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**Frontier Centre: Your seminar for the Frontier Centre introduces the concept of Tradable Energy Permits. Could you describe what they are?**

**Tom Adams:** The concept of Tradable Electricity Permits is to take the concept of public power out to its logical conclusion and effectively "individualize" the output of the Crown utilities, like Manitoba Hydro, by granting to consumers an alienable tradable permit to a block of power to dispose of as they please. So, under this proposal customers that found alternative ways of meeting their energy requirements but allowed them to use less than their entitlement will be in a position to trade their excess.

**FC: How might they change our energy behaviour?**

**TA:** Right now consumers in jurisdictions served by monopoly Crown utilities particularly have very poor price signals to encourage efficiency. Whether that efficiency is to come from fuel switching or just straight out energy conservation or self-generation which are all examples of ways that people optimize their energy consumption needs but all of these measures are discouraged in an environment where prices do not reflect opportunity cost. So, what we are looking for with the Tradable Electricity Permits proposal is to bring to consumers a real opportunity cost of consumption whereby the marginal value of electricity whether it is consumed or conserved is a function of its market value. The proposal for Tradable Electricity Permits could be implemented without requiring the wholesale restructuring of electricity markets. A proposal that, although I am predisposed to, is problematic in some jurisdictions.

**FC: Manitoba Hydro would remain a Crown corporation?**

**TA:** Under a regime of Tradable Electricity Permits, Manitoba Hydro could stay a Crown corporation but there is nothing inherent to the proposal for Tradable Electricity Permits that would prevent a future decision to move to a privatized system. The assets could be privatized after Tradable Electricity Permits were put in place.

**FC: Would consumers who wanted to cash-in their conservation credits be paid at the official regulated price or do you anticipate the development of a market to price these assets?**

**TA:** The value of permits would rise and fall according to the market and Manitoba is in many ways a nearly uniquely favourable situation where you are surrounded on two sides with active vibrant wholesale markets that are developing where there is a posted price that is readily ascertainable. So, under a regime of Tradable Electricity Permits any surplus permits that a customer has accumulated because in an instance where a customer has used less than their entitlement those permits have a resale value that is a function of markets rather than regulated prices.

**FC: The data you have assembled at Energy Probe shows that Manitoba and Quebec consume among the most electricity per capita in the world. What's wrong with that if we can produce it cheaply, why can't we enjoy that advantage?**

**TA:** There is no question that the access to inexpensive resources is a tremendous advantage but what I am suggesting is that this advantage that these low-cost hydro power jurisdictions enjoy can

yield a greater economic benefit in a situation where consumers have a greater range of choices available to them. Take the example of Alberta with its petroleum industry – Alberta is a gigantic exporter of natural gas yet consumers of natural gas in the province are expected and understand that when they consume natural gas they will pay market prices for it and this encourages those consumers to behave as cautiously with their gas usage as gas consumers that happen to be located in other jurisdictions. Now, to take the electricity analogy – if Alberta applied to natural gas the practices that are just accepted as the normal way of doing business for these Crown electric monopolies, natural gas in Alberta might be priced vastly below its market value. What good would that do? It would be, in one sense, a benefit to Alberta consumers because they have access to lower cost resources, but we could expect that what they would do is what jurisdictions like Quebec and Manitoba do with their electricity resources – that is that they throw a lot of it away on low value applications.

**FC: What is the advantage from an environmental view point?**

**TA:** Manitoba's electricity supply is not simply inexpensive but it has a favourable environmental characteristics. There are no emissions associated with it; the risks associated with it are very limited. You are surrounded again by electricity markets where characteristics – clean, cheap power – relatively rare and have extra value. The developing markets in the United States and in Ontario for green power – Manitoba could be re-marketing and perhaps even branding its electricity for re-sale into secondary markets at premium prices. One of the patterns that we have seen in energy markets in the last many decades is a gradual tightening of environment rules. Emissions of all kinds of noxious substances are becoming less socially acceptable and penalties are being attached to acid gas emissions and smog precursors and these kinds of things. So, for example, Ontario has a political commitment from all of the major political parties to phase out its use of coal-fired power. That is an initiative represents a natural economic advantage for Manitoba. You can sell your power into Ontario, displacing coal-fired power and realize substantial benefits for the community here in the province as well as your customers across the border. Manitoba's neighbours have electricity markets that value power at much higher prices than you do and that creates a big economic opportunity for Manitoba to exploit.

