and future generations of Londoners - residents, employers, employees – for the necessary behaviour modifications that are required. Local government is the closest level of government to the people that must make the necessary changes.

The City of London re-focused its commitment to improving air quality, reducing climate change and increasing energy conservation in 2003 when Municipal Council approved a series of recommendations (Appendix A) that provide the foundation for working within the community and established appropriate roles to work with senior levels of government. This work was captured in a document entitled London's Air Quality Strategy: Moving Forward Locally, which is a statement on direction for the City of London.

Since February 2003, the City of London has implemented a strategy that addresses both air quality and climate change issues through their primary root cause - fossil fuel energy use. Our strategy involves engaging stakeholders in London as well as senior levels of government on task-specific partnerships. For example, for several years the City of London worked alongside numerous citizen and business groups and companies (e.g., Thames Region Ecological Association, Try Recycling, London Home Builder's Association) on the Federal Government's One Tonne Challenge program designed to be a cornerstone initiative in the previous Federal Government's direction with respect to the Kyoto Protocol.

A current example is the City of London's work with the London Home Builder's Association, London Hydro, Union Gas, and other stakeholders in London's EnerGuide Partnership to promote energy conservation in the residential sector. This includes promotion of the former EnerGuide for Houses Retrofit Incentive as ENERGY STAR(r) New Homes. We are now working on a follow-up project, the Builder-Led Energy-Efficiency Partnership (Builder-LEEP) Project, to bring the latest home construction and renewable energy technologies to London's home

construction sector. This project is running in parallel to the City's Placemaking project, since both projects share a common objective - building better communities.

Placemaking refers to liveable communities that have an identifiable character with community focal points, providing a strong sense of place and a high quality of life for its residents. Functional Planning refers to the built form of communities such that it conserves energy, preserves the environment and sets parameters for health and safety. While London has, for the most part, been doing a good job at "functional planning", it has not been as successful at avoiding the negative aspects of suburban growth that provide neighbourhoods with a distinctive community character and sense of place. The objective of placemaking is to provide for high quality, liveable neighbourhoods that offer a strong sense of community. This can be achieved through good architectural design, pedestrian-oriented streets, accessible recreational amenities and progressive environmental design. These elements will help to provide safe, healthy environments, and create a sense of place that residents can identify.

Since 2004, City staff has been developing a Corporate Energy Management Program complete with quantifiable goals, objectives and required actions for the City of London and for Boards and Commissions. An Energy Matters Steering Committee (EMSC) has been established with a mandate to develop a Strategic Energy/Asset Renewal Master Plan (E-MAP) and provide direction and guidance to the City's Energy Management Engineer. The EMSC will also develop a financial "model" for program development and implementation (e.g., revolving fund), and establish appropriate targets, timelines and specific action plans. The E-MAP will act as a "road map" to more efficient energy consumption and lowered maintenance costs for buildings. The E-MAP is not only a process to reduce energy costs, usage and peak demand; it is also a strategy to organize and improve existing energy systems and operations.

The City of London is addressing peak oil issues from the transportation sector through the SHIFT (Solutions to Help Individuals Find Transportation) Alternatives Program. Transportation choices such as carpooling, public transit, walking and cycling are promoted to Londoners. The City partners with local organizations to develop transportation choice initiatives. These include improved cycling facilities as part of the Bicycle Master Plan, rideshare matching for local employers to promote to their employees, and promotion of walking as physical activity to residents. The City recognizes that residents already have busy schedules, but if everyone changed at least one trip per week to a sustainable mode, it would have a great effect on decreasing our reliance on fossil fuels.

Additional projects include providing clean air and climate change resources to London's small-to-medium sized enterprises, landfill gas collection and flaring systems, and fleet greening initiatives.

Appendix A

Extract from Air Quality in London: Moving Forward Locally (February 2003)

London is committed to the health and well-being of its citizens. As such, we are committed to improving our air quality and developing a local program that can be implemented to make a difference.

