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# Official Report of Debates (Hansard)

**Thursday 30 August 2001**

# Journal des débats (Hansard)

**Jeudi 30 août 2001**

## Select committee on alternative fuel sources

## Comité spécial des sources de carburants de remplacement

Chair: Doug Galt
Clerk: Tonia Grannum

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LEGISLATIVE ASSEMBLY OF ONTARIO

ASSEMBLÉE LÉGISLATIVE DE L'ONTARIO

# SELECT COMMITTEE ON ALTERNATIVE FUEL SOURCES

# COMITÉ SPÉCIAL DES SOURCES DE CARBURANTS DE REMPLACEMENT

Thursday 30 August 2001

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*Report continued from volume A.*

*The committee recessed from 1700 to 1800.*

**The Chair:** We'll call the committee on alternative fuel sources back to order.

## ADM AGRI-INDUSTRIES

**The Chair:** Our first delegate this evening is Robert Barlow Cash, Canadian environmental manager, ADM Agri-Industries. I hope you don't mind presenting right after dinner; sometimes that's the toughest slot to have.

You have 20 minutes in total for your presentation. What time is left over will be divided equally among the three caucuses. Please state your name as you start.

**Mr Robert Barlow Cash:** My name is Robert Barlow Cash, and indeed I'm the Canadian environmental manager for ADM Agri-Industries. I give you my thanks for your attention for the presentation, particularly given that we're at the beginning of what I suppose is a long evening for you. I'd also like at the outset to recognize the US National Biodiesel Board, which has kindly provided the presentation you'll see this evening, and indeed my presentation is on biodiesel.

I thought it would be appropriate to start with a quick introduction to who ADM Agri-Industries is. We are, among other things, Canada's largest flour miller, with nine flour mills across Canada, four of those here in Ontario. We also have four edible-bean processing plants; one starch-gluten processing plant; two chocolate-cocoa plants, both of those here in Ontario; two animal health and nutrition plants, one of which is here in Ontario; and, of greatest relevance to this discussion, two oilseed processing plants, one in Alberta and one in Windsor, Ontario. At the Windsor oilseed processing plant we process soybeans and canola seed.

ADM also owns 19% of the recently merged United Grain Growers and Agricore, which you'll see in the presentation, with a number of sites. ADM has over 1,000 employees in Canada. Our involvement in the Canadian economy exceeds $1.5 billion, of which $1 billion is here in Ontario.

ADM Agri-Industries is a subsidiary of Archer Daniels Midland Co of Decatur, Illinois, which had roughly $20 billion in global sales last year. The president of that company is John McNamara, a proud Ontarian who spent much of his career with ADM here in Ontario, in Windsor and Toronto. ADM has significant involvement in alternative fuels, as we produce roughly half the ethanol used in vehicles across the United States and approximately 25% of the biodiesel used for vehicles in Europe. We're very interested in alternative fuels in Canada.

Biodiesel has advantages both from an energy and an environment perspective. Briefly stated on the energy side, biodiesel is a renewable energy. It's made from homegrown commodities, has a very short supply chain and is very competitive with diesel on an energy basis.

Briefly on the environment side, low-content biodiesel blends at the range of 1% and 2%, mixed with regular diesel, allow for the use of low-sulphur diesel, because biodiesel greatly improves lubricity, a critical feature lost when the sulphur is removed to make low-sulphur diesel. In a variety of different blends ranging from 2% to 100% biodiesel, or neat biodiesel as it's called, emission improvements are observed.

I should also add that the econometrics are good for farmers. As demand increases for oilseeds, so does the quantity price. From a government treasury perspective, a US-based study shows that biodiesel use in substantial quantities—and by this is meant hundreds of millions of gallons—would create a net benefit to government treasuries, offsetting a relevant subsidy that might be necessary to support biodiesel.

Biodiesel is not just an alternative for trucks. Indeed, there is a good range of mobile sources that can benefit, including transport trucks, utility vehicles, mass transit, school buses, rail transportation, marine and aviation uses. But biodiesel is useful and practical for stationary power sources as well, including industrial, commercial and institutional boilers, turbine generators, backup generators, home heating and similar uses.

How is biodiesel produced? In short, biodiesel is made from the reaction of an alcohol with a triglyceride—and that triglyceride is usually vegetable oils, animal fats or recycled cooking oils—in the presence of a catalyst. There are two main products: biodiesel and glycerine, and the reaction favours biodiesel at about 90%.

What's really interesting is that the energy balance for biodiesel production means we gain 3.2 energy units for every one energy unit expended to make biodiesel. Diesel is much lower, at 0.88, actually a loss.

How does biodiesel perform relative to other fuels? Well, like all CI or compression ignition engines, biodiesel is 30% to 40% more efficient than spark ignition

engines. Biodiesel has a more attractive cetane value, at 50, compared to 42 for regular diesel. A cetane value of 40 is the minimum required in the United States. In case you didn't know, cetane is a measure of the affinity of a compound for auto-ignition and is an attractive feature for fuels.

Biodiesel also has a very high lubricity, essentially twice as high as diesel. That's also very attractive. The energy content of biodiesel is very comparable but slightly lower than diesel.

From a cold flow perspective, a 20% blend of biodiesel in regular diesel with some flow enhancement additives prefers temperatures above minus 15 Celsius. We'll talk a little more about that later.

The flashpoint of biodiesel is higher than regular diesel, at 149 Celsius compared to 47 Celsius for regular diesel. A higher flashpoint suggests safer storage.

From a health effects basis, tests have confirmed that biodiesel is 10 times less toxic than table salt and degrades as fast as sugar. This is particularly attractive for marine applications.

From an emissions perspective, if you look at biodiesel itself, it has essentially no sulphur, nitrogen or aromatic hydrocarbons. It does contain about 11% oxygen by weight.

Biodiesel use reduces emissions of most US and Canadian regulated contaminants, including particulate matter, carbon monoxide and sulphur oxides. Nitrogen oxides can be slightly higher or lower, depending on the blend ratio of biodiesel to regular and engine operating conditions.

From a global-warming perspective, greenhouse gases are reduced by 80% based on a closed-loop life cycle assessment. Why so high? The $CO_2$ emitted by combustion is balanced by $CO_2$ absorbed by the oilseed grown to produce the biodiesel.

Mutagenicity tests have shown that biodiesel use reduces the risk of cancer and birth defects compared to diesel. There's a 90% reduction of air toxics, including a 75% to 90% reduction in PAHs—polycyclic aromatic hydrocarbons—and nitro-PAHs.

I'd like to give you an idea of the product status in the United States right now. In the US, biodiesel and its various blends are registered and legal with the EPA following a rigorous assessment process. It has also achieved official alternative fuel status, and the Department of Energy has provided support by means of committing to use one million gallons of biodiesel in the year 2002.

Biodiesel is also called an acceptable EPACT compliance option in the US, which means its application has been approved as a means to comply with a legal requirement for US federal operations to purchase or modify vehicles to achieve a certain alternative fuel use standard.

With almost 72.5 million kilometres of application, biodiesel has gained market and OEM—original equipment manufacturer—acceptance both in the United States and Europe.

This list of biodiesel customers shows you there are not only many biodiesel customers and many applications for biodiesel, but that the government itself can help create a market to stimulate and support biodiesel use and production. Many of these, of course, are US, but you'll see they include many that are comparable to our own ministries of transportation.

Related to this, there are also a number of initiatives the US federal government has implemented to promote biodiesel and alternative fuel use in the United States, including three presidential orders mandating biodiesel purchase, a subsidy-like bio-energy program and a goal-oriented order to displace 20% of current mobile fuel use by the year 2010.

Various other US agencies have developed policies and implemented formal as well as ad hoc commitments to support biodiesel use. We could go on with a number of examples in greater detail, but I won't at this point.

I'd like to examine some common biodiesel myths, the first one concerning cold flow conditions. We believe cold flow challenges can be overcome with further work on additives and blending in order to make biodiesel applicable in Canada for all seasons.

**1810**

Regarding cost, biodiesel does not need to be too expensive. Appropriate programs, subsidies and incentives can be implemented to make economic sense and can price biodiesel at relevant market prices.

With respect to availability, biodiesel is now widely available in the US, where markets have been developed, and I should also say that biodiesel is widely available in Europe. We can do the same here.

From a warranty perspective, based on the US and European use of biodiesel and OEM acceptance, warranty issues are not significant and can be readily addressed and resolved.

Finally, the question is, is more testing needed to determine whether biodiesel is a viable option? No, there isn't a need. Biodiesel is widely used throughout Europe and is accepted by the stringent US EPA as an alternative fuel. I might say there's no need to reinvent the wheel; it's already on the road and running.

**The Chair:** Thank you very much for your presentation. We have about two and a half minutes per caucus, beginning with Ms Churley.

**Ms Churley:** We've had a couple of presentations now on biodiesel, including one from the Ontario Soybean Growers. I'm sure you're familiar with them. They gave some specific recommendations, and I won't go into them all, but you haven't made specific recommendations. One of the things they say is essential, and that's their language, is that biodiesel have the same federal and provincial excise tax exemptions that are currently in place for other alternative fuels. Would you agree with that, that that's one of the problems in getting this on the road, so to speak?

**Mr Barlow Cash:** That's certainly one of the options. I'm not sure that it's the only one or necessarily the best

one, but it's a good option towards improving the competitiveness of biodiesel in the alternative fuel market.