**FC: British Columbia resembles the most wasteful provinces in two respects: its power utility is a Crown corporation that has an abundance of hydro electric capacity. Why is B.C. more efficient in using electricity than Quebec and Manitoba?**

**TA:** B.C. has been less aggressive than either Manitoba or Quebec in using its electricity capabilities as an economic development tool. The economy of B.C. is more diversified than your economy here and that has just improved its efficiency ratios. B.C. Hydro, as well, has for more than a decade now been, at least internally, thinking quite differently about what kind of business it wants to be in and B.C. Hydro, under the leadership of Larry Dowell, back in the late 80's decided that it didn't want to be building any more mega projects that represented a risk to the corporation that it didn't want to take. So, B.C. has been managing its resources to much more effectively live

within its means from the point of view of power capacity. They have not been deliberately going out and building.

**FC: When we talk about mega projects, we talk about the Conawapa dam here. Do you have any thoughts on that?**

**TA:** Well, Conawapa is a potentially worthwhile investment but there are a lot of "ifs" associated with it and I think it is very difficult given these "ifs" to really make a conclusive statement as to its ultimate value. The lead time between deciding to build and actually delivering to the market is in the order of ten years. If the power is to be brought to Ontario and is intended to help mitigate the serious supply-side deficiencies that have developed in the Eastern Ontario power grid – Ontario's power deficiencies are not primarily in the Northwest which is approximate to the Manitoba market, but if the Conawapa power is to be delivered in a fashion that mitigates the deficiencies in the Eastern Ontario market, the transmission interconnection that we are talking about here is one that is well in excess of two thousand kilometers. This represents an engineering challenge of a very substantial magnitude and it is not just an engineering challenge but it is also an economic challenge. The vast transmission distance imposes a penalty of electricity losses. In power transmission, the very physics of that transmission process means that a certain portion of the power is lost and that portion is a function, in part, of the distance – the greater the distance, the greater the loss. This is a situation we have seen with some of the Labrador power projects as well where at the mine-mouth, so to speak, on the hoof at the barn door the resource is very low cost and very attractive. But by the time you get it delivered to the market it is intended to serve it has lost much of its attractive quality so Conawapa is not a "gimme", it is not a "slam dunk." On the other hand if you found some low cost measure for using your existing electricity resources more efficiently the possibility here exists for very rapid conversion where you can free up incremental megawatts for delivery to neighbouring markets and grow your export potential in a much more organic fashion. That is much more incremental fashion rather than the lumpy mega project approach. Before you do it I think the prudent thing to do is take advantage of the easier opportunities. Conawapa is a less efficient distance product – Manitoba should get off its behind right away and use your existing hydro power to maximum advantage before you branch out into further investment.

**FC: Your Trading Permit idea essentially encourages conservation – what is the potential in terms of Conawapa dams if they achieve substantial conservation gains?**

**TA:** One way of looking at this question of Manitoba's conservation potential is to compare among the power that it takes to operate your economy relative to its economic output and compare that with other modern industrial jurisdictions where people live well and enjoy a standard of living similar to or perhaps, in some instances, superior to the living enjoyed here. When you do that comparison across the OECD what you find is that Manitobans are using in the order of about twice as much power to run your economy as your industrial competitors. Well, taking that experiment of bringing Manitoba's electricity efficiency in line with that of your industrial competitors, the amount of power that could be liberated in this approach is in the order of 2.3 times the capacity of the Conawapa project and the lead-time for achieving substantial savings is substantially less lead-time than would be involved in building another northern mega project.

