HANSARD

NOVA SCOTIA HOUSE OF ASSEMBLY

COMMITTEE

ON

RESOURCES

Thursday, January 31, 2013

COMMITTEE ROOM 1

Verschuren Centre for Sustainability in Energy and Environment

Printed and Published by Nova Scotia Hansard Reporting Services

Resources Committee

Mr. Sidney Prest (Chairman)
Mr. Jim Boudreau (Vice-Chairman)
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Mr. Mat Whynott
Ms. Lenore Zann
Mr. Leo Glavine
Mr. Andrew Younger
Mr. Alfie MacLeod
Mr. Chuck Porter

[Hon. Graham Steele replaced Mr. Sidney Prest]
[Hon. Christopher d'Entremont replaced Mr. Chuck Porter]

In Attendance:

Ms. Jana Hodgson
Legislative Committee Clerk

WITNESSES

Verschuren Centre

Andrew Swanson, Distinguished Fellow, Program Director, CBU

HALIFAX, THURSDAY, JANUARY 31, 2013

STANDING COMMITTEE ON RESOURCES

9:00 A.M.

CHAIRMAN
Mr. Sidney Prest

MR. JIM BOUDREAU (Chairman): Good morning everyone, I'd like to call the meeting to order. Today we have a presentation from the Verschuren Centre for Sustainability in Energy and Environment. We're very happy to have Dr. Andrew Swanson here.

First of all, I'd like to have the members introduce themselves. We'll start with Mr. d'Entremont and we'll go around the table.

[The committee members introduced themselves.]

MR. CHAIRMAN: We have an agenda in front of us - are there any additions or any things we'd like to put on the agenda? We will need some time at the end of the meeting to look at committee business; there are a number of items there. One, of course, would be the next meeting date and we needed some clarity around one of the witnesses so I guess we'll deal with that in number five as well, under Committee Business. Is that okay? Okay.

Andrew, you have time for your presentation and then we'll move to questions and answers. That's the part where I think most members find it most useful, so we'll turn the floor over to you now and thank you again for coming.

MR. ANDREW SWANSON: No problem Jim, thank you for the opportunity to speak to you all today. It's a great opportunity to sort of spread the word, we're in our first year at the centre essentially, so the ship has been launched and we're on the water as we speak.

Why I'm here today - I understood the backgrounder was just a little bit useful for you guys, being that the centre is fairly new, to understand its mandate and where exactly that this or the next opportunities are for Nova Scotia and beyond.

The Verschuren Centre essentially, as I said, was constructed about two years ago but in actual fact was operational just a little bit over a year ago. We're based on the campus of Cape Breton University, which is in Sydney, Nova Scotia, of course. The centre has a mission - it was put together on the concept of a couple of different sort of underlying principles behind it. Obviously the legacy of the Sydney tar ponds and the heritage of coal mining - there was a lot of environmental remediation and environmental impacts, things of that nature. An opportunity came to light that the centre should be formed with the tenets of working in those areas. Those areas are a key component of the centre, so that is sort of the environment piece on the Verschuren Centre's handle.

However, in light of opportunities and sort of the logical transition to a bio-economy through energy sources - especially with offshores and offshore opportunities and whatnot - there's a lot of focus around energy and the centre has adopted that into its mandate as well. So the centre is, the long handle is sustainability in energy and the environment. That's sort of the area that we operate in but I think you'll probably see that it's a pretty big dossier to operate in.

The key objectives, mandates are innovating and developing sustainable solutions for regional opportunities, issues, as well as more global-minded issues as well. So we very much like to see ourselves positioned as the centre where, if there are energy or environmental issues that need to be spoken or have dialogue around, that this would occur. We're not at the stage where we're reporting on things but we're arranging a fairly large, high-profile event in the coming months ahead, centred around these themes.

We are also very commercially focused. The centre is a little dis-attached from the university, in the sense that we are trying to self-fund ourselves through collaborations, so we have a commercial phase. A lot of the work that I do and that my colleague David Alderson does as well is in fundraising, but not from a pure donation prospect although we will take that, that's fine. The point is really that we want to be useful and relevant to customers. So we look at ourselves as a centre that reaches out to a customer base, industrial partners that have issues and being clever people that we are or claim to be, we would offer these some solutions to better their operations and to hopefully make a smaller impact on the environment they work in. It's a lot of focus on collaboration and commercialization and within that is obviously contributing to regional prosperity.

It's a fantastic facility, and I invite you all to come up and view the centre. As I say, we're just really getting our stride at this point in time. It's a $15 million actual build - in total piece, it's larger than that. It's a LEED gold certified facility which in this speak means essentially we've adhered to the rules of the road for a LEED facility, which is that our impact in terms of building materials, in terms of how we operate the facility - it has

met a certain standard and it's an interesting facility from that perspective. There are challenges associated with that.

The facility is complete and more or less we've worked out most of the bugs. It's about 3,200 square metres of primarily labs but a lot of meeting spaces as well, a large open space in the bottom for events and whatnot, as well.

Some interesting features to it - on the bottom left here, you see the living wall which is essentially one of our air-conditioning units in full action; it's a fairly impressive thing. There are biomass facilities within the university - I'll get into that in a second as well. We have a wind project out front, a very small one that pretty much drives our geothermal heat pumps. The building is heated entirely and cooled through geothermal heat pumps - although you don't need much cooling around here - and operates just fine.

There's a lot of smart lighting systems with LEDs and other sort of clever ways of not wasting - and we have a grey water system that is essentially recycling water from the roof for utility and applications that are - you don't drink - that are useful.

Really what the Verschuren Centre is, is essentially a living lab. We are essentially throwing as much at the wall, if you will, as possible, to trial out technologies that make claims. We're offering ourselves essentially as an experiment to see how it flies and the end result is obviously that we're hoping to see savings, we've seen numbers and we're capturing those numbers as we go along.

The university as a whole has fortunately seen the potential as well and has embraced this and I'll explain a little bit more. Cape Breton University has declared that it will be North America's first completely self-sufficient-on-energy campus. That is likely within striking distance within the year or two. A lot of this has to do with just the innovations that came out of, well, the partnership with all of us working towards, driving towards energy efficiency fixtures to just clever ways of running an operation of a building.

The building has been featured in architectural magazines, green building design magazines, et cetera, so it really stands out as an interesting facility. In terms of utility, we are about half-staffed in terms of operations in the labs and things like that - as I say, we're building up to capacity right now. Roughly about 11 staff members are dedicated although we are embedded deeply into CBU and we have a lot of nice toys that they come and use as well and vice versa, so there's a lot of sharing. We are definitely moving forward.

The strategic themes are essentially the paper to which we speak when we look for opportunities to work with commercial partners and where we see ourselves as being useful. The environmental remediation and mine water management speak to the legacy industries that are in the region but there's some interesting opportunities that have come to light that we're pursuing as well, in terms of some of the technologies that we're utilizing with those areas are actually quite interesting to the offshore oil and gas hydraulic fracking

and impacts associated with those industries as well. So we are looking into those and some natural opportunities for everybody and benefits.

The two themes that I'll talk a little bit more about today - only because they are the ones that are really getting going and, I suppose, they're a little bit near and dear to myself as well. I came out of the United States the last 10 years working on biofuel energy efficiency projects and renewable energy. I'm from Ontario originally, but there's a lot of energy in the United States towards bioenergy and renewable energy so this is one of the reasons why I came on board, as well as an opportunity to help the centre out in this thrust.

Renewable energy, self-explanatory, but bioproducts is really trying to look at industry directly and see wastes as not necessarily a liability, but potentially shift those into a revenue stream. I did a lot of work with algae biofuels and I've got to tell you, you have to look at everything coming off your process if you want make one slim dime doing that. So we got really good at squinting long and hard and checking technologies against our waste streams.

There's a tremendous amount of information out there now that has been developed and a lot of these things need to be deployed in the right place. The bioproducts is an interesting aspect with all the resource space that Nova Scotia and the Maritimes, and Atlantic Canada as a whole, have in front of us and we're pursuing those opportunities. So these are sort of the four theme areas. We're positioning research chairs and their - I want to say "posse" - but their work teams around these as well.