**Ms Churley:** You're saying that's one option. Quickly, what would some of the other options be that we could look at?

**Mr Barlow Cash:** Unfortunately, for this presentation we didn't assemble a list of the things. We're not far enough along in our market assessment to be able to come up with good, conclusive advice to the government on what would be good ideas, but we certainly do want to work both with this committee and other interested parties to further develop those.

**Mr Hastings:** Robert, if the Ontario government did get involved in some demonstration project or made it a requirement under an RFP or what have you for a fleet situation, would we, beforehand, have to get an approval from Environment Canada or from Transport Canada comparable to what the EPA and the energy department in Washington—energy being only the policy side—to have it cleared as an operating fuel on your highways?

**Mr Barlow Cash:** To be honest, I'm not sure what we'd have to do with the federal government, but I can quickly find that out for you and report back to the committee on that.

**Mr Hastings:** It would seem to me if you went before and didn't have a project in mind, a specific proposal, that would hold it up. But if you had something concrete, that would move it in Ottawa a little faster.

**Mr O'Toole:** If I may, biodiesel was brought up earlier today in a presentation from the OTA and was dismissed as one of the alternatives; they're really advocating the low-sulphur diesel. They said there was some problem with the product. I was looking it up in their notes. I did quote what he said: "Biodiesel is not effective." That's from the OTA. They're the biggest consumers of the product. How do you respond to that? You've said it's broadly in use in other jurisdictions. What's the problem?

**Mr Barlow Cash:** I'm not too familiar with the nature of their concern, why they feel it's not viable, but it is widely used.

**Mr O'Toole:** Does it affect horsepower or maintenance life and all these myths that you tried to address here?

**Mr Barlow Cash:** I'm not aware of anything that is substantive that's prevented its use.

**Mrs Bountrogianni:** Thank you for your presentation. I've noticed, and perhaps I missed it, and forgive me, that you have processing locations in Canada and your customers are American. Are there any Canadian customers yet? Did I miss that?

**Mr Barlow Cash:** I'm sorry. Customers for?

**Mrs Bountrogianni:** For your product.

**Mr Barlow Cash:** Our product range—ADM Agri-Industries—as I say, we are Canada's largest flour miller and oil seed processor. Those are Canadian customers.

**Mrs Bountrogianni:** But for this particular product?

**Mr Barlow Cash:** For biodiesel?

**Mrs Bountrogianni:** Yes.

**Mr Barlow Cash:** No. We do not manufacture biodiesel in Canada. We produce—

**Mrs Bountrogianni:** Oh, so these other locations are for other products.

**Mr Barlow Cash:** That's right: flour, oil seed, animal feed, edible beans, chocolate, cocoa.

**Mrs Bountrogianni:** My misunderstanding. Basically my question was the same as Ms Churley's. I look forward to the recommendation.

**The Chair:** Thank you very much for your presentation. It's much appreciated.

## CANADIAN RENEWABLE ENERGY CORP

**The Chair:** Our next presenter is Patrick Gillette, vice-president of the Canadian Renewable Energy Corp. You might want to take one of the microphones at the other side and sit down and relax. Thank you for coming forward.

**Mr Patrick Gillette:** Good evening. My name is Patrick Gillette. I am the vice-president of acquisition and corporate affairs of the Canadian Renewable Energy Corp, CREC. CREC is located at 2395 Speakman Drive, Mississauga, Ontario. I also hold a master of environmental studies degree, York University, and a master of public administration degree, Queen's University. Both degrees focused on energy and privatization issues in the province of Ontario.

I want to begin by thanking the Chair of the select committee on alternative fuel sources, the Minister of the Environment, and the committee members for allowing CREC to make this deputation.

CREC is a private Ontario-based developer of renewable energy assets. We will finance, build and sell green energy in the province after market opening. CREC is financed through private investment, with our main investor being the ARC Financial Corp, Alberta, Canada, through its ARC Canadian Energy Venture Fund 2. This information is provided in our submission in appendix 1 or it can be found at our Web site, which is www.crec.ca.

CREC is the only company, other than Ontario Power Generation and its partner British Energy, that we are aware of that is proceeding to build a renewable energy asset in Ontario this year. Pending Ministry of Natural Resources approvals, CREC will be constructing a three-megawatt Eco-Logo certifiable "run of river" hydroelectric facility in the Kirkland Lake region. Once again, this information is contained in appendix 2 or it can be found on our Web site.

CREC has plans to invest, in equity and debt, over $400 million in the next six years to construct in excess of 200 megawatts of capacity, which will include water power, wind, biomass and biogas projects.

The mandate of this committee as I understand it is to "investigate, report, and recommend ways of supporting the development and application of environmentally friendly, sustainable alternatives to our existing fossil fuel sources." I will constrain my comments to that mandate, but invite the committee to seek our input at

any time during its investigations or afterwards. I will also attempt to keep my comments brief so as to allow for any questions that the committee may wish to pose at this time.

I would like to begin with the most obvious of observations. The government of the day, to its credit, showed the leadership and vision needed to open Ontario's market to competition. Now it must complete that task and open the market by May 2002 at the latest. Any further delays will drive out of the market the emerging renewable energy business. CREC, over the past two years, has been approached several times by other jurisdictions.

At a minimum, the government must open the market to the sale of renewable energy. Presuming there is no technical reason, only concerns related to price, the government should open the market to renewable energy sales. Why? Renewable energy will be sold at above-market prices as a premium product, so price for standard supply is not an issue. In fact, it adds to the overall market supply, which will indirectly help control price increases by decreasing demand for the standard supply mix.

**1820**

Yes, price increases will happen. I believe this committee must accept that in a market that has seen no price increases for eight years, is removing indirect market subsidies, and requires massive re-capitalization that there will be price increases. However, supplying the green market, which can be estimated initially at 1% to 5% of the total market, will decrease some of the upward price pressures on standard supply by reducing demand. This estimate is primarily based on the United States Department of Energy figures that show that in 48 American jurisdictions in 24 states there are existing green programs; average market demand is 1% to 5% at a premium of 1 cent to 2 cents per kilowatt hour.

In short, we are behind the Americans and many other jurisdictions. This should cause the committee to ask whether, once again, Canada and Ontario are missing a long-term trend in industrial development. Our caution has sometimes hurt us and now, in a global marketplace, the penalties are much higher and less forgiving. To reiterate, we need market access and competition.

Secondly, we need a level playing field. Many discount renewables as a too expensive and not competitive. Only if society accepts the following:

(1) That the financial and social costs of burning fossil fuels should not be charged to production. We know there are substantive costs related to medical, infrastructure, tourism and the yet to be calculated costs of global warming; and

(2) The yet to be paid, deliberately delayed costs of uranium mine decommissioning, uranium refinement, nuclear waste disposal and reactor decommissioning.

Both costs are either borne indirectly or directly by society, or will be paid by future generations. Either cost can be calculated in the hundreds of millions or billions of dollars. This does not take into account the various direct and indirect subsidies both industries have been granted in the past decades.

To highlight what I am suggesting, may I draw the committee's attention to appendix 3. Enclosed is an excerpt from an October 1993 report commissioned by Atomic Energy of Canada Ltd, AECL, from Ernst and Young. I apologize that I cannot provide the full report, but given the limited time to prepare, I was not able to find a complete copy. It showed upward rising prices for nuclear power versus coal when decommissioning and fuel disposal costs are included. I would suggest the prices have since escalated and could be much higher. This document provides on example of the indirect subsidy provided to the nuclear industry at this time.

The Economist also echoes this opinion of the industry as a whole: "It is hard not to believe that if the cash thrown at nuclear power had been put into almost any other technology ... even hamster powered flywheels ... it would have produced something commercially viable."

My own research, when doing my master of environmental studies degree, which involved a cost comparison of fossil and nuclear power, showed substantial subsidies, verified from solid academic and government literature. I would suggest the committee engage a third-party consultant to examine this cost issue, and have this consultant examine the academic, government and industry literature to confirm that direct and indirect subsidies exist in Ontario and to what degree.

The question I will now put to this committee is, if you want renewable energy, how will the government level the playing field to producers that do not have society paying indirectly or directly for part of their production costs?

One option is tradable emission credits. However, the current structure, as proposed, is flawed. Its designers seem to have forgotten the key economic principals under which an emission credit regime functions. Those that pollute beyond the level set by society, known as the cap, must either reduce emissions or buy emission credits from those that do not pollute beyond this cap. This stimulates a market reaction: polluters either recapitalize plants or enter the market to the standards set by the government, that is, the cap. Those that cannot afford to recapitalize—as an example, an older plant—buy emission credits to delay recapitalization until it is optimal. In short, the polluter subsidizes the non-polluter in recapitalizing the industry to achieve governmental and societal goals related to air pollution.

In the case of renewable energy, we either do not pollute or reduce existing pollution emissions, yet the current system, as it is proposed, provides marginal financial rewards to the renewable energy developer. Why should current generation, fossil and nuclear in particular, have their costs subsidized by society, with no equal compensation to renewable energy producers?

Remember, one of the cornerstones of emission credits is to encourage new production methodologies to enter the market, recapitalize that market, but allow older production methodologies to function until the facilities'

useful life has expired. The current proposals do not adequately address that issue.

One real option for this committee to consider is a structure that forces full cost accounting of the production of electricity. This cornerstone of emission credits seems to have been lost in the current process. To achieve this goal, Ontario should consider building on the system functioning in the United States and allow for cross-border trading of emission credits. After all, smog considers no borders, and acting as if it does only hobbles the full potential of an emission credit system.