In order to move forward, a re-focused air quality strategy is outlined that correctly identifies the role for the Corporation of the City of London; fully recognizes and promotes what can be achieved locally by Londoners; and properly identifies the role senior levels of government must play to design programs and initiatives, and provide adequate resources to cost effectively manage existing and emerging air quality matters that impact all Canadians.

To implement the re-focused strategy, it is recommended that:

1. Municipal Council reiterate its commitment to improving air quality in London by acknowledging that air quality is an important concern to Londoners and that all levels of government, businesses and citizens in Canada have a role to play.
2. The Federal Government and the Government of Ontario be relied upon and encouraged to deliver specialist scientific expertise, knowledge, funding programs, innovative technologies and related initiatives for air quality research projects and for overall monitoring of south-western Ontario's air shed.
3. The Mayor of London reiterates London's support for dealing with air quality initiatives through the Big City Mayor's Caucus dealing with municipal sustainability; through the Federation of Canadian Municipalities (FCM) and its Partners for Climate Protection Program (London is a member); and encourages the University of Western Ontario and Fanshawe College to further pursue the impact of air quality initiatives both locally and globally.
4. The Corporation of the City of London concentrates its efforts on developing local air quality solutions in the full context of all municipal environmental priorities; the ability to pay for the initiatives; and the integrated nature of programs and projects; all under the 'moniker' Air Quality in London: Moving Forward Locally.
5. The development and implementation of Corporation projects and solutions be integrated wherever possible with local community initiatives within defined boundaries and expectations and with realistic and affordable budgets.
6. As part of the Environmental Services Department Organizational Review, Municipal Council directs the General Manager of Environmental Services & City Engineer to provide an area within the department which, coordinates; enhances and reports on the City's environmental activities today; fosters environmental awareness and solutions within the community; brings together the City's environmental initiatives such as transportation demand

management, stormwater management, recycling, ecological planning, water conservation; and focuses on incremental changes for the future, such as improving air quality in an integrated and cost effective manner.

John W. Tak

President and Chief Executive Officer, Hydrogen & Fuel Cells Canada

The Role of Hydrogen and Fuel Cells in our Low-Carbon Future

Hydrogen and fuel cell technologies are positioned to enable a clean and sustainable global energy system for future generations. They offer significant benefits over conventional power-technologies (including batteries and internal combustion engines) as well as having the ability to complement these technologies. Hydrogen and fuel cell technologies can exist on their own as power producers as well as help all power-technologies meet their full potential. This flexibility allows the diversity in our energy mix to provide greenhouse gas and pollution reduction, clean air, energy security, energy reliability and improved energy efficiency.

Fuel cells are electrochemical devices that enable the chemical energy of fuels to be converted directly into electricity. Fuel cells can offer significant benefits over traditional energy technologies including:

- Superior fuel efficiency;
- Zero to near-zero emissions in comparison to combustion engines;
- When fueled by hydrogen, produce zero “tail-pipe” emissions and low greenhouse gas
  emissions (depending on feedstock for hydrogen);
- When fueled by carbon based fuels produce significantly lower emissions and green house
  gas emissions compared with most incumbent energy technologies;
- Versatility – can be applied in micro, portable, stationary, and transportation applications;
- Low maintenance costs due to few moving parts;
- Modular design allowing for low cost high volume manufacturing;
- Design freedoms; and,
- Quiet operation.

Hydrogen as an energy carrier offers multiple benefits, including:

- Can be zero emissions depending on method of production;
- Can be produced using a variety of methods and feedstocks allowing most regions of the world the means of producing hydrogen;
- Is safe to produce, store, transport and use;

- Can be produced at point-of-use making it suitable for refueling stations and distributed power generation; and,
- Can store off-peak energy produced by solar, wind and tidal generation.

Hydrogen powered fuel cell buses and GHG benefits in Canada

Scenario	*Number of Buses*	*GHG Benefits* (tonnes)*	*Cost per Tonne($)***
Short term (2010-2015)	20	53,140	941
Medium Term (2015-2025)	7000	18,600,000	376
Long Term (2025-2040)	Total Fleet replacement (+15,000)	39,840,000	376

*Assumes hydrogen generation from renewable or nuclear sources or hydrogen generation with CO-2 sequestration. Further improvements in efficiency will occur as technology advances.