**FC: Do you take a position on the public ownership of utilities? If we retain companies like Manitoba Hydro in a public domain, how do we avoid the phenomena of cross-subsidization?**

**TA:** In an ideal world where economic reason applied we would, in my view, have government out of all industrial operations and the government's role would be regulatory in nature where they would be ensuring that the rules of the road protected the rights of the participants and they would be basically developing the law adjudicating the disputes and beyond that producers and consumers would come to their own settlement as to what is an appropriate quantity at what price. Now, my own preference is for wholly liberalized markets where the commodity component of power service to consumers is governed by the rules of supply and demand and the monopoly services of transmission and distribution are privately owned but publicly regulated. That structure – competition for the naturally

competitive elements of the business and regulation of private monopolies for the inherent monopoly elements of the power system – has been developed and experimented with in many jurisdictions around the world. The results that we see from these international experiences is that where these markets are well-designed and well-implemented the transition process is one that enjoys a presence of mind on behalf of decision-makers, a commitment to the task, a far-sighted view and also a sufficient political sense to ensure that the public feels some confidence in the process that process can be extremely beneficial from a public interest perspective. We see this in electricity market reforms in places like the state of Victoria in Australia, to a very significant degree in New Zealand which has demonstrated very substantial progress in market liberalization, Norway another very substantial success in the introduction of markets, and also in Chile. My favourite example of being from Ontario where our power system bears an uncanny resemblance to the U.K. power system, is the U.K.'s electricity liberalization. So, there are examples where this can really fly and deliver from a public interest perspective. On the other hand, there are famous examples of real collapse.

**FC: When people hear about markets, they automatically point to California, Alberta and Ontario. Perhaps you could just briefly discuss each one and what really happened? Let's start with California.**

**TA:** California demonstrated that the folly of a half-baked liberalization. Liberalization of electricity markets turns out to be something like flying a modern aero plane – you can't do a half-assed job at it or the thing will crash. California put itself in jeopardy by having a market at the wholesale level but sticking with regulated prices at the retail level. The discontinuity between those two pricing systems caused financial and operational collapse of their experiment with liberalized markets.

**FC: So they should have deregulated retail at the same time?**

**TA:** If you are going to use the price mechanism for rationing the power market and you are going to rely on prices to signal both producers and consumers to align their decisions you cannot possibly survive if you disconnect one side of the market from the price mechanism. So, the lesson from California is if you are going to start deregulating prices, you have to be quite thorough about it and carry the logic right through the market.

**FC: How about the next case - Alberta? We heard horror stories of small companies suddenly seeing huge price increases for their power and some of them actually said they were going to move to Manitoba.**

**TA:** Alberta's electricity market reforms – contrary to what you read in the newspaper are, I think, properly considered as a mixed bag. There are some substantial benefits in Alberta that never get reported – the newspapers concentrate on the bad part of the story because of the way newspapers go about their business. The bad part of the story is that in the run up to deregulation in the very early going of a deregulated power market, or partially deregulated power market, Alberta found itself with supply constraints, serious threats to its power system reliability, there were very substantial increases in price relative to the historic price and that's where the attention is directed. The other side of the coin in Alberta where the elements of their power system re-structuring experience have been favourable includes a huge increase in new investment in power generation and a real major shift in the type of investment where the investment has flowed into new power generation technologies that have much higher efficiency than were favoured in the in the preceding regulated market. Alberta's economy has diversified in important ways largely as a result of the electricity restructuring. Some of Alberta's very energy intensive industries have converted to industrial co-generation -- simultaneous production of heat and power -- that has significantly reduced their cost of heat for industrial purposes and that has brought a new level of resilience to Alberta's petro-chemicals industries that didn't previously exist. So, the bottom line is that Alberta has made some progress in some important areas and they have some serious problems in other areas. They are stumbling on some political fronts where the politicians are starting to interfere and prevent markets from correcting

some of the inefficiencies and pricing problems that have developed. I still remain cautiously optimistic that Alberta is going to pull out of it.

**FC: And Ontario... the final example of botched reform ?**

**TA:** Ontario is an electricity tragedy in the making. At the outset of Ontario's electricity restructuring experience, it looked like Ontario was on the road to creating really something wonderful – a very efficient market that would replace an extraordinarily inefficient and dysfunctional public sector power system. What happened was that half way along the implementation process the provincial government lost its sense of direction and panicked in light of some relatively modest complications along the way, many of which the government actually self-inflicted on itself. They responded to these challenges in a panic mode and started to reverse the liberalization process culminating ultimately in November of 2002 when the premier announced his intention to freeze electricity prices for about 52% of the total sales of power. This, fundamentally, destroyed the electricity market. Ontario is now for reasons that just don't bear any explanation, repeating the California experience where we have got a floating wholesale market price and a frozen retail re-sell price. Government is picking up the tab for the difference between those. Very substantial shortages are developing and Ontario is now in a situation where there are prospects for bankruptcies and blackouts.