Just to speak a little bit more about the newer areas - the renewable energy and the bioproduct schematic. The concept really is we're building a business-to-business bridge, so you would have a bio residue - be it forest fibre, sawmill dust, municipal solid wastes, residues from dumpsters from a Sobeys, or one of these sort of larger outputs that an industry has - and say, well, they're likely throwing it away, it's garbage or they're packing it into press boards or not making a whole lot of value out of that effort. Maybe they're breaking even, maybe they're making a couple of dimes here and there.

One of the interesting things is when you look at all products - I'm a biologist by training, a biochemist really, but you look at all these things and you break these down into what their constituents actually are, and as single entities they are worth a heck of a lot more in separation than they are as a "polyglot of garbage." A lot of these things are disposal liabilities. There are regulations associated with complying to disposal and what we'd like to try to do, and this is what we are doing, is reaching out to industries that have large output streams - they have a pipe or some place of aggregated waste - and we can work on that material and shift it into something more interesting. The value really we bring in it is that, but also in connecting them to the natural flow of the consumer.

For instance, forestry products are essentially long chains of forest products, fibre, essentially long chains of glucose. There are technologies that will chop those into bits and when complete, they could be sold into feeding everything from the bio-ethanol industries

or food manufacturing or even pharmaceuticals. There's a lot of natural flow if you could just make it economically feasible to go after that.

There's a lot of tightening demand in terms of consumers, as well, with the price spikes that are still on the way from last year's drought, which was tremendously exciting in the Midwest. There is certainly a need to diversify their sources of base materials away from corn, which is the predominant one in North America. We'd like to imagine ourselves as clever folks and we're positioning ourselves around technologies that will allow us to touch and shift these materials both through biochemical or thermochemical processes into various end products. I won't go into great detail about what all the fine print is, but ultimately what it is, it's essentially an evaluation of the material and a determination of whether the value could be better through just some clever science and a reasonable process.

By example, this is a fair visual of how this goes. The product value in tons, you would look at, by example, as just forest products, but you could think of this as sewage also. It sounds like a terrible thing, but it's a carbon source that is essentially disposed of at great cost. There is a lot of value, believe it or not, in sewage sludge, with the proper technologies.

This is an example of forest fibres. You could imagine fisheries products, bycatch; I work with some large groups out on the West Coast that are looking directly at that. Anyhow, all these things can be moved up. I've just drawn the arrow here to give you an example of how you can improve the value of "wastes" and shift those into higher value product, some at quite remarkable price tags.

Conversion, of course, is not 100 per cent, you wouldn't imagine that, and processing and upgrading comes at a cost. Our plan is to deploy some of these technologies that we know exist or to improve upon them at the centre and to demonstrate those things at some scale for our partners.

This is more sort of an activities list. Again, I'm trying to imagine what everyone here would want to hear so I put together a bullet list, if you will - that is two pages, if you bear with me - on things that have been happening in the last year.

This year we've hired two industrial research chairs. They have both started January 1st. These are the environmental remediation and the mine water remediation projects - one individual from Germany and the other one from Waterloo University. They have started up and are not just coming on board with post-doctorals, they're bringing students in as well, so we're getting some traction, very exciting projects around there as well - post-docs associated with a grant that we achieve through a partner, through the Atlantic Innovation Fund, as well as self-funded within the centre itself. A director - that's myself; I just came on three months ago from Cleveland, Ohio. We have a lab manager and a research coordinator. We've essentially doubled our staff just this year, so as I said, we're just catching our stride right now.

There was also, I believe, about four months ago a visit - there have been a lot of back-and-forth visits between Chinese delegations, and Cape Breton University has a very strong relationship with China and India, as well, and looking for natural partners in China. It made sense to do some memoranda of understanding with one particular group that is focused on gas-to-liquids approaches. So this would be turning either biomass or, in their particular case, coal resources into gasoline, diesel and the like. This is a group out of China that we are working through a relationship to try to understand where the natural partnership should happen.

The Canada-India summit - this is something that has happened frequently in the past but CBU has focuses around the centre. We have, if you will, a sister institute in southern India, in Tamil Nadu Province, that is very interested in modelling the Verschuren Centre's overall thematic and mandate. There's a lot of resources and a lot of staff down there and we have exchanges. This Fall we had about four or five Indian researchers at the centre working through projects of common interests, alongside some industrial partners as well.

A very exciting development just recently - some of you may or may not know Dr. Wheeler. I believe David Wheeler was the Dean of Management at Dalhousie not too many years ago - he went back to Plymouth, England, where he is originally from - but he has agreed to be CBU's next president. So even before hitting the ground running he is very much engaged in our fundraising and sleuthing out opportunities as we see fit, so we're all very excited about it. His background is he spent a good deal of effort working with the province to develop the framework, I believe, of the Community Feed-in Tariff Program that now exists that a lot of us are benefiting from. So it's very exciting to have him on board as well.

CBU, as I mentioned before, will plan on being the first campus in North America to be completely energy sufficient. I'll explain that a little bit more. Sort of a springboard from that, some of our partners are Lockheed Martin - they are one of our major partners that we've been working with and they are a fantastically huge and complex organization that touches almost everything in the space of energy management and the like. So we're very happy to be working through a partnership there with one of our sponsors for one of our research chairs in renewable energy, but they also bring a whole lot of bandwidth on other aspects that are in the - looking at the campus as a whole, if you can imagine, it's an extension of a community; it's essentially a small town.

The campus essentially, like we said - the Verschuren Centre is an experiment - the campus as well is offering itself as an experiment program for groups like this to trial out new technologies and for us to reap the benefits, but also the pride of ownership in terms of actually making a difference. We've been working alongside them and other partners as well to make the campus lower on its energy burn and also generation.

We've been working with the Unama'ki groups previous, but it has now expanded due to the success with Efficiency Nova Scotia as well as a partner in energy efficiency and

conservation programs for Native housing and that program has expanded in leaps and bounds.

Our partners Lockheed Martin and ECBC were early proponents of trying to develop a framework behind energy crops that are regionally relevant. My background is a lot actually in marine biology and I think that's a focus that the centre is also going to move down to eventually. Energy crops and demonstration of the willow crops are essentially ready for harvesting this year, so we will be capturing the critical data, but preliminary results show that actually we're doing - I don't know in terms of percentage I'd rather put that out - we're doing better than most of the other field sites in the Maritimes. It's probably because Cape Breton is fairly rainy. There are good reasons to believe that this is a crop that could support a nascent biofuels industry and happily Cape Breton Explorations made that declaration. They succeeded in getting through their COMFIT process for a biomass gasifier and anaerobic digester system that is coming along - I believe it was a 6-megawatt installation on the north side of Sydney.

We are also in parallel examining a gasifying technology that Lockheed Martin is involved in with partners. This is one that would look at our campus as essentially a resource base. If you imagine garbage as a resource base, what we'd like to try and imagine - anything that comes into campus doesn't get out. We let the students out at night, but by and large the idea is to look at all of our waste streams and repurpose those into energy or combined heat and power. The technology is fairly forgiving in terms of its feedstock agnostic and we're just going through our due diligence - the more detailed due diligence that is needed this year to wrap that program into an actual purchase for the campus.

Yava Technologies is a group out of Toronto that has doubled down on their bet that their technology is the real thing and they are moving towards essentially setting up in-house at the centre a full-time staffing operation. They have already placed one staff member who has been with us for about a little less than a year, working on aspects of lithium battery fabrication and manufacturing. They believe they have the secret sauce for cheaper lithium batteries that go directly into the Chevy Volt and technologies like that. They have a natural flow for product.

They have another side to the business that's quite intriguing. They call it in-situ mining. It is essentially an approach to remove selective minerals from the ground without actually disrupting the ground. It's a fairly interesting technology and if you're interested in more, I'd be happy to talk a little bit about that.

CBU qualified for a fairly large wind farm and that is pretty much the big thump that's going to help push us over the line for energy self-sufficiency, as well as a lot of the internal updating of infrastructure towards energy efficiency.

As I mentioned, we had an Atlantic Innovation Fund jointly with B.W. BioEnergy. This is a really exciting technology developed in Cape Breton that is looking at densifying biomass for the purposes of transportation, but also which produces, obviously, cost of

utilizing biomass resources when you have to mobilize it to a generator or to a downstream user. That is really a very tremendously powerful technology, but also a way to shift materials into a more stable state so it can be treated pretty much like coal. That coal infrastructure exists globally. You can mobilize materials if it looks and feels a lot like coal, if it burns like coal, but it's a green carbon. It could be utilized and displace coal reserves using forestry wastes or forestry as a whole, but that's work down the road. Some of this money goes towards understanding a little bit more of one of the higher-end products of that process, which is activated carbon, which is used in water treatment.