The Role of Hydrogen and Fuel Cells in our Low-Carbon Future

Canada is recognized by countries like the US, Japan, China, Korea, and the EU as being a leader in hydrogen and fuel cell technology development. This “made-in-Canada” technology provides a clear path for the successful implementation of the federal government’s environmental and economic initiatives by providing for: cleaner air, innovation-based job creation, greenhouse gas reductions; and improved energy security, reliability, and efficiency.

The hydrogen and fuel cell industry generates significant economic benefits for Canada. In 2004 the industry employed more than 2,000 people. Private sector investment in innovation (over $100,000 per employee) is extremely high, with more than $237 million spent on research and development in 2004.

Over the last five years, the private sector has invested over $1 billion. As a result, early commercial sales in the US and overseas are now being made in fuel cell forklift truck and power back-up applications. More than 60% of the 100 fuel cell buses operating globally use Canadian technology.

However, further investments are required to overcome the challenges that remain, including:

- Reduction in product costs;
- Improvements in product durability and reliability; and,
- Competition from aggressive policies and programs in the US, Japan, China, and Europe that support technology development and market access for their own fuel cell sectors.

Immediate action is required if Canada is to face these challenges and maintain our world leadership in this new industry. The return on early government support is jobs, a solid base of tax revenues to support social programs, a clean and healthy environment and a more diversified economy. More importantly, over the mid-to-long term "made-in-Canada" hydrogen and fuel cell technologies will have a significant impact on the reduction of GHGs through the more efficient use of both fossil fuels and renewables in Canada and globally.

A National Strategy for Canada's Hydrogen and Fuel Cell sector is in the final stages of completion. Strong support of the National Strategy by the Government, including the recommended policy and support activities, will ensure that Canadians accrue the benefits of government investments in the sector, and that the Government of Canada meets its broader policy objectives, including:

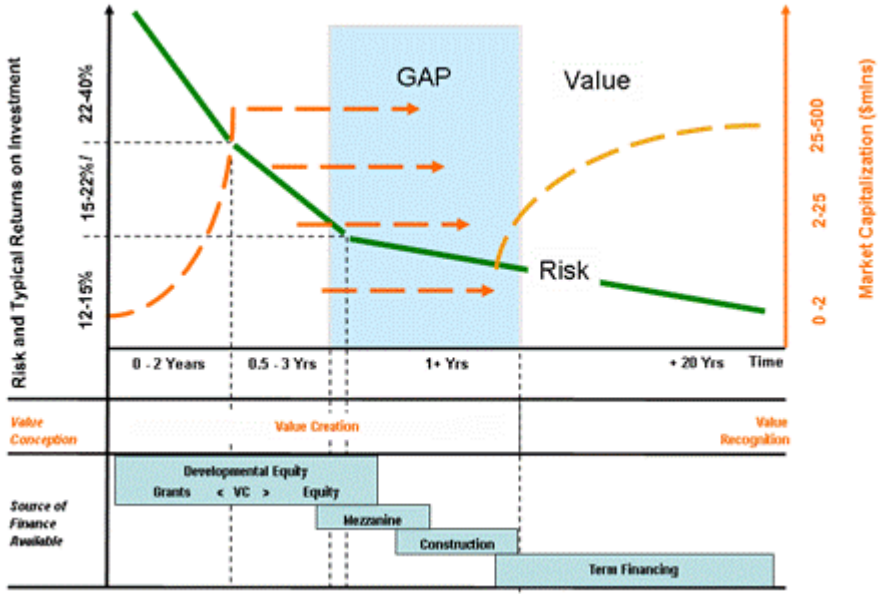
- Enhanced innovation capacity;
- Reduced pollution, greenhouse gas emissions and health care costs;
- Leadership in sustainable development and climate change solutions;
- Enhanced energy efficiency and energy diversity;
- Increased knowledge based employment; and,
- Growth in value added exports.