**FC: What is it going to cost?**

**TA:** Oh, boy! The size of the crisis that is developing in Ontario looks it is going to result in new public sectors liabilities that are going to add up to at least \$5 billion -- that's a conservative figure that assumes Ontario rapidly comes to its senses, starting now, and reverses the bleeding.

**FC: What about auto plants being closed because they are out of power... that type of thing?**

**TA:** Ontario's power system reliability is spiraling downward and could impact auto plants. The path that Ontario is on is one that is very likely to result in blackouts. If Ontario is able to avoid blackouts this summer the probability is greater that next summer there will be blackouts and the summer after that worse. Every peak period that we come to now – there is a summer peak and a winter peak in electricity demand – those peak periods, every one of them looking forward represents a major risk. So, I think that when industrial organizations start to come to a realization of the fragility of the power supply that they rely on, I think there are likely to be some very rude questions asked.

**FC: Might that impact the rest of the country? Manitoba's equalization money, to some degree, is a function of the strong Ontario economy.**

**TA:** It is not inconceivable that the electricity problems in Ontario translate into a generalized weakness in the Ontario economy which could have national implications. I mean it is hard to know where these things are headed but it is not inconceivable that Ontario's wonderful growth record certainly since the mid-90's could falter as a result of this developing crisis in electricity.

**FC: Use of wind power has been a position with environmentalists for some time but their dreams have floundered on the rock of reality. Electricity can't be efficiently stored and the cost of having other generational alternatives in place to produce power when the wind isn't blowing makes that option too expensive. Are wind farms ultimately impractical?**

**TA:** Wind power has some potential but its potential is often overstated by drawing attention to jurisdictions that have used subsidies to create an artificial industry. So, Germany and Denmark are examples of countries that are really at the top of the charts in terms of wind power development but they are also at the top of the charts for subsidies. The real economics of wind have not been thoroughly tested yet. The good news is that it does appear verifiable that the wind industry is demonstrating improvement in its cost of production and so that leaves me optimistic in the longer term that in some regions of the world wind will be able to make a dent in the power supply. However, because of its unpredictable output, the portion of our power supply that is ever likely to come from wind will be limited. The Danes are discovering that even when you throw huge subsidies

at the wind industry, and it comprises twenty percent of your power supply it becomes very difficult to maintain reliability at reasonable cost.

**FC: Is Canada better off complying with the Kyoto Accord?**

**TA:** I am very skeptical about the Kyoto processes because I don't see a lot of thorough public process underneath it. There is some science around carbon cycling – I am one of those people who believe there is a reason to be concerned about carbon emissions but if we were to get serious about cutting – so a trend that it would expect to see affecting energy markets into the future is that there is likely to be, even in the United States, increasing pressure over time, we may be talking about decades here, to constrain carbon emissions. In that situation, Manitoba's hydro power becomes even more valuable than it is today.

**FC: What is your view on government energy conservation programs like Manitoba Hydro's "Power Smart"? The government is asking us to save power but then offers us low prices. Do they work?**

**TA:** These programs are primarily P.R. and the track record is that the results are often vastly over-stated. I have studied some of these programs in significant detail and, almost without exception, as you start flipping rocks over and looking for what's actually underneath the claimed savings, you discover that the subsidies based conservation programs are really based a lot on hyperbole and hot air. Subsidized conservation programs are basically not effective in achieving their objectives.

**FC: Some say Manitoba is well-placed in the hydrogen economy to convert its electricity into hydrogen, thoughts?**

**TA:** Energy markets are prone to fads and fashions where impractical crazy ideas become dominant ideology and sometime for a substantial period of time. There are lots of examples. Nuclear power is an example and the counterparts in modern parlance today are hydrogen and ethanol – these are examples of utterly dysfunctional impractical dead-end energy sources that just have no relevance to meeting our future energy requirements.