There are other options, less market driven but perhaps just as effective: tax credits for both production and consumption of renewable energy; direct charges to the polluters; favourable tax treatment for those who build renewables; and quotas and mandatory procurement. Examples are renewable portfolio standards and government procurement of renewable energy. However, because the alternative energy industry has been labelled as being non-competitive by established players, I am leery of these options without adequate public education. To reiterate, if the government desires renewable energy's entry into the market, it should recognize the hidden subsidy to other players and take measures to impose a structure that levels the playing field.

Thirdly, the government has to create a regulatory framework that is conducive to building renewable energy assets. As examples:

The current licensing structure should simplify the sale of green power with a goal of maximizing consumption. Currently it does not.

A clear retail sales and certification process should be implemented so as to protect consumers.

The regulations to build a site should be streamlined and clarified so as to encourage development; for example, the new water power guidelines being created by the MNR.

The process for acquiring crown land for hydro and wind development should be reoriented toward promoting renewable development. The government should also revisit the Lands for Life process, asking itself how renewable energy assets could be built on this land being set aside. Allowances already exist for mining and the forestry industry. Why should the renewable industry be treated differently?

Access to the provincial grid should be mandated, and measures should be taken to minimize costs.

The government should organize this within a separate department in the Ministry of the Environment, so industry deals with knowledgeable public servants who can assist in their efforts.

What does society gain by the government's taking such actions?

It encourages energy production that minimizes negative environmental costs and forces the real cost of energy to be paid by all consumers. This will allow renewable energy to compete on a level playing field with traditional sources of generation. These actions would also encourage, as I am sure has been argued by others, a move to conservation and less use, the optimal way of minimizing future costs and the need for recapitalization of the Ontario electricity market.

Renewable energy is a distributed generation technology benefiting multiple regions across the province. Examples of the benefits are: it reduces grid connection costs for local utilities; it clearly reduces intraprovincial transmission losses; it increases local tax bases; it increases local grid stability—power supply, ice storms and so and so forth that could take out the larger grid; and it benefits regional interests—wind leases for farmers, municipal taxes, First Nations power development.

It provides the market with innovative solutions that can help achieve other policy objectives; for example:

Animal waste disposal which produces methane for electrical generation. This could assist in increasing the number of animals per acre while protecting water quality;

Anaerobic digestion of organic municipal solid waste; and

First Nation and remote energy development in the north, which in turn assists the First Nations and opens the north to industrial development—mining and forestry.

It creates an export market to the United States, where there is an existing demand for green power. It encourages multi-million-dollar and potentially billion-dollar investments and creates an industry that can service a global community.

In summary, we propose in general that industry needs market access as soon as possible and no later then May 2002, including a clear process to export to the United States, a level playing field to set prices, and a clear regulatory structure and government institutions mandated to assist and not hinder our endeavours.

We propose specifically for consideration that if the government will not proceed to full costing of electricity, the government implement alternative measures. CREC would propose that the government mandate that all producers wishing to sell their electricity as green power into the Ontario market must match existing renewable power with new green power built after market opening. Furthermore, until OPG—Ontario Power Generation—completes its divestiture, it must purchase new renewable power from the market equal to the old generation that it plans to rebrand and sell as green power until it has completed divesting its generation base as currently mandated by the government. This meets current federal standards organized through the Eco-Logo program as to green power sales, specifically that generation built prior to 1990 must be matched with new generation to be labelled as green power.

This proposal is made in light of recent announcements by Ontario Power Generation; please see appendix 4. While we applaud OPG's ongoing commitment to the environment, this activity contravenes the purpose of market deregulation by allowing one player easier market access. Furthermore, OPG is supposed to be divesting assets and limiting its market role so as to encourage

market entry and competition, not expanding into the renewable sector beyond its current capacity of approximately 138 megawatts of old hydro generation rebranded as green power with marginal amounts of wind and solar.

**1830**

Furthermore, if properly structured this approach will encourage new green generation equal to market demand, dividing the market between new and old producers. Furthermore, the old generation built largely with government support will be capable of taking a lower price. In short, it's a subsidy that costs the government no new dollars and allows all players to make a fair profit.

CREC wants to support OPG's goal of bringing 500 megawatts of green power to the province, but with the private sector paying for the new generation within a competitive marketplace.

In conclusion, the benefits of what we have purposed are:

(1) The total, all-in cost currently paid by society for electricity will be reduced, and consumers will have access to a product they desire—cleaner air and a better overall environment.

(2) Diffuse investment spread across the province.

(3) Innovative approaches that assist the government in meeting wider policy goals and objectives but driven by the market and consumers at no cost to the public purse.

(4) The potential for new investment and new industries forming in the province.

Once again, I thank you for your time and kind consideration of CREC's deputation. I renew our offer of any assistance to the government and this committee. If time allows, I would be happy to answer any questions.

**The Chair:** We have about a minute and a half per caucus.

**Mr Hastings:** Sir, with respect to your recommendations dealing with the financing of energy, I see your company and other companies' involvement in trust units—that sort of thing—dividends for investors. My question specifically deals with retail investors. Martin has now established a Canadian renewable and conservation expense item. We've had a similar regime in operation for 20 years plus with the carbon or fossil-fuel-based industry. Would you recommend that specific flow-through share arrangement to attract retail investment in these renewables? There is a tremendous amount of money in Ontario that's going into pension funds. It's the free market, but it ends up in real estate and in things that you wonder, are there not enough retail investor products on the market to drive the sort of major policy initiatives you advocate here?

**Mr Gillette:** Firstly, it'll take me a second to explain how the flow-through works and what restriction they are; this is not brought forward in this deputation. The flow-through currently functions in a manner that precludes small investors. By and large it's been hobbled by Revenue Canada in several ways.

The first is, it's very difficult for us to use the CRCE flow-through. We have to first raise the money and then spend it. We can't raise the money and spend it later; we have to incur the expenses after we've raised the money. It's more restricted than oil and gas, because they have a 60-day lookback. After December 31, they have 60 days to complete spending the money. So someone can use the CRCE and have the tax write-off in that tax year. For us, it has to be December 31. So basically, the period of time when we raise the most money is in September, when people are considering how to deal with their taxes, and we have four months to both raise the money and spend it, which is unrealistic.

**Mrs Bountrogianni:** Thank you very much for an excellent presentation. Once again, there are many overlapping recommendations from our presenters, and that's heartening to us. I do want to point to page 6, the first point in your summary. You propose, "(1) Market access as soon as possible and no later than May 2002, including a clear process to export to the United States." I guess I'll ask a question that my colleague from across the way, Mr Hastings, has asked a few times of our presenters: to your knowledge, would NAFTA, the free trade agreement between our two countries, limit us or put us in some sort of uncomfortable position in the future, if (1) were to pass?

**Mr Gillette:** How renewable energy would be treated under NAFTA is an interesting question, and I think we probably would want a ruling on that for a comfort zone.

The reason renewables are probably a good export for us to consider, if we could get a ruling from NAFTA separating them, saying there's standard supply mix and there's renewable. Renewable energy is a premium product. We have a big province. There's still a lot of renewable energy that could be developed here and then exported. If you could get that separation of the two, so that you are not making a commitment, I think you'd be on fairly safe ground. This is sort of a premium product that a proportion of the population will buy, so I think you'd be fairly safe on that.

The other advantage of renewables is that most renewable contracts are for intermittent supply, so it can be generated here. How the market works is, I may generate my power in Kapuskasing, as an example—it's going to go to the closest source—but what happens is that the IMO treats the closest power to the border as the power that's renewable and ships it across, but it could do it at night. It's intermittent supply. I'm not going to say to anybody that I'm going to deliver my green power at 3 am or 3 pm; it's going to come when it's generated. So it can be shipped across the border when there isn't a lot of load on the wires.

There has been really no process. To quote one group in the US to whom we have been talking about this, it's a little bit of black magic getting across the border. If we could clarify the rules, I think there's a market there for us.

**Ms Churley:** You pointed out in your presentation—which was very good, by the way, a very clear and concise representation of what's happening—while we're on the subject, that traditional fossil fuels, dirty energy

producers, are subsidized in various ways as well, and you talked about the externalities, the health care costs and other costs that are not factored in that are being subsidized. For instance, incredibly, nuclear power was subsidized and still is, even though it's in private hands now, which I find almost unbelievable. But it's entrenched; it's the way we've been doing business for so long that's got to be turned over.

My question relates to the question just asked. We're already in many ways subsidizing existing energy to keep the costs low, and I assume from all the presentations that it's the same in the US and other countries, so what would the difference be? It's simplistic, I know, the way I'm putting it, but why would this be treated differently under NAFTA than existing technology?

**Mr Gillette:** I believe you could get the NAFTA ruling, because it is a separate product sold in the United States in a great many different jurisdictions under the Green-e program. Georgia has a renewable energy program that has just come up. There are 24 jurisdictions. You probably can make the argument that we want to do renewable energy exports, but we don't want to get tied in that this is going to be a standard supply mix.

The other factor of it—and the government would have to consider how it constrains exports—is that the advantage is that this is extra supply that gets separated around the province, and the excess would be sold over the border. But it's going to be used where the source is. So some careful thinking might have to go into how much we allow export, an export licence being issued, but my understanding of NAFTA is that you can't get dinged—you can only basically be penalized if you stop selling the amount you're selling. So if we're selling 500 megawatts and we stop selling that for illegitimate reasons under the trade regulations, then we can be penalized.