We are also working with groups out of Colorado that are looking at solar, thermal and PV operations that can work in this region. If you do the math on a lot of PVs, straight PVs, they are a sketchy operation, at best, but some of the ones that integrate in are quite exciting and there has been some development, some concentrated on solar lately that could probably work here, so we are looking through the due diligence of these technologies to understand how this would help us in our more distributive framework.

We have a lot of residences that are spread out, a lot of outbuildings that aren't connected to a central district heating kind of model, so we're trying to establish whether that would make economical sense. So those are some of the things going on this year.

That's Dr. Ross McCurdy standing on our willow farm. The willow farm - as I mentioned, this will be the first harvest year so we'll know a lot more data on the actual performances and whether it met expectations and going forth with that aspect. I'd be happy to talk to any other questions you might have coming out of this.

MR. CHAIRMAN: Thank you, Dr. Swanson. We do have a number of questioners, people who want to ask some questions, so we'll start with Mr. Steele.

HON. GRAHAM STEELE: Thank you very much, Dr. Swanson, a very interesting presentation. It's really exciting to see some of the stuff that's happening at the Verschuren Centre. I was particularly interested in what you were saying about being an energy self-sufficient campus, which is obviously not only a good thing in itself but is an inspiration for others - not just university campuses but other organizations that might have a similar situation. You showed that you can do it, well, then they can do it too. I had that down as a question but I think over the course of your presentation, you basically answered all the questions I had.

There is one other thing I wanted to ask about - and you referred to it briefly in your presentation - work that you're doing in terms of working with the mine water, water that is in the abandoned mines, of which I understand there are many thousands of kilometres, which is incredible. Now just as a layperson, I'm assuming that's a thermal resource, that the water is heated because of its location, but I may be completely wrong about that. Can you elaborate a little bit on the mine water project - what you're thinking of and what's possible?

MR. SWANSON: Okay. You're correct, there are thousands of miles - kilometres, whatever you want, metric if you want to use it - in the Sydney area, as well as Nova Scotia, as well as in the world, in terms of coal mines. So the coal mines that are managed right now have largely flooded. These mines, when they were abandoned, the pumps were turned off and they flooded naturally with groundwater. When the water comes in contact with the coal body, there is a reaction that goes on that precipitates some nasty materials that acidify the water to the point where I believe it comes down to pH 3, so it's like car battery acid kind of thing. It's nasty stuff, it has a lot of heavy metals in it as well.

When that reservoir eventually floods over, a lot of these things positively displace themselves. They spill out either into stream bodies - you see these orange river pictures, you can sometimes see these streams that come out of the mines. That's the nasty acid that they're talking about. So ECBC was given the task to maintain these mines. I believe their mandate goes out decades. Part of what our effort is here at the centre and what our sponsorship is asking us to do is to - and I'll just back up.

ECBC has put in place a tremendous system of containment that is through bioswales, sort of natural ways of using nature to try to control but also with pH adjustment materials. It comes at some cost. That system is safe and it's being monitored well. Our task was, could we do better? The concept behind "better", as you know, you would extend that to, can we try to at least curve the ball in terms of costs or could we perhaps even generate revenues from such a resource?

You touched on groundwater. Groundwater naturally will be the average temperature of the area you are presently in. If you go down a mile or two, then the core starts to affect the water temperature and deep mines generally are warm. However, the surface mines which these generally are, are predominantly influenced by, let's just say, the ambient temperature above. Around this region that would average between 10 and 15 degrees Celsius, so it's not too hot, it's not too cold.

There are two resource pursuits that we are looking into, one of which is geothermal heating. Currently right now in Glace Bay there is an ice rink called the BAYplex, a fairly large community rec centre, and a seniors centre that I believe are entirely heated by geothermal heat pumps. So essentially it's like the back of your refrigerator, it operates both ways, it can heat or cool, and depending on which side of the fridge you're on, whether you're inside or you're outside, you're getting hot or you're getting cold. They can flip that around so they're using that, as well, to keep the rinks extra, extra cold; in fact, actually there are complaints that it's too cold.

What it has done is it has shut down all their compressors, these very large compressors that are used - basically big air conditioners - to keep the ice just so, and are either completely off or at a much-reduced capacity even through the summer, just through the utilization of this very large heat reservoir. The nice thing about this heat reservoir is that it's abiotic, there's nothing in it, so you essentially can operate - you can throw heat at

it or you can pull cold or hot out, whichever you want. You couldn't really do that with an ocean, although it's an infinite supply.

I believe we did the math, without moving the temperature even one degree in the largest mine we have, which is called the 1B mine, I believe there's almost about - you could throw a nuclear reactor on top of that body of water and throw all it had at it for an entire month and it would raise it one degree. So it's essentially an infinite reservoir of heat or cold, so you can go both ways.

So we've been looking at it as a district heating model, perhaps, but more of recent, I'm essentially a refugee of the biofuels industry in the United States. One of the biggest operational costs for food and food manufacturing, beer distilling, any kind of fermentation process in these large bioethanol, is actually industrial chilling power. This water is within striking distance and with geothermal pumps you can actually knock it down to the sweet spot for what they need.

The other group that we've been looking into, as well, is actually data centres. With the food manufacturers, about one-third of their operational costs are actually in the costs of operating these large air-conditioning units, these chillers. So mine water is actually a pretty interesting application and we've been getting some good calls on that.

The other is data centres, they are large data clusters, you throw energy in them - this is the cloud services and whatnot - they require a tremendous amount of cooling as well. In fact, 50 per cent of their operational costs are in cooling. So we've been looking at how we could mobilize mine water, cold mine water that is essentially something you can manipulate without fear of influencing the biology or ecology, as essentially a reservoir of displacing what you would otherwise utilize in oil or coal or gas or however your cooling power came to you, or heating.

There's a lot of synergies, too, if you wanted to expand that beyond, in terms of district heating. So you would have an opportunity to take waste heat and distribute. There are some towns in Europe that have cleverly integrated heat sources. I believe there was a conversation I just picked up on for Halifax Harbour here that they are talking about using district heating models, which is exciting.

We're looking at re-purposing mine water. There are other things sort of at the chemical level. Our scientist is a chemist so he's looking at it from how do I prevent corrosion in a geothermal heat pump or how do I reduce the influence or how can I more quickly process that water as it flows out of the mine shaft and spills into the ecology? How can I process it quicker and cheaper? Those kinds of aspects are going on as well.

MR. CHAIRMAN: Mr. Younger.

MR. ANDREW YOUNGER: Thank you for your presentation. Actually Graham asked one of the first things I wanted to ask about so that was great, got some more information on that one.

There's a few things you touched on that I just wanted to ask about. You talked about the biofuels and I'm familiar with the work on willows, it's one of those ones that has been around for a long time, just because it's a fast-growing nature.

I'm sort of wondering whether you know this or what has happened or whether you guys are doing any work on fish waste biofuels. The reason I ask is, every time we open National Geographic or most other international publications and they talk about biofuels, they talk about water usage because it's all coming from methanol and corn, and the relative benefits or risks because it takes more energy to produce it. Willows are obviously one option because that solves part of that problem, but the ferries and the buses here use a fish waste biofuel - not in the cold of the winter because it gels - that I believe still is, or at least until recently has been provided by Wilson Fuels, but it's still in the experimental stage. I know, for example, one of the problems they have is that the reason they don't use it in February is because it gels in the motors at certain temperatures.

I'm just wondering whether there is any work being done or being looked at being done around the fish waste side of things because obviously, being where we are, we have this unique opportunity to provide biofuels into a market and technologies into a market that addresses that issue. First of all, it's a waste product, obviously. Otherwise, hopefully it's composted, but it's a waste product and so you don't have that problem of using agricultural resources to produce fuel in potentially warmer water - all the negatives associated with corn ethanol.

MR. SWANSON: Yes, and there are a lot. To answer your question quickly, the statement as to whether we're working currently on fish wastes right now . . .

MR. YOUNGER: Yes, you mentioned the willows, which I think is great. I'm just wondering if there are other ones.