William R. Tharp

Chief Executive Officer, The Quantum Leap Company Limited

Project Financing - the Carbon Risk Continuum

Venture Capitalists and Term Financiers have different perspectives on carbon risk and valuation of projects. Venture Capital has the capacity to take carbon risk management into account, and consider their involvement in a project to be one of value creator. Traditional long-term project financiers, on the other hand, analyse the intrinsic value of a project, but are highly unlikely to take any lending risk in which the return of capital is dependent on carbon monetization, without fist addressing the management of such risk on a stand-alone basis. Because of this distinctive risk, a gap exists in the project financing continuum (see diagram).



To overcome this discrepancy, two early stage trends are emerging that should lead to the strengthening of the flow of funds to projects: 1) traditional capital providers are attempting to build their knowledge base, through partnerships with specialists, in order to understand and manage discrete carbon opportunities and risks (for example, the Carbon Facility, a joint venture between EcoSecurities (NY, USA), a recognized carbon specialty firm, and The Standard Bank Group (Johannesburg, South Africa)); and 2) specialized funding entities and/or pools of capital are being formed to meet this need (for example, RNK Capital (NY, USA), a specialized environmental attribute / carbon focused hedge fund).

The skills required to manage financing during the mezzanine and construction phases are found in a combination of the technology/VC investor working with a project or term lender. Areas where we've now seen successful collaborations between these skill-sets include: wind power projects in Europe, energy & efficiency projects in the United States and landfill gas (LFG) projects in South America - risk and long-term capital joining to provide a complete funding package.

Dr. Ted Parson,

Professor, Centre for Global Studies, University of Victoria

Post-Conference Description of Next Steps.

At the Centre for Global Studies (CFGS), University of Victoria, we are following up on the "Developing Sustainable Energy Policy" initiative. We are developing a multi-year international project that will develop and support a series of senior expert/decision-maker workgroups. These workgroups will examine focused

questions related to identifying and diagnosing present sources of blockage in mitigation policy, and identifying, elaborating, and evaluating promising paths forward.

In the initial stage of the project, working with several partner institutions, we will create a series of such workgroups in Canada that will consider key questions related to Canadian mitigation strategies, barriers, and potential ways to move forward. Expert and senior participants will be drawn from the public, private, academic, and NGO sectors. Drawing on participants' expertise, as well as briefing materials and staff support, the workgroups will integrate knowledge from diverse research fields and domains of practical expertise. Their participation, process, task definition, and direction will draw on insights derived from research on effective scientific and technical assessments, and on the successful model of the Montreal Protocol technology assessment panels.

The workgroups will aim to find a balance between purely academic exercises, divorced from decision-making and uninformed by knowledge of political realities, and purely consultative "stakeholder activities" that are inadequately informed by requisite scientific and technical information and that do not provide enough platform for mutual education, argument, and persuasion to push participants beyond current positions, understandings, and short-term interests. Participants are expected to bring their own knowledge and perspectives, but are discouraged from representing a constituency or arguing a pre-determined case. As appropriate, the workgroups may be structured as specific group problem-solving tasks, scenario exercises, or simulations.

The first activity will focus on developing a set of practical, transparently documented, long-run emissions scenarios for Canada. Other workgroup topics under consideration include assessing alternative mitigation policy instruments in the Canadian context; burden-sharing and compensation mechanisms within Canada; and innovation and competitiveness implications of Canadian mitigation policy.

Subsequent activities will draw on existing partnerships of CFGS to replicate this consultative model in other national settings, and then pull insights from the various national processes together in a major international exercise.

The output from these activities will be a credible set of information on the practical options for reducing green-house gas emissions, which will inform the public debate in Canada and internationally, providing a realistic basis for the work of senior decision-makers. In addition, the project will generate a sustained core network that spans research and policy communities, in business, government, and civil society, working on a foundation of greater shared understanding.

For further information regarding the Lawrence Centre and the Developing Sustainable Energy Policy Workshop, please visit www.ivey.ca/LawrenceCentre