**The Chair:** Thank you very much for your presentation. We really appreciate your coming forward to shed some new light on moving electricity around.

**Mr O'Toole:** Mr Chair, as a point of information to the researcher: several presenters have asked us about this equation of full-cost accounting of production of traditional energy or power. I wonder if we could have some attempt to summarize what we are all alluding to, that there are subsidies, direct or indirect, to nuclear, coal, so that we are all talking, whether it's the health care costs—could we get legislative research to give us a bit of a model on what full-cost accounting is all about?

**The Chair:** Certainly.

**1840**

## FUEL CELL TECHNOLOGIES

## KINECTRICS

**The Chair:** Our next presenter is Robert Stasko, director of business development for Fuel Cell Technologies. You have 20 minutes for a presentation and questions and answers afterwards. As you start, please state your name for the sake of Hansard, once you get going.

**Mr Robert Stasko:** Just to introduce myself, my name is Bob Stasko. I'm director of business development for a company called Kinetrics, formerly known as Ontario Hydro Technologies. I'm here actually representing Fuel Cell Technologies, another company involved in fuel cell development. Basically I'm representing both our companies and the fuel cell sector. I guess that's how I'll characterize it today, because I'm talking about some general policy initiatives in this area.

Just a little bit of background: Fuel Cell Technologies is a Kingston-based company which is developing residential fuel cells based on solid oxide fuel cell stacks. Kinetrics, as I mentioned earlier, was formerly Ontario Hydro Technologies. We're involved in several technologies, fuel cells being one, but we're also involved in the development of other renewable and alternative energy technologies. Today I'm going to emphasize issues relating to alternative energy.

I should just give you a little bit of background about myself. I've been in the energy area for about 25 years. I've worked on everything from energy from manure to fusion. I've been seconded to government on three separate occasions: to the Ministry of the Environment, the Ministry of Energy, and the Ministry of Energy, Science and Technology, under the Liberal and NDP governments and, most recently, the Conservative government. I just thought I'd throw that out for a multiparty committee.

What I really want to talk about today is the opportunity for government to address three major issues with a single crafted initiative, and I'm not going to pretend to lay out recommendations at this stage. I only had a week since I met Dr Galt at the AMO trade show, an event I would characterize as a shooting gallery for cabinet ministers. But that's another story. I've only had a week, so I won't pretend that I'll come up with definitive recommendations, but I'll go over these issues.

The opening of the Ontario electricity market: as we know, although we have three to five years of supply margin in Ontario, there are no assurances that new supply will appear when needed. Uncertainty in the gas and electricity markets, plus the possibility of government intrusion, has reduced the incentive for new investment in large generation facilities. Just to elaborate, considering the large capital investment that many of the private merchant generators would be involved in, they are somewhat skittish whenever they see a hint of any price caps or any changes in electricity pricing structures.

Last, merchant plants will be drawn to those jurisdictions with lowest risk and highest return, California and the northeast US at this time being the most popular.

Issue number 2: the need to address environmental air quality issues. As we know, the burning of traditional fossil fuels in trucks, automobiles and large fixed electricity generators has led to an air quality crisis. Distributed generation technologies are more environmentally benign, for many reasons, and have the potential to be

very efficient. By that I mean that renewable energy clearly has a very small environmental footprint. But even something like a fuel cell, when it's operating at 85% efficiency, which we project some of these devices will do when they're operated in a cogeneration mode, and with basically a turbine at the back end capturing the waste heat as well, compared to 35% for most generation right now, you can see that simply the emissions profile would be much lower, and of course, fuel cells do not emit $NO_X$ or volatile hydrocarbons anywhere near or even in measurable quantities.

Electrotechnologies in the transportation sector, which I'm not going to talk about very much today, nonetheless are worth mentioning, because we feel they are a key solution to the problem of transportation emissions. When I talk about electrotechnologies basically what I mean is fuel cells are, for all intents and purposes, a hydrogen battery. So you're talking about an electric car, which has been a panacea for decades, if not a century.

Issue number 3: a provincial strategy on alternative energy solutions. By this I mean this may be part of a broader promotion of environmentally friendly distributed generation. I will refer to distributed generation technologies repeatedly in this presentation. At present, Ontario is home to what I would call a critical mass of fuel cell capabilities and expertise, along with other related and emerging technologies. By that I mean of course the other renewables and alternative energies but also supporting technologies for fuel cells, such as hydrogen generation, hydrogen production and advanced hydrogen storage. Here in Ontario we have companies such as ours or Fuel Cell Canada or Hydrogenics or Stuart Energy Systems, many smaller companies and many universities, all of whom are contributing.

Unless there is some action, this capability could be dissipated as companies move to other, more nurturing jurisdictions. As an example, I give you Ballard, which flew to the west coast many years ago and I suggest that they might not be the last. However, something of interest that's general knowledge now is that the state of Michigan has issued a 100-page document basically describing how they intend to be the fuel cell development centre for the United States essentially because they are the number one sector for automobile production in the US. I believe we are second only to them and so this should be an issue for us as well.

Finally, an opportunity to enable a new sunrise high-growth industrial sector with environmental benefits and premium jobs could be lost if we don't act.

My thesis is that the opportunity is to address all three of these issues with a single initiative. Under the Energy Competition Act, 1998, government can provide policy direction to the Ontario Energy Board to develop suitable incentives for distributed generation. As it now stands, in recent discussions with staff at the OEB, they are waiting for government direction on this issue and have stated that, and even though they are preoccupied with market opening, are quite welcome to begin a dialogue to find out what kind of incentives would be appropriate.

Government can develop additional cost-effective incentives targeted at the end user similar to what has occurred in other jurisdictions.

Finally, if carefully crafted, many of the incentives can be revenue-neutral through minor changes to existing codes and regulations. Again, I have some knowledge of this from my most recent involvement with the Ministry of Energy, Science and Technology and the development and implementation of the Energy Competition Act.

Electricity market dynamics in a deregulated environment: I thought I would mention that just to give you some of the background of where we will be without DG. The market will be dominated by a few large generators who will have great market power. Electricity flow will be constrained by transmission bottlenecks which will have price impacts. Price spikes will be created by large inelastic loads. By that I simply mean that generally people do not shed their habits of electricity use easily, so when there is a shortage of generation the prices spike. That's what has happened in California and that's what has happened in Alberta.

The fossil component of the energy mix is higher and that's because it's easier to dispatch, it's basically a swing fuel, and it can be brought on board very quickly, so there is generally more fossil generation in a spot market dynamic.

Finally, distribution utilities or municipal utilities at present have few innovative technologies to improve their performance. In effect, they are now trying to get better performance through amalgamation and efficiencies, but they have few technologies to help them.

**1850**

The solution: distributed generation concepts and technologies from the bottom up. Large generators balanced by robust local distributed supply create a more ideal market. You have more sellers and, as we know, when you have more sellers rather than a few sellers, you have more of a market condition.

Distributed generation reduces the load on the transmission system because the electricity is produced and consumed locally within a distribution system.

Dispatchable load and peak shaving or shifting technologies can also be brought on board to smooth demand, and basically the whole panoply of demand management technologies and systems which we've used before with great success we can use again as part of a broader initiative.

New distributed generation technologies like fuel cells will be cleaner, more efficient and less intrusive. By "less intrusive" I mean there will be less of a concern about people having these in their backyard. They are more environmentally friendly.

Distribution companies will have a tool to fine-tune their system performance by putting things like fuel cells or windmills or cogeneration facilities at the ends of long feeder lines where otherwise they might have to put in a capital cost to upgrade that line.

What are some of the policy tools that are available? Although more analysis is required, and I will be the first to admit this is not an exhaustive list, I would say

everything from a debt recovery charge variance that would be applied to efficient or renewable generation; tax incentives, some of which are in place but should be improved for capital cost allowance and also on revenue as in other jurisdictions; modifications to the generation licence requirements in order to incent more distributed generation; and finally, giving the local distribution companies more latitude in how they can use generation technologies, because presently under the act they are barred from doing so without setting up an affiliate.

How to implement this initiative: a combination of well-crafted regulatory incentives plus new co-funding for demonstration projects across Ontario.

Some alternative technologies have recently crossed the threshold, and I suggest that wind and conventional cogen are part of that. They might disagree with me, but I feel they've crossed that barrier. However, others do need incentives to overcome market barriers. These include fuel cells, biogas, photovoltaic, low head hydro and advanced energy storage technologies.

Incentives can be levered off modifications to existing OEB and MOE regulations after suitable stakeholder consultations. I'm sorry if that's redundant, but I thought it was a point worth repeating.

Finally in implementation, new initiatives are needed which would provide risk management for early adopters of new alternate technologies. These would be pilots that would encourage uptakes by others. Any funding needed for these initiatives would easily attract co-funding from the federal government, energy companies, the municipal sector, the early adopters and other private sector stakeholders. I can personally assure you of this, because I speak with these individuals as groups and on an individual basis on a daily basis.

In summary, distributed generation can help to stabilize the new electricity market and ensure that it operates as designed. Government proaction will ensure that new, efficient and environmentally sound energy systems such as fuel cells can address any future electricity supply gap and avoid the California and Alberta experience. The resulting market pull for advanced distributed energy systems will create an ideal business climate to establish a fuel cell industrial cluster in Ontario, something which I believe we all would like to see. Thank you very much.