MR. SWANSON: We are in discussions with a group in Montreal that have a technology, the idea behind it is to repurpose fish offal - that's a great name - the by-catch of fish and shift that into these higher value omega-3s and separate some of the proteins associated with that as well, so more co-product kinds of things and nutritional aspects. I am aware that in the province there is a group - Ocean Nutrition, I believe, are exporting to Europe a fair volume of - and I don't know in what form, but it's going to bio-diesel. So there is that opportunity.

I think the only sort of limitation with all these things really, quite frankly, always is a cost of shipping and/or centralizing - how close they are to a central processor to upgrade. Fish oil is perfect for bio-diesel in many ways. It can throw off some by-products that make it a very valuable thing, but at the volumes that I believe most fish processors

have on-site, it might be a marginal benefit to them to invest in that kind of infrastructure. So you're stuck with . . .

MR. YOUNGER: It would definitely have to be - you'd have to have a centralized - if you made it commercial, you'd have to have it centralized.

MR. SWANSON: What I was hoping, working with this - and I'm aware of exactly the potential of those resources and I very much would like to deploy on them. We have a few challenges and one is, how do you concentrate the waste to a point where it's stable enough to be shipped and meaningful in terms of, it's not going to cost them an arm and a leg to get it to that point.

I'm not quite clear on processing. Out in British Columbia when I was out there, there is a lot of processing that goes on the boats, so most of the materials actually don't make it back to shore. I think that helps them in the big picture because they're not dragging back materials that have questionable value. Now, that's a tremendous waste. I'm sure the seagulls don't think so, but it is an opportunity that - again, it's an education to a degree, but it's also a bit of a demonstration opportunity.

I do hope that within the year we will be talking to groups, at least in Cape Breton, that are addressing that and maybe use it as a demonstration point - you could be doing better for your business if you tried x, y and z. We haven't really moved down that road, but it's very much on my radar.

MR. YOUNGER: You listed a whole lot of things and I obviously won't get to them all, but I noticed in the picture you had talking about the turbines, it was what looked like a vertical access wind turbine.

MR. SWANSON: That's a different model. They're out front of the Verschuren Centre. They're not big units.

MR. YOUNGER: They're probably the same size as the ones at the community college over here.

MR. SWANSON: I haven't seen those.

MR. YOUNGER: I'm just wondering - my question around that was that in terms of that, look, is there anybody looking at the relative - well, the differences between the vertical and the horizontal axis at your centre? China has largely moved now to - except the very large ones - vertical-axis turbines. In fact, they did it starting with the Beijing Olympics; that was their big switchover. The theory - and I say "theory" because I haven't seen any papers to say one way or the other - is that you have less issues or less complaints around noise, a more efficient generation, you can pop them up on top of an office tower and you tend not to get the - you're always going to get the visual complaints but in terms of the health side of things, you don't get those.

MR. SWANSON: I agree. There are actually some interesting models. When I was at Case Western Reserve in Cleveland, there were some groups that were working on actually using buildings to essentially - you'll notice this in the wintertime, it funnels that wind. You get all your power from torque, so that's like how hard is it to turn a bolt. That is the same effect you need to have. The vertical ones don't tend to get a lot of torque, so they don't tend to generate a lot of power. When you have those big wind vanes you see on the side, they really can crank a bolt, so there are compensations. They look visually pleasing, they do provide some electricity. My understanding with the vertical ones to date is that the paybacks are - unless you can integrate them with some sort of funnelling effect, they have some challenges ahead of convincing people to see the value in them.

That said, we have again sort of, like I said, thrown a lot against the wall to try to make that happen. The larger turbines we're buying are big - yes, they would be traditional.

MR. YOUNGER: I know you're buying traditional ones, but just having seen the picture, I wondered if anybody was looking . . .

MR. SWANSON: We would like to have a discussion with another group, where we're trying to arrange that, that thinks they have changed the scenario a little bit, but my understanding to date is that the vertical ones are somewhat challenging.

MR. YOUNGER: That's fine. You mentioned, sort of in passing, research on fracking. I'm just wondering, could you elaborate and then sort of . . .

MR. SWANSON: Elaborate on fracking or elaborate on what we're doing?

MR. YOUNGER: No, elaborate on what you're doing. I think we probably all know the technology, we all know how it works and we've heard the pro and the con. There's just another study that came out of MIT last week saying that all the studies in the past are useless and they have to start again. It just seems like every time you turn around, there's something else. So I'm wondering specifically what area you guys are looking at.

MR. SWANSON: We're pretty much focused - our sweet spots are in removing metals and organics from water streams. If you think of what fracking fluid is, at least what comes back up, the produced water that oil and gas are using, it's tremendously salty. It has a lot of heavy metals in it; oftentimes it has a lot of organics in it. Through the legacy of the Sydney tar ponds and through the mine water aspects, we're looking at some nanotechnologies to pull out selectively - and even some of the work with Yava - some of the nasties that are present in produced waters. The salt aspect I don't think we're really going to address immediately, but that said, there is an opportunity for us to play a story. We're talking to the offshore big boys about what opportunities we could offer to them.

MR. YOUNGER: So it's about cleaning the . . .

MR. SWANSON: It's about cleaning produced streams.

MR. YOUNGER: Which is significant, because obviously there was a fracked well here, but there's nothing going on at the moment. That's one of the problems at the Kennetcook site - or has been - is how to get rid of the water, because our plants in Nova Scotia aren't designed for the treatment of that waste water and really probably outside of Texas and maybe Alberta, there aren't too many plants that are designed to treat.

MR. SWANSON: It's a funny story we had - not funny but interesting - the Marcellus Shale, which is that big one predominantly in Pennsylvania and it spills into Ohio, they - so in the Ohio area there are gas pumps everywhere. It's like a boom town. All the hydraulic fluids - I believe for every gallon of good stuff that they want, they've got about five gallons of water that has to come back up, as well, so it's a volume.

What they are doing is literally there are about four or five trucks a day - big water trucks - that move that material to a central location. To date, back around six or eight months ago, those were all going to deep injection wells, so two miles down, injected into sand. But when we started getting earthquakes in Ohio, which doesn't happen, some of them were cracking windows and people said, really? So it all shut down.

The traditional way of dealing with the produced water is these solarization ponds. They're exactly what you would imagine - they're just large, open ponds. They evaporate the water and you're left with salt and brine and a mixture of sort of nasty. That's the stuff they were moving around.

There are a lot of folks who are looking at this. It has applications in the tar sands, as well, so there are opportunities for us to work in terms of addressing some of those issues as well. It's not an enabling technology from my perspective. It's more of - how do we solve a waste problem? So we're not taking a bias on the whole story; we're staying clear of that right now. Nonetheless, there are opportunities to purify the water that is used in the hydraulic fracking process in produced waters that we're looking at.

MR. YOUNGER: One more question because I'm probably out of time.

MR. CHAIRMAN: Yes, you are, but one more question - go ahead.

MR. YOUNGER: This is probably a good lead-in for anybody else. You mentioned a lot of things that are sort of overlapped with things that are being done elsewhere. For example, at the Agricultural College they're looking at what you can use for biofuels and waste farmland. People are talking about the torrefaction of pellet mills. I think everything you're doing is great, but how do you make sure that you're not redoing something that is being done somewhere else in Nova Scotia and that instead you're partnering on the resources?

MR. SWANSON: We're focused on Cape Breton - that's our base - so most of the issues are solutions we're bringing to that region but will naturally flow out from the island, but we are looking at Nova Scotia as a whole. We're part of the Atlantic Council for

Bioenergy Cooperative - ACBC - and they have connections. We have regular meetings to make sure that we're not completely stepping on each other's toes, but like a lot of things, it's not about everyone inventing things in isolation; it's about communication.

So really the first steps that I brought here - obviously in the States there's a lot of things going on; there's a lot of duplication. Some of that is done here; some of it is not. What I'm doing is essentially pollinating the area with what I understand to be probably interesting pursuits and we're reaching out to all the different players and stakeholders to try to understand the best pursuits, but truth be told, serendipity always smiles on inventors in most scenarios. It's not like it's a bad thing for us all to be trying to do the same thing because a lot of times the secret sauce is just a slight nuance that someone just tried.