**FC: So why is hydrogen a dead-end?**

**TA:** Hydrogen is a dead-end for about six reasons. There are high conversion losses for taking electricity and converting it to chemical fuel and then reconverting it back to electricity. Each one of those conversion steps imposes fundamental thermodynamic losses on the overall economy which translates into huge prices for delivered energy services. Hydrogen in a widely available industrial commodity and has been for about a hundred years. The hydrogen economy is a very mature technology when you take a currently available hydrogen product available industrially at bulk prices and convert it through the anticipated fuel cells of the future and try to calculate out what the corresponding prices are for electricity relative to current electricity prices, relative to current gasoline prices if we are using hydrogen for our cars, what you find out is that this stuff is cost ineffective by a factor of three orders of magnitude. Toronto hydrogen prices today translate into electricity at a fuel cost alone of about \$13.26 a kilowatt hour. The Manitoba wholesale price is about 3.2 cents per kilowatt hour and when you convert through a hydrogen for road vehicles and compare it to the cost of gasoline taking into account the claims about the efficiency of fuel cell engines it still translates into an equivalent cost of gasoline for hydrogen fuel that works out to about \$30.00 a litre equivalent to gasoline. So, how far are you going to get on \$30.00 a litre gasoline? Well, I don't think it is a whole helluva lot of distance.

**FC: Why is the Bush administration and other political groups rushing to endorse hydrogen technology?**

**TA:** The politicians and the interest groups that are behind hydrogen and ethanol are modern counterparts to the groups that gave us Hibernia, the Lloydminster Heavy Oil Upgrader, the Darlington Nuclear Project. We have seen these fashions before – mega projects that became enormous liabilities rather than assets.

**FC: What's the problem with ethanol subsidies?**

**TA:** Ethanol – starch-based ethanol is a fuel cycle without a future. The input energy costs for producing the raw materials exceed the

energy delivered in the final product. So, when your input fuels exceed the value of the output fuel – there is just no way you can get to any kind of economic breakeven. Of course, in the production of ethanol fuels you have more input than simply energy, you've got all the human effort, all the engineering and materials, agricultural production and the handling of the fuels and all of those things which are not costless processes.

**FC: So, who's paying for the subsidies happening somewhere? Who's paying for it?**

**TA:** Ethanol could not exist as a road fuel without subsidies. It is entirely reliant on subsidies – take the subsidies away and the product disappears because it has no inherent economies. The shame of it is – I mean there are so many ironies in this whole area – but in the name of Kyoto and achieving Kyoto targets, the federal government is planning to subsidize the production of negative value fuels. These are fuels that consume more input fuel than they produce as output. Every litre of fuel ethanol represents a greater environment loss from an emissions perspective than gasoline itself. So it is a treadmill that just makes the situation worse – not better.

**FC: What would you say to the politicians in Manitoba who are embracing ethanol subsidies?**

**TA:** Ethanol is both an economic and ecological mistake. The more you do the worse off you are.

**FC: Is there a future at all in nuclear energy?**

**TA:** Nuclear technology has a future in a variety of areas but power production is not one of them.

**FC: Too expensive?**

**TA:** It just can't pass the market test. The clearest instance of nuclear being put to a market test first off, with very few exceptions, the entire world experience with nuclear generated power has been in monopoly circumstances where the state has been directly or indirectly either funding or sheltering, or both, the industry. One of the clearest instances of nuclear being put to the market test is in the U.K. where they had a vibrant, large and expanding nuclear industry that was flown into the privatized and deregulated market. Incidentally, one of the purposes that Mrs. Thatcher had, whose was a great fan of nuclear power, one of her purposes in introducing the liberalized market was to encourage or facilitate private sector investment in nuclear. It was recognized that nuclear was getting too expensive for the public purse and she thought that opening up new sources of funding would secure the future for new nuclear. What happened was quite opposite to her expectations, in fact what Energy Probe had anticipated which is one of the reasons we have been a fan of markets, when subjected to a market test the cost of capital for nuclear investments rose astronomically relative to the cost of capital that had been applied under public sector control and nuclear investments became – the first thing that happened were that the prospect for new nuclear just simply evaporated – the challenge became for the nuclear industry could they manage to keep the existing nuclear power plants on line even though the capital cost was entirely written off. What has been demonstrated is that with well-operating younger reactors that they can squeeze a few more years out of them in a market environment but as soon as the reactors get older they start facing maintenance and operational complications so the economic course of action for their private sector owners then is to shut them down. So, the U.K. has, as a result of its liberalization of the electricity market, been in the process of an economic phase out of nuclear.