**The Chair:** We have about a minute and a half per caucus starting with the official opposition.

**Mrs Bountrogianni:** An excellent presentation. You started out by saying you didn't have time for recommendations, but you did indeed include them. Again, they overlap with many of our earlier presenters. I don't have any questions. Thank you very much for your presentation and your expertise.

**The Chair:** Ms Churley?

**Ms Churley:** Ditto, I suppose, except I did want to ask—you mentioned that you did some work for this government on the OPG and deregulation. Can you expand a bit on what your role was?

**Mr Stasko:** Yes. I was seconded to the government, and again, there is a bit of an anecdote. I have some nuclear expertise and I also have a wide range of expertise in energy technologies. I presumed that's what I would be applied to when I was seconded to the ministry, but in fact it was the deregulation issue that was driving everything. I was actually working more in the distribution sector trying to develop an implementation strategy to soften the blow on municipal utilities, so that's kind of why I know what their particular concerns and constraints are.

**Mr O'Toole:** On your policy tools, the debt recovery variance, tax incentives and local distribution companies—I know they're incentives. They're all asking for it in a different kind of vocabulary. But let's say we put in a policy where, by 2020, 20% of the power has to be from some sustainable form. What about the assets we currently own as Ontario citizens, even though it's old technology like a coal-fired generation plant, and the whole issue with OPG having to divest themselves down to 35% of the total generation capacity? How do we deal with those assets that become worthless if we send these policy signals? How do we deal with that? It's a real question.

**Mr Stasko:** I agree.

**Mr O'Toole:** We've got $35 billion out there now that's sort of stranded. It's going to be paid for by somebody; let's call them taxpayers.

**Mr Stasko:** I think my only response to that is, this requires analysis. For instance, the kind of figure you mentioned as a target might create the very situation you suggest: stranding assets.

**Mr O'Toole:** How do they sell Nanticoke?

**Mr Stasko:** I think the incentive should basically be crafted to match the actual capability of this sector to deliver. Right now, frankly, we're struggling to get the sector to deliver on a lot of the green energy opportunities because there are not enough of them there. There is not enough critical mass.

**Mr O'Toole:** Pollution knows no borders, so the coal from our side or their side and all these emission trading credits and the bureaucracy to set up and monitor that—if we can sell current capacity to the States, we're going to be criticized for using coal, which is supposed to be a peak-load management tool. I'd be cranking the sucker up, because coal will be dead in 10 years and you might as well use it up. Do you know what I mean? How do you get around that?

**Mr Stasko:** There are clean coal technologies; I didn't talk about them today. It's just that some people view that as an oxymoron.

**The Chair:** We appreciate your presentation. Thank you for the invitation I extended to you at AMO. I appreciate seeing you on the schedule.

**1900**

## STUART ENERGY SYSTEMS

**The Chair:** The next delegation is Kevin Casey from Stuart Energy. There is a total of 20 minutes for your

presentation, and what's left over will be divided equally among the caucuses.

**Mr Kevin Casey:** My name is Kevin Casey, and I am vice-president of business development for Stuart Energy Systems. Thank you for inviting me here this evening. I'm here to talk to you about the hydrogen opportunity. This is an alternative fuels committee, and we believe hydrogen is the ultimate alternative fuel. Hopefully by the time I get through this very quick overview, you might agree to a certain extent.

One of the reasons we see hydrogen as the ultimate fuel is because it doesn't make a lot of technologies but it makes a lot of technologies better. It links them together. What you're seeing here is hydrogen as we see it, as the centre of a web of power technologies, linking them together and making them better, and not just average power technologies but renewable technologies and clean technologies that will certainly go a long way to improving air quality in this province and around the world.

At Stuart Energy, we've been doing one thing for 50 years and that's taking water and electricity and turning them into hydrogen and oxygen by zapping the water. It's a water electrolysis process. What that allows us to do is take electricity from any source at any time and convert it into hydrogen—a different form of electricity, if you want to look at it that way—store it, move it around, bring it to where people live and travel, and either use it in a process at home—cooking—or have it regenerated at home in a fuel cell or in a fuel cell that's aboard a vehicle or in an internal combustion engine that's aboard a vehicle. It can be used in storage and then regenerated and put back on the grid to shore up a lot of these power resources. So we see some tremendous potential in hydrogen improving the quality of life of people in Ontario.

To tell you a bit about Stuart Energy, the company was founded in 1958 and since that time we've been busy installing about 1,000 plants—

*Interjection.*

**Mr Casey:** Sorry, did I say 1958? You're quite right, it's 1948. I ripped us off for 10 years.

We've been busy installing about 1,000 plants, hydrogen generating facilities, in about 100 countries worldwide. We are the recognized leader in water electrolysis. It's a niche market, but we are the world leader, located right here in Ontario. We have about 180 employees at the present time and various sales offices around the world. We have had an excellent safety and performance record during that time. There has never once been any serious safety incident as a result of there being anything wrong with our equipment. More recently and more importantly, we have become one of the world leaders, if not the world leader, in hydrogen refuelling.

The partners in crime, as it were, are the Stuart family, who got the ball rolling many years ago. They own 50% of the company. There's the SC Johnson family trust. Sam Johnson, of Johnson wax fame, is a very strong environmentalist and sees some interesting commercial applications to consumer products from what we're doing.

We also have a partner in Hong Kong, Cheung Kong Infrastructure. That's part of the Li Ka Ching group of businesses. The Li Ka Ching empire is one of the biggest, if not the biggest, corporations or group of companies in Asia with market capital of hundreds of billions of dollars. They own infrastructure, ports, highways, real estate, electric utilities—Hongkong Electric. We have a joint venture with them. Their task is to aggressively pursue the establishment of a hydrogen infrastructure throughout Asia using exclusively Stuart equipment. We're very excited about that.

We are also members of the California Fuel Cell Partnership, which I'm sure everyone is familiar with, a group of energy, fuel cell and auto companies that are trying to make the fuel cell a reality starting in California.

We also partner with SunLine Transit, a very forward-looking transit company in Palm Springs, California. SunLine has converted all their buses to natural gas and are next looking to convert them all again to hydrogen. We have one of our Stuart plug-and-play fuelling appliances down there fuelling an Xcellsis bus that has a Ballard fuel cell engine in it.

We have also recently set up a fuelling station at BC Hydro, in their Powertech Labs, that will also be used for fuelling vehicles they will be bringing up shortly.

What has allowed us to do this is a breakthrough in technology that was discovered or developed right here in Ontario at our Stuart labs. This is what we call our DEP or double electroplate technology. The breakthrough here is that it's the heart of our fuelling appliance, and the cell itself is designed for low-cost, high-speed manufacturing—simple materials, nickel-plated steel—and it's a very scalable type of technology.

This double electroplate is the integral component of the heart of our fuelling appliances, which are our electrolysis stacks. We've divided our stacks into three separate platforms—small, medium and large, if you will—in order to address the full range of fuelling requirements that might be out there. These in turn go into a series of fuelling appliances.

The personal fuel appliance, which you see here, is something that's designed for home use. We envision this going into the average user's home. It will plug into a 220-volt outlet like a typical stove, and all you have to do is attach a garden hose and you're in the business of hydrogen. You're making hydrogen.

You've heard all this kafuffle about where the hydrogen infrastructure is coming from. This is infrastructure in a box right here. This unit on the left is the prototype that we have right now. The one on the right is the target we're shooting for. When fuel cell vehicles become commercial, this will alleviate a lot of the infrastructure issues. "Where am I going to get fuel?" is going to be the typical question a consumer will ask, and the answer is, "You're going to get it in your home." You're also going to be able to fuel from your home many other hydrogen devices, we hope, in the future.

A step up from that is our community fuel appliance. This is for small fleets. We see that as an introductory level for most companies with corporate fleets that want to get into the hydrogen game, and then a size up from that for large fleets or bus fleets, we have our bus fueller. That's a picture of the one that's down at SunLine California right now. The SunBus is one of their buses.

So we're going to fill the needs of all the hydrogen fuel users everywhere with this scaleable technology that is essentially plug-and-play. Everything comes in a box. All you do is plug in electricity and water, and high-pressure, high-purity hydrogen comes out at the other end.

We've been hard at this development program since 1995. The Ps represent different phases in our development program, and increases in power density or the shrinking of the unit footprint to make it smaller and more compact, and reductions in solid capital cost of a fuelling station based on hydrogen.

P1 was connected to a photovoltaic array at a Xerox facility in El Segundo, California. It was making hydrogen from electricity generated by the sun and it was feeding it directly into the tanks of hydrogen internal combustion engine trucks. So we were taking energy from the sun, creating a completely zero-emission pathway—there are no emissions in the photovoltaics; there are no emissions in our appliances. There's a bit of emission in an internal combustion engine running on hydrogen, but with a fuel cell there'll be no emissions. So you have a completely zero-emission pathway that we've established the technical feasibility of.

P2 was a project we did with Ballard and BC Transit from 1998 to 2000. We fuelled three Ballard fuel cell buses that were in regular revenue service. During that time we never failed to produce the hydrogen as required by those buses. So we're one of the few companies in the world that can claim a perfect track record in fuelling fuel cell buses in regular revenue service. Nobody else out there can do that at the moment. Air Products did it in Chicago—I should mention that—but we're the only other one.

In P3, technology was deployed last year at SunLine California, as I mentioned. The picture here is of the one we delivered to BC Hydro in January. We have another unit at the National Research Council in Vancouver as well.