There are predominant problems that need a lot of researchers - the more that are doing this the better. Sharing through conferences or interactions is really the key. So one of the things that we're going to try to do in this year - well, when we get our stride going - is to bring in all the stakeholders for these meetings. ACBC - the Atlantic Council for Bioenergy Cooperative - is the one piece that we're sort of playing into, but we're also going to be pulling in larger stakeholders, as well, to try to make sure that's covered. That's a good question.

MR. CHAIRMAN: Mr. Epstein.

MR. HOWARD EPSTEIN: This was really fascinating, thank you. It's just a big help. I've been fortunate enough to actually have a look at the centre first-hand. This was a couple of years ago when it was at an earlier stage of development but at that time, I think many of the projects that you have talked to us about today were at an earlier stage of development and were being mentioned in the tour that I had, so it's good to see that there has been some advance.

I wondered first if you can tell me a bit about the interaction of the centre with the rest of the university. I saw your list of the staff and I saw there were a couple of post-docs that you now have, but is it also a teaching institution; that is, do you have undergraduates or do you have post-graduates, or is it purely research? Can you talk about the teaching component? I'm particularly interested in that.

MR. SWANSON: CBU - I don't know exactly the year, but it was very recently a college, very much teaching-focused, and of course just down the road there's the technical college, Nova Scotia Community College - they have technical engineers and things like that. In the CBU campus, it is trying to find its place in terms of - there are a lot of colleges in Nova Scotia for the per capita, which is an asset, I'm not going to complain about it, but it is also challenging to try to find your niche that you speak to. CBU is gradually, through new hires, bringing in more research-focused faculty members.

We have undergraduates to the tune of - I think there are 3,200 undergraduates. It has one of the largest - I think it surpassed Saint Mary's in terms of the amount of overseas

students as well, I think almost 1,000 of those are from various parts of the world, so it has a very international feel to it.

The research component is really just in the last five or so years. I heard a statistic yesterday and I'm going to forget the exact number but again, on a per capita basis, we're doing quite well in terms of acquiring research grants through federal dollars and through provincial, as well, so there have been a lot of peer review opportunities for research that the faculty at CBU has succeeded at.

The centre is embedded within - two of the chairs that we have right now are cross-appointed to biology or chemistry, so they are teaching faculty members in that they have a very reduced teaching load, but they teach nonetheless. That's where we believe that they will engage students.

We're working towards getting a master's program. We do not have a master's program just yet, which needs to be fixed. That's something that's sort of a knot in my shoe that I need to help accelerate, as we do need graduate students in a hurry. That said, we're moving in the right direction. Of course we have the MBA school; the Shannon School of Business was opened just last year, I believe, and it is working towards - there is one graduate program on campus but I'm so new there that I couldn't tell you exactly . . .

MR. EPSTEIN: That's okay, what I really wanted clarification about was really whether the centre operated, as you seemed to present it, which is almost exclusively as a research institute. So if I follow correctly, of the 11 professional staff that you highlighted for us, the seven Ph.D.s, the two engineers, the two MBAs, it's perhaps two of the Ph.D.s who would be doing some undergraduate teaching at this point in time, because of the cross-appointments. Is that the picture?

MR. SWANSON: That's correct, yes.

MR. EPSTEIN: But you hope to have a graduate program at some point that your professional staff would be involved with?

MR. SWANSON: That's correct, yes.

MR. EPSTEIN: Okay, that's clear enough, thanks a lot. Just to move to something else, I thought I heard you say early on and in passing that you were thinking that the possibility of energy derived from algae was something that was not likely to advance very quickly, did I hear you correctly? Could you just say a bit about that?

MR. SWANSON: I would elaborate on that but that's the general tenet right now that I would hold to in very quick passing, but there are other opportunities.

MR. EPSTEIN: Okay, and that's not part of the research program that's going on at your centre?

MR. SWANSON: Algae is kind of like saying plants, so there are shrubs, moss and trees. Algae come in all different forms too. Microalgae, where I predominantly worked in the last few years, these large, open ponds - there are some technical challenges there. Predominantly, there's too much damn water so we can make beautiful jet fuel. That was one of the projects that - we had a $56 million Department of Energy grant to essentially capture carbon, recycle carbon through algae. It worked fantastically; we had the best jet fuel. Our fuel was scrutinized by Honeywell's UOP; I worked with a lot of the U.S. Air Force on some of these projects.

Using algae just like yeast, just like bacteria, they are one more vector, one more arrow in our quiver, to move to products that we need. One of those right now - there are ships moving up and down the West Coast that are big ships and that are fuelled by algae oil, but at tremendous cost. So there's a rate-limiting step in that whole process and that's the cost of sugar. Sugar is the fuel of the future and this is one thing that the centre is going to be diving into - how do we find cheap sugar?

As I say, when I'm looking at all this material around me, I'm looking at sugar. The idea is to try to - this is something that has been looked at for a long time. We're going to be going in that direction only because we're going to learn from the bodies that came before us, but there's an opportunity for the centre to mobilize in that field. So if you can have a cheap source of sugar, then you can make anything, is essentially the story.

Algae are one of those vehicles that you can make the "anything" for but there are also macroalgae, which is seaweed that you would see on the shore, which is a different beast. I actually did my Ph.D. work on those. They have different types of components. Acadia Foods down the coast, has a fantastic operation. They're hitting the high-end niche market and doing quite well, I understand. There are other people who are trying to re-purpose those as well too. I've worked with a lot of South Korean and Japanese groups and the mariculture - they don't call it agriculture - is an opportunity that Nova Scotia and the Maritimes as a whole has not so fully taken advantage of.

As a carbon source, seaweed are the fastest growing things on the planet, on a carbon basis. Literally they grow a foot a day; not like willow, which is a fairly slow process. It's just in cost of how you harvest effectively. All of the development there is really in logistics. It's not that the material isn't useful. I could take seaweed and shift that into gasoline at a fairly reasonable price, as long as I didn't have to factor in the cost of harvesting. All of this is in logistics and this is fishermen - fishermen know the seas, they know how to operate. The shellfisheries, those are the people who actually understand moving big, heavy objects out of the water and whatnot.

Development - in my vision - is really that we've got all the technology pieces in front. We have all the back end stuff but we're still working on the front end, so the willow is part of that. Marine resources like seaweed are also something that we need to understand a bit better as the potential. I don't think it's out - I'm just saying that there are some challenges that we're moving towards.

MR. EPSTEIN: This isn't your institute directly, of course, but Acadian Seaplants - my understanding is that they're really working on the food and nutrition end.

MR. SWANSON: That is correct.

MR. EPSTEIN: Are they working on the energy end at all, do you know?

MR. SWANSON: They're not interested at this point.

MR. EPSTEIN: I was curious about what you said about acid mine waters. I have to say, it was new to me that the Cape Breton mines were flooded with what you called ground water, which is presumably fresh water. I have to say, at some point I had it in my head it was sea water that infiltrated and used in the flooding.

MR. SWANSON: I questioned that too because I do go out to sea, but nonetheless the salt content is not apparent to me right now, but I would imagine it's brine. It's not perforated to the ocean; it's not directly talking to the ocean. I understand that's true, so if the infiltration occurs, it's very likely through - it could be brine water, but it could be from fresh water sources, but when it's done, I do know that it's a salty brine mixture and I don't know where the salt originally came from.

MR. EPSTEIN: I'm more concerned about the acid part. Wouldn't the mixing with the sea water tend to deal with that?

MR. SWANSON: It doesn't interact with the ocean water, as I understand. The mines aren't talking to the above, which is fortunate because that would essentially be a - but the ECBC group has told me that there is no connectivity between ocean waters and the mines themselves to date, which isn't to say it could not necessarily happen in the future through seismic issues. Anyhow, they really know what they're doing in terms of mine water management and I encourage you guys to take a look if you're curious about how safe your ecology is. It's a remarkable operation and they're probably the best ones in the world right now, but at cost, no doubt about it.

MR. EPSTEIN: One more point. You mentioned sewage as a possible source for further investigation. I don't know the state of play with respect to sewage disposal in the Sydney area. Can you tell me what it is?

MR. SWANSON: Actually I'm meeting with Cecil Clarke tomorrow to actually talk about some of these things. I don't know if he'll know all the information, but he'll point me in the right direction, but we're still getting our understanding. Traditionally how sewage is treated, there are usually anaerobic digesters that result in a sludge material, which is then usually either - it used to be spread onto farm fields, but because of the heavy metal content, they generally don't let that happen as often.