**FC: How come we don't have peak load pricing, where prices rise during high demand times and fall during low demand times to shift demand away from high consumption times, at the retail level generally in Canada?**

**TA:** Historically, utilities have opposed peak load pricing because it interfered with their ambitions to do mega projects and customers grew accustomed to the idea of electricity priced at the same level

irrespective of season or any other constraints on the system. I think it really is partly an institutional and partly historical accident.

**FC: So wouldn't that mean that we build excess capacity?**

**TA:** The most inefficient electricity consumption that happens in Manitoba is your winter peak demand where the government policies have stimulated the use of electricity as a heating fuel which is a very inefficient application of electricity. That has necessitated investment in a lot of excess facilities in order to meet that excessive demand.

**FC: Let's talk about pelletized bio fuels. What are they and does it make sense in Manitoba?**

**TA:** The most attractive bio fuels opportunity is a perennial grass species, tall grass Prairie native species cultivated in a manner that reduces the ash content of the ultimate fuel product, delivered in pelletized form that looks just like rabbit food – its pelletized in the same equipment that agricultural food processors use for making rabbit food and delivered in bulk to consumers for use as a home heating fuel. Now Manitoba's opportunity here is enormous. You have two things, one is that you have an extremely tough winter which means a high heating requirement to maintain any kind of decent quality of life during this time of the year. The second thing is that you enjoy the lowest hay prices in North America. Hay is a good market surrogate for cost of production for this very comparable product produced with similar agricultural input and the research indicates that this fuel is at current natural gas prices would be a substantial home heating cost saver for many households here.

**FC: So could we say that the provincial government instead of focusing on ethanol subsidies, for example, that they should re-direct their priorities towards pelletized bio fuels?**

**TA:** I think the pelletized bio fuel is going to take off whether or not governments get on board – there is a natural market for these fuels, people need to heat their homes, they want to save money doing it, farmers want to make a little money.

**FC: How might government accommodate this industry?**

**TA:** They don't have to – if governments got on board and helped to facilitate some of these things through their agricultural extension programs, some of their agricultural research could be directed in this area so there are opportunities to improve things for a research prospective but the market development is going on. In China the government has banned coal combustion in fifteen major industrial cities now because of air quality concerns and pelletized bio fuels are starting to pick up this market.

**FC: Don't they pollute?**

**TA:** Pelletized bio fuels...no. The modern combustors that are available now have an emissions profile is very similar to oil, for instance.

**FC: How would it work - a large bin on the back of the house?**

**TA:** Just to kind of walk through a practical scenario for the ordinary suburban house, what you have got is maybe in your garage, maybe out back of your house a hopper-bottomed tank that looks like the kind of thing they have in a chick hatchery – you know, a feed bin. There is an auger that comes off the bottom that feeds into a furnace that is adapted for combustion of these relatively high ash fuels. From the customers point of view the delivery comes in bulk. Europeans are making a big push into bio fuels I think with some very substantial progress in the area. They have bulk handling systems where you have tanker trucks that come using air pipes for delivery.

**FC: What countries are doing this?**

**TA:** Northern Europe and Austria.

**FC: Are we are not losing energy cutting grass, pelletizing it, transporting it, etc. Are we still coming out ahead?**

**TA:** The pelletized bio fuel cycle we estimate has an energy pay back of about 19:1.

The Frontier Centre for Public Policy is an independent public policy think tank whose mission is to explore options for the future by undertaking research and education that supports economic growth and opportunity. You can contact the Centre at: Suite 25 – Lombard Concourse, One Lombard Place • Winnipeg, Manitoba CANADA R3B 0X3 • Tel: (204) 957-1567 Fax: (204) 957-1570 • E-mail: newideas@fcpp.org • www.fcpp.org