We're moving on to P4, the next generation. The small one is a P4 technology that has been deployed at Ford, in our joint evaluation program with Ford. It's fuelling their fuel cell vehicle. We have another one at Atomic Energy of Canada Ltd.

The market opportunities for us: we see breakdowns of three main categories. The industrial applications have been our traditional bread and butter, but with the advent of the fuel cell or regenerative device that could take hydrogen and convert it back to electricity, a couple of other huge markets have opened up in transportation and regenerative power applications.

In the transportation market, here's a picture of the unit that's down at Ford. This is the Ford TH!NK fuel cell vehicle, and we've been fuelling that at various trade shows and conferences around the country.

**1910**

Our strategy for solving the infrastructure problem and how we're going to win in the marketplace is based on some realities of introducing fuel cell vehicles, and this is what this graph is trying to depict. The green area is, if you will, the total number of vehicles on the road growing over time and the grey represents a possible penetration scenario for hydrogen vehicles. You can argue about the time and the slope of these, but in reality they're going to be very thin at the beginning. You're going to see very few hydrogen cars on the road —one in 10,000, one in 100, one in 10. The question is how you effectively fuel those vehicles when there are so few of them out there. That's where we think our small-package, scaleable appliance is the answer, because you're going to need an affordable, small, highly distributed system of fuellers. The current paradigm for making hydrogen is to make it very cheaply, but at centralized plants that make a heck of a lot of hydrogen. Unless you want to have everyone drive their cars to that plant, you're going to have a very difficult time in selling hydrogen cars. Our answer is to use the established infrastructure, which is the water and electricity grid that's already in place, and just add on a small appliance to start with, trade it in, swap it with a larger one. With our scaleable modular approach we'll be matching the fuel supply with demand in a cost-effective way.

This is where we see our place in the market. On this axis you see the cost per tankful; on the other axis is the increasing number of cars that need to be supported. We're going to dominate in the small end, where there are not a lot of cars that need to be supported. It isn't until you get into a very large number of cars that other forms of generating hydrogen such as steam methane reforming are going to become economical, because those technologies don't scale down very well. They're great if you want to make massive amounts of hydrogen, but if you're going to make it small-distributed, where people need it in their homes, at corner stores, wherever there's water and electricity, they just can't match that capability in terms of cost or convenience for the customer. We see ourselves as fulfilling an important role in getting things started for the infrastructure in the most cost-effective way.

This is our target. As far as economics are concerned, we believe we can get to a point where we're providing consumers with the same cost per gallon as gasoline is now. Our target in mass production of our equipment is $250 per kilowatt. We have an efficiency right now, which we hope to improve, of 55 kilowatt hours per kilogram, a capital return factor of 7%, maintenance of 7% of capital cost per year, and an electricity price of 4%. We can get to a cost per kilogram of around $3—these are US dollars, by the way. Since one kilogram of hydrogen is roughly equal to a gallon of gasoline in energy content, it's $3 per equivalent energy content of a gallon of gasoline. However, fuel cell cars are going to

be roughly at least, we are told, twice as efficient as current internal combustion engines. So you just divide this by two to get your cost of a gallon of gasoline equivalent, which is about US$1.50, which is what we're seeing in the US right now. So we believe this is achievable.

The reason we have a utilization rate of 46% is that we feel that in order to make maximum use and get the low-cost electricity, we're going to take advantage of the fact that we use off-peak electricity. We can make the hydrogen any time of the day we want, so we're not going to make it during peak periods. With deregulation and time-of-use rates, we feel we'll be able to access low-cost, off-peak rates. Not only that, but we'll also provide an avenue for renewable resources, such as wind turbines, to be more cost-effective. We feel we can establish long-term contracts for their off-peak electricity at above their marginal cost of producing it, which will provide a much stronger financial incentive for them to establish these wind turbines. So, through our equipment we will be inducing more renewable resources to be brought on line to serve the peak power markets, and we'll be taking the off-peak. That's why I have utilization rate of less than 50%, because we're making it only half the day.

We're also looking at the power markets because of the unique ability of hydrogen to store electricity. The other way of doing it right now is by battery, but once you go into large amounts of power that need to be stored for a longer period of time, batteries aren't feasible. Our solution is, turn it into hydrogen, store that hydrogen as a compressed gas and regenerate it, either with an internal combustion engine that runs on hydrogen or a fuel cell that runs on hydrogen, and you will have an effective storage mechanism. This allows us to shore up base load power with peak shaving and load shifting. It connects to renewables, as I said before, in a way that makes them more economically feasible. It's a system that can provide for backup power, peak shaving, as I said, and a source of hydrogen for portable power units.

Just a graphic representation of the way we see this happening: you take a wind turbine, off-peak electricity, run it through one of our electrolysers, store it. You can take some of that hydrogen and put it into a portable device for cooking or whatever, or you can run it back through a regenerative engine of some sort and provide electricity to the end user.

Based on the assumptions you see here, which are all achievable with today's technology, with internal combustion engines, not fuel cells, we can get to an electricity cost, round-trip, of 11 cents per kilowatt hour. If you were to try to do the same thing with a diesel gen set, it would be a break-even of about US$1.32 per gallon of diesel. That's what we're seeing in the marketplace in a lot of places, and it's certainly less expensive than a lot of places in the world.

So our strategy, in general, is to provide an appliance, plug-and-play, so the consumer or the fleet owner does not have to bother with anything. It's very reliable wherever there's water and electricity. We're going to focus on the entry-level fuelling solution and provide scalability to match their investment with the hydrogen demand as the fleet increases. We're going to use low-cost, off-peak electricity to make the hydrogen, we're going to link to renewables as much as possible to provide a completely zero-emission pathway from cradle to grave, and we're going to use the same technology and the same product in these power markets, industrial and automotive, in order to drive down the cost curve. That's our pathway to a potential trillion-dollar market.

In summary, we believe that hydrogen is the ultimate fuel, because you can get zero-emission pathways, and electrolysis is really the only economically viable way right now to provide a true zero-emission pathway from the cradle to the grave. All the necessary technologies are in place right now except for the fuel cell. That will be coming; however, we don't need to wait for that. If you use hydrogen internal combustion engines, they are the cleanest available technology right now, and they are available right now, and they can be used in both transportation and stationary applications.

The message I would like to bring to you is that Ontario has the ability right now to take the lead. This is a nascent type of industry. You have some world-leading companies, and other areas around the world are catching on, but nobody has really jumped out in front like a Silicon Valley type of arrangement, so the opportunity is there for Ontario, if they want to take it, to be a world leader in this. We would suggest, to get started, you might think about some high-profile demonstrations, which we would be more than happy to participate in, and make things easier for people in our industry by providing the proper incentives and regulations that at least don't hamper us in what we're trying to do. Thank you for your attention.

**The Chair:** We're actually a minute over time, so we've run out of time for questions, but thank you for an excellent presentation, very much appreciated, and we just might take you up on your invitation to visit.

**Mr Casey:** I hope you do.

**The Chair:** Your location is Mississauga?

**Mr Casey:** Yes, near the airport there, on Orbitor Drive.

**1920**

## RAY PASQUAN

**The Chair:** Our next presenter is Ray Pasquan. Please come forward. As an individual you have 15 minutes for a presentation, and anything that's left over after your presentation we'll divide up evenly among the caucuses for questions. Just state your name for the sake of Hansard, and the time is yours.

**Mr Ray Pasquan:** My name is Ray Pasquan. I was born and raised in Ontario. I'm an inventor and I'm also a tool designer, machine designer, and I'm not used to this.

**Ms Churley:** We're pretty harmless.

**Mr Gilchrist:** This side is, anyway.

**Mr Pasquan:** That's good. It's nice to be here. It's very distinguished company. Thank you for having me. I'm just looking here at names, and this is quite impressive.

**The Chair:** Don't let us make you uncomfortable. Just go ahead.

**Mr Pasquan:** Did the clerk hand out copies?

**The Chair:** Yes. We have them.

**Mr Pasquan:** I doubt if you've had time to read anything. I think on the cover you can see that "Heat Churn/Windmill (Max e Mill)" is the name of my windmill, and I've thrown in a wind power tower which may be interesting to people. Without wasting too much of your time—I think you've seen the photograph—I wonder if you could read page II regarding the heat churn and then we'll show the video after that.

This is an amateur video taken by my farmer friend out west, and it's not really of very good quality. I asked him to pan up to show the air brake at the top of the tower, a Kenworth air brake, by the way.

The electronics down below is not necessary for this windmill. It's just a small package required. We put it there just for demonstration. The tank at the bottom is the heat churn. That's a canister of nitrogen that will release the brake.

The heat churn has paddles in it as described here, and fluid friction converts the shaft power to heat. This was test electronics and not required for this windmill; it's just for demonstration.

I'll release the brake here. There is no motor to start this; it's self-starting. It's a little bit slow, but—

**Ms Churley:** It's doing better than the Ontario—

**Mr Pasquan:** This is actually more efficient than their windmill, believe it or not, but I shouldn't go into the numbers yet. This is just a general introduction to heat churns and windmills. It actually truncates fairly quickly.

I say that I'm going to put the brake on, but I don't get a chance to before it goes off. You'll see it spin quite quickly, and then I put the brake on.

Normally this windmill operates at three times the wind speed. In a high wind it takes a while to accelerate to speed, but once it's at speed it follows the wind.

OK, we're starting to go now.