MR. EPSTEIN: I'm aware of what the possibilities are. What I was wondering was what is actually happening, if anything, in the Sydney area right now?

MR. SWANSON: I'm not going to speak to that because I don't know just yet myself, but I do understand that there is a source at which we can work with. Now from the algae point of view, the algae farms that we are growing in Hawaii were being fed - the fertilizer was coming directly from the air force base sewage treatment plant and we were re-purposing that material back to jet fuel.

The point is that there are opportunities, a clever couple of ways, technologies or whatnot to try and - it just has to make economic sense at the end. It's not that you can't do it; it just doesn't make economic sense.

MR. EPSTEIN: Right you are. Okay, thanks for your help.

MR. CHAIRMAN: Thank you. Our next questioner is Mr. Glavine.

MR. LEO GLAVINE: Thank you very much, Mr. Chairman, and thank you, Dr. Swanson, that's a fascinating presentation. I did have a couple of breaks in there so I hope I'm not asking a question that has already been addressed this morning.

I'm just wondering, first of all, when you're looking at a wide range of possible biomass products to convert to energy, how do you look at the current 60-megawatt project that's going on in Port Hawkesbury? I find that, you know, out of the model that we see through Scandinavia, with three- four- and five-megawatt projects and using a lot of different source materials for that, when I look at the geography and our climate and so on, I think that's a better model. I'm just wondering how you kind of put that in perspective.

MR. SWANSON: I agree with you completely, I think distributed power models are the way to go. What ruins the fun always is the shipping costs and like I said, if you can find a pipe and position yourself, you're all set with that aggregate; if not, if you are trucking materials in, then it does get - somebody is going to pay for it. So that model, again, precedes me and I wouldn't want to speak directly to that - that was somebody else's good decision.

MR. GLAVINE: The other couple of parts of our current energy procurement and so on, there's a couple of areas that I feel especially through the COMFIT program that are unfortunately not part of that, and that's geothermal and solar. I'm just wondering, you know, can you provide some insight as to why it may not be part of the current COMFIT when I look at enormous possibilities within geothermal?

MR. SWANSON: Geothermal is, in fact, one of the more exciting possible sources that Nova Scotia could take advantage of. As to why that and solar were not on, I think it was because they were taking this not as sort of a - I had some conversations recently with

the groups that made these decisions and they wanted to get the story right, a one-at-a-time sort of approach, which I think is reasonable.

Now I do know that they're doing reviews on solar right now and they're going to be making some recommendations, probably - I tried to press them on timelines but it sounds like two years is kind of a reasonable approach. They are looking at Ontario as a model of that, which is appropriate; Ontario and Germany to a degree have been largely leading the field in terms of COMFITs, or the equivalent FIT programs.

So, yes, geothermal is a resource, it should be taken advantage of and it should be given an opportunity to find its place as part of the suite of renewable energies that are appropriate. With solar, not too long ago I would have said maybe not, but I have heard more details now to make me believe that paybacks can occur in less than 10 years and in some cases without FIT programs, so there are some interesting technologies that are making these applications.

If we think of it in a larger picture, if you look at the globe as a total - I'm sorry, but this is the prof in me - the world is essentially running on about 20 terawatts of power. When China and India come on board for the first-nation basis, we need to be up to 60 terawatts. That's the equivalent of turning on one coal generator every day, three times a day, until 2050. So we are in a corner. The one sort of impressive part of this whole story is that every day shining on the earth is 165,000 terawatts of energy. If you capture a fraction of that, Bob's your uncle.

MR. GLAVINE: Well, what intrigued me, in fact, was last summer one of my sons, who is quite into environmental issues on the West Coast, in B.C. said, did you know that today in Germany they produce 22 per cent of their power from solar, from the industrial giant of Germany? I mean I found it absolutely fascinating.

MR. SWANSON: It's a dark, gloomy place too.

MR. GLAVINE: Yet we have a solar regime not unlike Germany right here in Nova Scotia.

MR. SWANSON: It could work here.

MR. GLAVINE: I feel it is one of the areas that again, you know, not as perfected at the moment, but potential and possibility reign pretty strongly.

Are you doing some passive work or are you actually looking at stronger effort at your centre around solar?

MR. SWANSON: Most of our work right now has involved scrutinizing existing technologies for deployment at the centre as demonstration and how we could - where we are talking is about more integrating a suite of different renewables, so not developing. We

have been talking to groups about how there might be places we could operate, but that hasn't been formalized by any means. So not just yet, I would love the opportunity, though.

MR. GLAVINE: That's fine.

MR. CHAIRMAN: Very good, thank you. Ms. Zann.

MS. LENORE ZANN: Thank you, that was very interesting. First of all, what brought you to Cape Breton from the States and what intrigued you to come?

MR. SWANSON: Well, the centre is new and it had an opportunity to sort of find the direction, the directions weren't completely set. I find that an interesting opportunity, and to some degree, we had been in the States 10 years but we pretty much had enough. But nonetheless, we were looking for an opportunity to come back to Canada was part of it, but the centre predominantly was the opportunity that I saw as a good, fertile ground to operate in.

MS. ZANN: Yes, it's pretty exciting. I've also been there on a tour just recently and it's a very exciting place. Actually, I'm the MLA for Truro-Bible Hill so we have the new agri-innovation centre, now it's called Perennia and they are doing a lot of research, as well, with many different products, bioproducts and seaweed as well.

MR. SWANSON: I talked to an individual there not long ago about their seaweed research.

MS. ZANN: Yes, so there are some neat things. A gentleman with TruLeaf, it's called, where they actually have containerized growing fresh vegetables, fruit, and they can take it anywhere in the world, including the Sahara, sub-Saharan desert and up in the tundra, and provide fresh food for people, all in a big . . .

MR. SWANSON: CC container.

MS. ZANN: Yes, where they are growing it live, so there are some very exciting things happening. Would you be talking to people like that?

MR. SWANSON: I must confess we haven't been down to visit but that was on my agenda, to try to see what resources are there. I have talked, through this ACBC group, to an individual that has some aspects of what we're speaking to but I don't know the full-on of what's going on there.

MS. ZANN: I bet you'd probably find some very interesting things that you could talk about. The other thing we just announced recently was a grass pellet furnace for that building so it will be heated on the biomass as well.

MR. SWANSON: We're looking at sort of the same thing. Biomass is a fascinating potential. Pelleting is one way to densify the material. The technology that we sort of have in-house is using torrefaction to essentially pull even more water out of that without reducing that much of the energy associated with it. That process there might be some nice alignment with putting this technology to task on these particular aspects because when you draw those circles of economic likelihood of success, it gets a whole lot bigger when you use B.W. BioEnergy technologies for pelletizing. It's a remarkable technology.

MS. ZANN: So definitely you should contact them.

MR. SWANSON: I definitely will.

MS. ZANN: Somebody else there is working on things like Astroturf that's not made out of any oil-based product. And they're actually doing really well selling it to many places around the world.

MR. SWANSON: Bio-based plastic, is it?

MS. ZANN: Yes, it's bio-based.

MR. SWANSON: Do you know what the original source is?

MS. ZANN: I can't remember if it was . . .

MR. SWANSON: Ethanol? Ethylene?

MS. ZANN: Canola, maybe? I'm not quite sure, I can't remember but I know that there's no oil in it, which normally there is.

MR. SWANSON: Fossil oil, it's probably lipid oil - it's probably canola oil there. Okay, I get it.

MS. ZANN: I was curious about a few things. Also, coming from Truro, you may have heard that we had these floods recently, so we live on a flood plain. Therefore, the water table is actually very high so I've always thought, gee, if we could tap into geothermal for our whole town it would be . . .

MR. SWANSON: A lot of times - you're right, there are different ways you can have geothermal heating. I mean, there are heat pumps for farms that have these horizontal beds, which are just large - they're only about a metre below the surface. There are other ones that are deep well approaches, so those are the ones that when you have a high water table, it's of great advantage. Especially if you have flowing ground water - it transfers heat out as you're dumping your coal back in, more heat comes back. So yes, you would have an advantage in that regard, definitely.

MS. ZANN: It's just that it's still expensive for the ordinary person.

MR. SWANSON: It has more to do with - in the Midwest, there's a lot of natural gas so a lot of people have switched over to natural gas furnaces as opposed to oil-burning furnaces. The natural gas in the Midwest being what it is they generally have central air, so they already have the duct work. Geothermal heating, a lot of it works very well if you have air ducts existing in your house. My brother-in-law works with a company that actually installs duct work and they make a lot of money off it. It has a little bit more to do with bringing the home into the form that you would have an airflow system - and pulling up our walls is expensive. The actual devices themselves, they aren't that expensive. They're essentially a complicated refrigerator.

MS. ZANN: So the digging of the well isn't the part that is expensive?

MR. SWANSON: It depends on the type of well, but as I say, if you have a very shallow groundwater scenario then you don't really have to dig that far down. If it's different, then obviously the price goes up, but some of these horizontal fields, they run - I think someone told me it was about $5,000 for a 2,000-square foot home, I think. That would be what it would cost. In Ontario and some places in the Midwest, there are governmental programs to help offset that cost, but at the end of the day, there is a very small electrical draw from running that compressor. But you're heating and cooling - in the Midwest - in Ontario it's not cooling - you are essentially off the grid. It's a great way to down the road - and actually in some scenarios, some people's homes achieve a higher price on the market because they have these installations. It's like putting in new cabinets or windows for a house - it really adds value to the home.

It is a pricey thing and usually when your furnace fails - I mean, I'm not calling up the geothermal guy, I'm calling in whoever is going to come and turn the dang thing back on. So unfortunately we respond to these things as kind of an emergency and we maybe don't have the liberty to think this through. That's the time when people could make the change, but you don't generally want your family to freeze. But if there were government programs to cover or defer costs out over long periods of time, it might be considered as advantageous.

MS. ZANN: I like the idea of geothermal myself because it's so natural. I looked into it. For my house, for instance, it would be about $25,000, they said. So I just think the average person is going to say no. I mean, even for me, I said I can't afford that right now, but maybe down the road.

The other thing I was interested in that you had to say, too, is about the sugar. When I was over in Germany at one point we were looking at different alternate energy plants and they had these farmers who had formed a co-op and they were growing sugar beets.

MR. SWANSON: Yes, very exciting.

MS. ZANN: They were turning that into biogas, actually.

MR. SWANSON: Oh really? Okay. Ethanol is actually even more exciting.

MS. ZANN: The thing is, they said that they hit a block for some reason. Maybe there was a glut on the market at one point in time? So they stopped growing sugar beets and they started growing barley and rye instead and turning that into the biogas, but you're saying that sugar is the way of . . .

MR. SWANSON: Sugar is the nectar of everything that we're moving towards as a society. I mean industrial foods are - these big ethanol plants in the United States have essentially turned what was originally going to be a protein crisis - it has gone away. The reason why is because the waste product is dry distillery grains, which is just basically yeast. They feed that to animals as the protein now and that actually makes more money for them than the ethanol.

Going back, you need the sugars for that to keep that going. Sugar beet is very exciting. We work with a group out of Prince Edward Island - Atlantic BioEnergy, I think the group is called. They are putting in an ethanol plant or have a fairly large one, based on sugar beet. Sugar beet is probably the sugar cane of the Atlantic. It is the real thing. It can generate value very quickly; I've seen their numbers. So I would encourage your constituent farmers to consider that as a possible option.

If you have an ethanol facility nearby or would like to start co-operatives, and I believe the model for co-operatives is actually a very good one, it has worked very well in locations in the States. Eventually there's a growth phase when there's a lot of amalgamation, which the co-ops tend to sort of go offline. But to initially further this, it's a great market.

MS. ZANN: Actually it worked really well in Germany, it was like six farmers who were struggling. They had 125 hectares of land and then they joined up with one banker, so six farmers and a banker joined this co-op and the next thing you know, they had this facility that harvested the fields where they grew the sugar beets to begin with and then the rye and barley. They made enough biogas that they could heat a whole factory that was there and they actually lit the whole town that was beside them.

MR. SWANSON: District heating.

MS. ZANN: Yes, and they were doing quite well financially now, which is nice to see.

MR. SWANSON: That's a nice story. There are opportunities like that around here, too. We just have to again maybe look to others for by example and try to apply those models here. Exactly right.

MS. ZANN: Yes, thank you for your presentation.

MR. CHAIRMAN: Thank you very much. Mr. d'Entremont.

HON. CHRISTOPHER D'ENTREMONT: Thank you very much - lots of great questions, lots of great answers. The quick one I have is on the centre itself. As it is taking on a number of projects - I mean you do want to be self-sustaining somewhere - how long out is that and what's the plans? I mean you've got a number of great projects that are going on there, but how many projects are you going to need to have going in order to be self-sustaining and when is that going to happen? It's a big question, it's a guess.

MR. SWANSON: Well a lot of this is speculation but I would imagine the way the centre is predominantly funded for activities is through major sponsorship. Within that there are sub-tiers of sponsorship as well, too. We have secured three of the four that we envisioned in our suite of themes that will carry us forward for another sort of three years, essentially. So to answer your question, we're never in nirvana and we don't expect to be and that's the nice thing about it. The research, we have to shake things up a little bit to get relevant again or to continuously be relevant. What we'd like to see ourselves eventually as, essentially, is having multiple subprojects and sponsors that would keep things afloat.

We're in pretty good shape for the next two to three years out and if we don't grow to the fourth tier then that gets problematic, but if we speculate or lean too far forward - so we're trying to be disciplined in terms of our excitement about projects and only deploy staff into fertile grounds that we believe are going to fund themselves in spades. We're trying to be disciplined and promote the centre but it is a challenge.

I like this model in that it keeps us relevant all the time, so that we can talk to the latest and greatest, rather than getting entrenched on any one particular technology. We would flow and move just as industry has as well, they do not generally - and this is sort of what the centre is supposed to be. It's a bit of a hybrid scenario between academic and commercial in that we are a little bit more nimble to change in some aspects, but still can talk with academics as well and to work alongside them. It's an interesting challenge and it's an interesting opportunity, and it's why I took the job.

MR. D'ENTREMONT: Sort of the second point of that is that Université Sainte-Anne in southwestern Nova Scotia is energy-sufficient at this point. They have two windmills, they have a biomass generator and a number of solar generators as well, so a good opportunity to maybe chat with them and see how they are doing because they have been doing it for about three or four years now, I guess, and really moving on. I think they just finally got the COMFIT figured out for the second windmill so that they can actually ship out some of that power as it goes along. There are other places that are doing some of these things too.

MR. SWANSON: That's fantastic to hear too, and in terms of what we're doing, the more back-slapping we do with other groups like that - I mean, power to everyone. The

reality is that everyone has to take a leap, but if we all start to see by example it's not that painful of a process. There are some limitations with the COMFIT, but that's one of the things - if any groups are interested in the COMFIT pain leap, we've been through a fair bit of it and we'd be happy to negotiate that maze, if anyone is interested.

MR. CHAIRMAN: Are there any other questions? Lenore.

MS. ZANN: I just had a couple more questions that I was interested in. One of them was - you know when you're talking about the hockey rink?

MR. SWANSON: The BAYplex in Glace Bay.

MS. ZANN: So that's frozen and also heated somewhere else just from the water from these mines?

MR. SWANSON: There are other places that do this. Imagine your refrigerator in heat and cool. You go to the back of the fridge, you feel the heat and in the fridge itself, it is cold. It's a reversible reaction so depending on where you put your heat or cool capture, you can transfer one way or the other. The idea behind it is that it can either dump heat into the mines or it can pull heat out of the mines on the corresponding drop-dump-cool. It's certainly not something we invented; it's something that has been done as long as - I think Carrier was the guy who invented the air conditioner or maybe the refrigerator long ago, 1950s. But that whole reaction is quite worked out. The scalability of these things has been in question. Our understanding with our partners is that it is scalable foreseeably to the industrial scale levels.

MS. ZANN: Does it have to be located near where the mine is or do you truck it in?