**Ms Churley:** How long does it take to get up to that speed?

**Mr Pasquan:** A couple of minutes.

**Ms Churley:** So this is real time?

**Mr Pasquan:** Oh, yes. Now you're seeing it in action.

**Mr O'Toole:** It's going in reverse.

**Mr Pasquan:** No, that's an optical illusion.

OK, the brake went on. Believe me, it stopped. The air brake stops in a hurry.

Pardon me for the quality of this video. He wanted to come back and do it again, but he didn't get a chance to and that's all I've got at this point.

Anyway, I could move to page III. I'm not necessarily going to read it all to you. It's straightforward, a lot of interesting points.

Are we out of time already? No? OK.

**Ms Churley:** It would be interesting to the committee for you to just tell us what your recommendations are.

**Mr Pasquan:** OK. On page VIII, I've made some recommendations. Let me just mention that I believe there's a place for thousands of these windmills throughout Ontario, rural applications and larger varieties. It's not like I'm starting a whole new fuel regime or something; it's something that, over a period of time, there could be tens of thousands, perhaps hundreds of thousands, of these in Ontario alone for heating purposes.

**The Chair:** Maybe we could just go around and get some questions from the various members. Let's start with the NDP. We have about a minute and a half per caucus.

**Ms Churley:** Let me say that it's refreshing, from time to time, to have a private citizen come in, because mostly, with all due respect, we have big companies and organizations.

I find it an intriguing demonstration. This is, as I understand it from a quick read of this, a small project. I assume that what you would want to do is sell it for a farm to be self-sufficient, that kind of usage?

**Mr Pasquan:** Or a home somewhere remote, or a shed—any application.

**Ms Churley:** Have you sold any yet? Are some of these in use?

**Mr Pasquan:** No, I haven't. But it's only within the past two years that it's been sufficiently developed that it's now ready to market, and we're basically in a position where we'd like to get some orders.

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**Ms Churley:** So you're looking for opportunities and getting the word out that you have this. Have you hooked up with any of the wind power organizations out there?

**Mr Pasquan:** No, they don't think small.

**Ms Churley:** They think big, eh?

**Mr Pasquan:** That's right.

**Ms Churley:** Already we're there.

**Mr Pasquan:** Yes, that's right. They think giant, and they don't want to be bothered with mosquitoes like me.

**Mr O'Toole:** I commend you for your inventiveness and also your determination to educate people about some alternatives. As I understand this, I guess the key is that it's primarily for heating the house?

**Mr Pasquan:** Yes, that's correct.

**Mr O'Toole:** And that's the only application?

**Mr Pasquan:** Oh, no. It can be used for heating greenhouses or hog barns, all kinds of applications.

**Mr O'Toole:** So the churn heats the liquid, I gather, by—

**Mr Pasquan:** The shaft heats the—

**Mr O'Toole:** —churn—

**Mr Pasquan:** Yes, that's correct.

**Mr O'Toole:** —the liquid, friction occurs and starts to heat and you transfer that heat through some convection process to—

**Mr Pasquan:** The fluid heats up, and you take that into a radiator somewhere.

**Mr O'Toole:** A heat exchanger.

**Mr Pasquan:** Yes, a heat exchanger.

**Mr O'Toole:** What do you think a typical unit would cost? Just sort of speculate.

**Mr Pasquan:** On page VIII, I've said $15,000 each.

**Mr O'Toole:** Have you spoken with other provinces at all on this?

**Mr Pasquan:** No. I'm involved with Saskatchewan. At this point I'm—

**The Chair:** Anybody else have any questions?

**Mr Ouellette:** How do you transfer the heat from the mill to the house? Is it through underground pipes?

**Mr Pasquan:** Yes.

**Mr Ouellette:** So you need electricity to—

**Mr Pasquan:** Oh, no. It's fluid in a pipe, OK?

**Mr Ouellette:** So the churning actually circulates the pump as well?

**Mr Pasquan:** No, you have a small amount of electricity to release the brake as well. It's a solenoid.

**Mr Ouellette:** Are you talking about the brake that spins it around or the brake that circulates it?

**Mr Pasquan:** They're not combined. The solenoid at the top releases the brake.

**Mr Ouellette:** And it stops.

**Mr Pasquan:** No, it's the reverse that happens. It's a spring-loaded brake. It's a fail-safe brake, and you need a solenoid on all the time to take the brake off and allow the windmill to operate. Some of the power that's going into the electronics and into that can then go into a circulation pump.

**The Chair:** OK, maybe I should move to Dr Bountrogianni.

**Mrs Bountrogianni:** Thank you very much for coming and presenting your invention. I must say that's it's the first time I've seen a video of something. It made me a little homesick for a certain Greek island. In recommendation number 3, you mention that the "Ontario government should commission an engineering and feasibility study of the viability of the wind power tower concept for urban locations."

**Mr Pasquan:** Yes, in fact the wind power tower is actually a high-rise building which could go up 600 to 800 feet, 250 feet in diameter with a series of these windmills at all levels. They could be used for pumping water, generating heat, producing hydrogen, whatever. The power tower could be made to go into downtown Toronto, for instance. You don't have the big, huge blades with the 10-mile kill radius, do you understand? You have a power tower which could generate 10 or 20 megawatts. There could be three or four of them in the city of Toronto. This is something else you might consider.

**Mrs Bountrogianni:** I was curious about what that meant. Thank you very much and thanks for coming.

**The Chair:** Thank you for your presentation. I'm intrigued with why it goes around. I understand an airplane wing and a propeller. It's intriguing; I would love to understand the aerodynamics. Anyway, I appreciate having you here this evening. It's neat to have an inventor come before us and explain something he has on the drawing board, so to speak.

**Mr Pasquan:** It's been a pleasure.

## METHANEX CORP

**The Chair:** Our next presenter, and actually the last of the evening and the last of this round, but that doesn't mean the least by any means, is Don O'Connor of Methanex Corp. But you are running into a challenge with a tired committee right about now. We appreciate your coming.

**Mr Don O'Connor:** I flew all day, so I'm starting to fade too.

**The Chair:** For an organization, there are 20 minutes for a presentation and questions and answers afterwards. Please state your name, and you may go ahead.

**Mr O'Connor:** My name is Don O'Connor. I'm here representing Methanex Corp. I think the clerk has given you three handouts. I'll speak to the highlights of the typewritten one. There is much more detailed information in the other two handouts that you can look at at your leisure.

Methanex is the global leader in methanol manufacturing and marketing. We have plants located in Chile, New Zealand, Canada, the United States and Trinidad. We are the largest supplier and marketer of methanol to each of the major international markets. In the year 2000, roughly 24% of the world's methanol was marketed by Methanex. We are a public company—our shares trade on the Toronto Stock Exchange—and we are based in Vancouver, Canada.

Methanol is typically made from natural gas. It is a basic building block that is used for very many things including formaldehyde, acetic acid and a number of chemical intermediates. You might be aware of it as fondue fuel or as windshield washer fluid for your vehicle. It's also used to make MTBE, methyl tertiary butyl ether, which is a clean-burning gasoline additive. It's also considered to be a leading fuel for fuel cell operations.

Methanol can be made from renewable resources as well as natural gas. There's one commercial plant in Germany that uses waste biomass, and research on and demonstration of some of the individual processes that make up a biomass-to-methanol plant took place in Ontario in the 1970s and early 1980s. There were even business plans developed for commercial biomass-to-methanol plants, but most Canadian activity ceased when oil prices dropped in the mid-1980s.

Methanol has been used as a fuel in internal combustion engines from time to time over the past 20 years. In the early 1980s, up to 5% methanol was used in commercial gasoline in many parts of North America and Europe, including Ontario. It has been demonstrated as a fuel for diesel engines in bus applications in Canada and the United States. Later in the 1990s, M85, which was 85% methanol and 15% gasoline, which gets used in specially designed vehicles, was also demonstrated,

including one station here in Ontario. None of these past fuel applications made it. Most of them have ceased. There are very significant hurdles to overcome in introducing any new fuel or any new technology in the marketplace.

What we're looking at now for future applications is methanol as a fuel for fuel cells and also things like the possibility of methanol in high-efficiency co-gen gas turbines in remote areas around the world.

I'm sure you've heard a lot about fuel cells, so I won't go into an awful lot of detail. Basically, they convert chemical energy directly into electrical energy. Most, but not all, fuel cells require hydrogen to do that. We're interested in methanol from two different aspects: one as a carrier for hydrogen, and we'll talk about that a little more. But methanol and water, when you apply heat to them, produce hydrogen and carbon dioxide. There are also technologies being developed that take methanol and water and directly make electricity in a fuel cell without having to make hydrogen. That's called a direct methanol fuel cell. That technology is under development and making quite rapid progress.

Methanex is not in the fuel cell design business, but what we are working at is trying to help fuel cell technology companies commercialize their technology. We think that methanol fuel cells can be used to run vehicles and provide portable or stationary power for things like laptops and cellphones.

Why do we think that methanol is a good fuel for fuel cells? First of all it's a liquid. It's transported today around the world, much like gasoline and diesel fuel. It is liquid at normal temperatures and we can deliver methanol suitable for fuel cell applications essentially within 24 hours anywhere in the world today.

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Methanol fuel cell vehicles have the potential to reduce greenhouse gas emissions. Full lifecycle emission testing that we've done, modelling that we've done, indicates that in most areas of the world the greenhouse gas reduction is almost as large as natural gas to steam methane re-forming of hydrogen, which is considered sort of the leading likely commercial hydrogen for any purpose.

Fuel cell vehicles of course almost eliminate urban smog emissions like nitrogen oxide, carbon monoxide and non-methane organic gases. Methanol is also quite safe from an environmental perspective; it biodegrades very readily. It's cost-competitive. Historically, it's been priced less than the wholesale price of gasoline. Even accounting for fuel taxes and distribution costs, retailer margins and vehicle efficiencies, we think that methanol fuel cell vehicles can be less costly to run than gasoline internal combustion engines.

Methanol's great advantage from a re-formed fuel perspective is the re-forming process takes place at a low temperature—250 to 300 degrees Celsius—whereas with all other fuels we're looking at 700 to 900 degrees Celsius. Lower temperature means higher efficiencies, lower cost and smaller, more reliable systems. Because it can be made from a number of different things, like natural gas and biomass, it extends the energy diversity, reduces the transportation sector's dependence on crude oil. We think it's particularly attractive for some off-grid applications. We can get methanol to places that aren't connected to the electrical grid or the natural gas distribution system.

Fuel cells are going to be quiet. We have the potential of the direct methanol fuel cells, which will take place at even lower temperatures than the re-formed methanol. We think that these methanol-powered fuel cells are going to be very convenient and very attractive to consumers.

Our strategy in trying to move methanol-powered fuel cells ahead is to work with some of the world's leading companies. We're working to implement safe handling and storage practices. We're developing suitable methanol fuel specifications for all fuel cell applications. We're working with governments, organizations around the world to ensure that methanol meets or exceeds existing and emerging regulations. We're working to ensure that there is a steady supply of competitively priced methanol and we're promoting methanol fuel cell technology by supporting demonstration programs.

Some of the activities we're involved in: the California Fuel Cell Partnership, which you heard about a few minutes ago; we have a methanol fuel cell alliance with BASF, BP, DaimlerChrysler, Statoil and Xcellsis which is looking at detailed studies and assessment of the issues associated with using methanol as a fuel. So we're looking at methanol production and distribution issues around the world, because our partners are global. We're looking at health and safety aspects. Methanol, like all conventional fuels, has inherent properties that may pose some health and safety risks. We're trying the quantify those and we're looking at things that can be done from a mitigation perspective as well. We're doing a lot of environmental fate modelling, trying to understand what might happen in the event of an accident and methanol does get released into the environment.

The one thing that's interesting is that methanol is produced naturally in the environment. We estimate that there's about 2.4 billion tonnes of methanol made by Mother Nature every year—almost 100 times as much as man makes—and it comes about from the natural decomposition process of biomass around the world.

We're looking at lifecycle emissions, carrying on with some of the work that Methanex has done, working on specifications, looking at the economics and commercialization. Some of our partners are in the retail petroleum business today. We're working with them so that they can understand what's involved in commercializing methanol as a fuel for fuel cell vehicles.

In Japan, we're working with Mitsubishi Corp and Mitsui, trying to promote the merits of methanol in Japan as the fuel of choice for our fuel cell vehicles. In North America, we're working with a small company called IdaTech that's manufacturing stationary fuel cell power units for home applications. Several of those have been

installed in homes in Oregon. We've been working with them on the supply of fuel to those, and we're looking at expanding that to 100 homes in the next short while.

We plan to be actively involved in the Canadian Transportation Fuel Cell Alliance. That's just getting underway in Canada with the federal government.

With all this activity, we're also aware that there are an awful lot of challenges that still remain. It is never easy for new technologies and new products to make it in the marketplace no matter how attractive they are to consumers and governments. It is always more difficult to displace existing products rather than introduce products that offer new services. We think fuel cells are not like cellphones or computers that gave new services to people. We are looking at fuel cells taking a longer time to commercialize. We're going to have to replace internal combustion engines or batteries or coal-fired power plants.

Governments need to consider strategic support for early adopters of these environmentally sound alternatives. This can take many different forms. Government can be an enthusiastic early adopter of some of these new technologies. We need fair and effective tax systems, although from a transportation perspective, methanol is quite attractively taxed in Ontario today so we don't have particular issues with that, unlike some other jurisdictions. We think governments can provide some assistance in modernizing and streamlining regulations that might have been written before some of these new inventions were ever even thought about, and governments can play a role in terms of financing some of the demonstrations. And there are other ways that governments can participate as well. These are only meant to be illustrative.

Based on the level of investment and commitment demonstrated by automakers and other stakeholders in the fuel cell industry, we believe that fuel cells are going to make a very significant impact in the world. When Ontario begins to receive the benefits of a cleaner environment, a sustainable, growing fuel cell manufacturing industry will depend to a large degree on the investment it makes in this exciting new industry.

With that, I'll be pleased to answer questions.

**The Chair:** We have about a minute and a half per caucus, starting with the government side.

**Mr Gilchrist:** Thank you very much for coming all this way and making the presentation. It's important that we hear from someone in your industry. We've heard from a wide range of manufacturers and different ideas. There's no doubt that when we're looking at both the short-term and long-term evolution from the status quo, we've got to make sure we have all the facts before us here. At some point we may very well go to you and ask for appropriate venues to actually see some of these various projects in play. In fact, perhaps I might simply ask you if you could supply to the clerk a detailed list of the venues that are utilizing some of the products you've mentioned in your presentation here, and particularly if you would recommend one over the others in terms of the degree to which they've advanced and are approaching a degree of commercialization that we might emulate here in Ontario.

**Mr O'Connor:** OK.

**Mrs Bountrogianni:** Thank you for coming all this way. Under the health and safety section you mention ICE applications. What does ICE stand for?

**Mr O'Connor:** Internal combustion engine.

**Mrs Bountrogianni:** I'm not an engineer, so thank you for that.

**Mr O'Connor:** Sorry.

**The Chair:** It is a challenge for us, as politicians, to keep on top of some of the technology that comes before us.

**Mr O'Connor:** I appreciate that.

**Ms Churley:** Well, some of us pretend very well and some of us actually know what they're talking about, I suppose. At least they sound like it.

**The Chair:** On topic, please.

**Mr Gilchrist:** This is one time she doesn't name names.

**Ms Churley:** No, not now.

I don't claim to totally understand the technology in such a short term, but where did you come from today anyway?

**Mr O'Connor:** Vancouver.

**Ms Churley:** Oh, you flew in from Vancouver. I just wanted to thank you for this. This is a new presentation. We've had a lot of repeats today, but this is the first time, at least when I've been in the room, that we've heard about this one, so it's another one to take into consideration. Thank you very much.

**The Chair:** I'm getting a signal from Mr Ouellette. He'd like to ask you a question.

**Mr Ouellette:** Coming from Vancouver, you would get some, I would expect, so hopefully we can oblige with something of relevance. Maybe you can give us a bit of a breakdown of MTBE and the problems. Are you the company that is currently dealing with California over that issue and using this component in that?

**Mr O'Connor:** Methanex is suing the US government under NAFTA, yes.

**Mr Ouellette:** Maybe you could give the committee a brief breakdown of positions or what you are able to—we're well aware of what you can and cannot do when dealing within the courts, but knowing what's happening or the reasons obviously helps us in future discussions when we deal with MTBE or other similar additives.

**Mr O'Connor:** First of all methanol is not MTBE, so when we look at future applications of methanol getting into the environment, we're not dealing with the same issues as MTBE. Methanol degrades very readily. It's completely gone in maybe a week if it happens to be spilled into the environment.

**Mr Ouellette:** Is that into the air or into the ground?

**Mr O'Connor:** In soil or in groundwater it biodegrades very readily. MTBE does not biodegrade very readily so it is persistent in the environment. It gets into the groundwater and soil by a couple of different means.

One is leaking underground tanks and the other one is two-stroke engines—there are still many power boats running on reservoirs. Gasoline is not very soluble in water, so the 25% of fuel that goes into a two-stroke engine that comes out of the tailpipe uncombusted floats to the surface. When people take their drinking water from that same lake, they take it from the bottom, so historically the gasoline and the drinking water never mixed. MTBE is slightly soluble in water and so it does go all the way through the lake.

There's no question that MTBE in gasoline cleans up exhaust emissions, lowers unburned hydrocarbons, lowers carbon monoxide and has been a very valuable component in cleaning up the air in a lot of American cities. It does need to be handled properly. What people don't realize is that if MTBE leaked out of an underground source tank, gasoline also leaked out of the underground source tank. The one small advantage is that MTBE is very odiferous. You can smell it at very low concentrations. In groundwater it also causes some separation from the gasoline. So you found out about leaking underground tanks earlier when there was MTBE in it than you would have if there was just gasoline and the first thing you picked up was benzene.

**Mr Ouellette:** I'd just like to say that I hope my colleagues realize that I wasn't taking shots at anyone except myself to make sure that the last presentation on the last day was something we can relate to.

**The Chair:** Thank you very much. We appreciate your coming all the way from Vancouver to present to us. An excellent presentation with good information.

The committee is now adjourned until 10 o'clock on September 26. If a meeting isn't necessary, we will let you know. Probably there will be a call for the subcommittee on the Monday or Tuesday, September 24 or 25, to look at issues prior to that meeting and decide whether that meeting indeed is necessary.

With that, the committee is adjourned. Have a safe trip home.

*The committee adjourned at 1954.*

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**SELECT COMMITTEE ON ALTERNATIVE FUEL SOURCES**

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