MR. SWANSON: You need to be co-located pretty close to your reservoir, but if you have a flow field, which is to say that your water table is moving at a fair clip - on our campus, actually one of the strategies we had envisioned is we were going to be using thermal-solar and take, in the summer time, the thermal-solar and place it into our geothermal reservoir below the campus. Sadly, it's a flow field, which means that essentially it doesn't stick around long enough for us to capture it back in the winter again, so we're just fluttering that now. The same scenario with respect to flow field is if you have a fast-enough flowing scenario, you can pretty much locate wherever that underground stream is and receive some benefits.

MS. ZANN: Do you think you could use that technology, for instance, for contained fish farms to keep the water cool within a degree or whatever?

MR. SWANSON: Yes, we were looking at greenhousing actually in Cape Breton and talking about opportunities - because that's the major cost for running a greenhouse, but aquaculture as well, too. I have some experience in that as well and keeping your crop happy is really an important feature to keep disease and stress down.

MS. ZANN: And to keep it within a certain temperature between like one degree or something is very important.

MR. SWANSON: There are very straight-forward tests. There are a lot of companies that are moving into this space. I'm not sure how developed it is here. Most of our consultants have been from Texas and the Midwest. But in terms of local talent, I'm pretty sure that it's not that complicated that folks around here couldn't service it. As you say, you got a quote on your home, so there's newer stuff that is coming around the corner, too.

MS. ZANN: There's a company in Truro that has actually started looking at that idea of cooling these contained fish farms on land with heat pumps.

MR. SWANSON: It's completely viable and there's no real down side.

MS. ZANN: One last question. When you mentioned about the earthquake in Pennsylvania . . .

MR. SWANSON: All over Ohio.

MS. ZANN: Were you talking about - when you mentioned about the fact that there are all these fracking fluids in the ground and you'd never had earthquakes, are you equating the two?

MR. SWANSON: There's something called glacial rebound that goes on in Ohio and Pennsylvania. There are shallow wells, which is where they are fracking to get the oil and gas out, and then there's these deep saline reservoirs that they are injecting, deep injection sites. When they go down that far they are placing water in areas where there may have been a fracture line or stress and that's a lubricant and then you have an earthquake that occurs when that extra water allows the earth to move against each other. That's how the earthquakes were occurring so there's a moratorium - I haven't paid attention too much. That's directly with disposal issues, it's not association with the fracking, just to be clear.

MS. ZANN: I see, it's the disposal.

MR. SWANSON: It's the disposal and it just happens to be close to where they do the fracking but everyone, of course, associated the two with each other, as maybe they should, and then the rest is history. So at this point in time, they are being forced to essentially do reverse osmosis to purify the water, which is incredibly expensive.

MS. ZANN: They should have done it in the first place.

MR. SWANSON: Well they're looking at costs. We believe there's cheaper ways to do it, too, as well. It's probably unnecessary the way they are doing it - it works, but at what cost.

MS. ZANN: Exactly. Okay, thank you.

MR. CHAIRMAN: Thank you. Mr. Glavine.

MR. GLAVINE: About a year ago I guess it is now, maybe a little bit more, Minas Pulp and Power, soon to be probably only Minas Power, I'm wondering - there was great fanfare around the use of elephant grass as a source of generating electricity. I was wondering if you heard anything about that or do you know, in terms of that as opposed to willow and other biomass possibilities?

MR. SWANSON: Yes, I don't know as much about elephant grass as switch grass and there are hybrids of switch grass that have - and a lot of acanthus and other crops like that that I am more familiar with. The grasses, as willow, have a high growth rate and with the hybrids bigger, the properties that they enable them with as well, you can achieve better.

The big advantage with some of those things, of course they can grow in "wastelands" - not really wastelands, but they are underutilized. In terms of their application towards ethanol or just burning, the really predominant thing that needs scrutiny, in terms of if you're going to a biomass, it's just about how dry you can get it, so the material has to be able to dry very quickly and easily, ideally in the field, before it is harvested. Now that's a property that is very interesting to have. Also, in terms of its density of the sugars that are actually being burned or how easy that would be to get at with enzymes to break it down into ethanol.

So the research is really focusing on making these crops easy to tear apart or easy to dry. A lot of the work on the actual productivity is pretty much Mother Nature is already doing a lot of that for us. So you look at a crop and there's not one silver bullet. A lot of times you would look at it as a suite of different crops, some that would work on wetter soils, some would work on dryer soils, different sort of profiles.

The danger is probably what the Truro people - not danger in what the Truro people are doing but the danger is looking at one crop only and claiming victory because if you have a blight or something like that. I think that what the Agricultural College and groups are doing is really trying to find a bunch of different things and if they had a profile of soil types, they could deploy a myriad of different options there that the farmer groups would do.

That's one option and regionally there's probably more that still need to be pulled out. That answered your question?

MR. GLAVINE: Yes, that's fine, thank you. One last question - we always talk about perhaps the best kilowatt of electricity produced is the one produced by renewable energy as opposed to fossil fuels. We do have some good things happening in our efficiency program in Nova Scotia. What would you regard as kind of a one-two to say that

look, we can decrease the demand - because that really is where dramatic savings can also take place, by not having to produce because we're not going to be out of fossil fuel use in Nova Scotia for a while? I believe conservation is really one of the great untapped areas that we really have only touched the surface on, in my view of how we deal with the whole energy equation. I'm just wondering what you would regard as kind of a one-two in that area.

MR. SWANSON: I concur. The best way out of this situation of requiring more energy is to stop using as much. There are simple things. When you look at any sort of facility as an operational cost for electricity, heating and cooling around this neck of the woods involves a lot of oil. But I do like the geothermal aspect; that's today-technology that could be done. Lighting is also a big draw. One of the last companies I worked for was deploying out actually fluorescent lights that use about one to two watts of what these otherwise would throw out in the 1930s and 1940s - and paybacks within several years. They have one of the largest contracts for the U.S. Navy and all ships were being retrofitted to fit these. Lighting is obviously an easy one.

Smart monitors that keep track of when people are in rooms; it's a little annoying but it's actually a good way to shave costs. There is also an interesting technology they had in terms of day-lighting a room, which is essentially if you're near a window here, the lights are lit and bright, but with LEDs you can dim those down to a point so it hits a certain set point, whereas over here it's dark and so you have in a room a gradient of light that can be adjusted in real time. Smart monitors is actually an interesting field and that could shave down costs and energy that way. Those are probably the easiest low-hanging fruit. They're not all cheap options, but some of them are in the hardware store today and people could do those things.

MR. GLAVINE: Thank you.

MR. CHAIRMAN: Seeing no more questions, we'll give you the opportunity, Dr. Swanson, to make a closing statement if you wish.

MR. SWANSON: I think it goes without saying, we'd be very excited to show anyone who wished to see the good things going on at the centre - an open invitation to you and your contacts and also to spread as much information about what was said here today to your groups. We're only a few deep in terms of our voices. Hopefully we'll transmit through you to all your good people so that we can maybe make connections. As I said, we're trying to find a use for ourselves that's commercially-focused and very interested to hear back from your constituents and especially from the commercial space or opportunities to work and collaborate.

MR. CHAIRMAN: Thank you. As the chairman, I want to thank you for coming here today. I think it has been a learning experience for most people around the table to see what is happening and some of the good things that are going on within this province - certainly some interesting facts about the university and what's going on there. I think for

some of us it's an eye-opener and so we do appreciate that and we do appreciate what you are doing at your centre and we urge you to continue your good work. There's a lot to be done and with regard to solar, for example, we all know that the technology is getting better day by day and we will see that soon probably in the suite of things that we're doing here in the province. Thank you very much.

We just have a couple of pieces of committee business so we probably can finish that rather quickly, and then that would allow the opportunity for some of us to speak to Dr. Swanson if we like. With the consent of the table, we'll just move on to the committee business. One of the items is with regard to the witness and also the next meeting date. (Interruption) You go ahead.

MR. YOUNGER: There was a wording error - not that it's going to make a whole lot of difference to everybody, but it's a procedural issue. It had been written "Christmas Tree Farmers Association" and it's the Christmas Tree Council of Nova Scotia. I think they're already booked.

MR. CHAIRMAN: Consensus on that? Everyone agreed?

It is agreed.

Our next item, Jana, perhaps you could report on this, is next meeting dates because there are a few glitches that have happened, due to some out-of-town caucuses and so on. Maybe you can give us an update on that.

MS. JANA HODGSON (Legislative Committee Clerk): Yes, I just wanted to ask the members as to when they would like to have their next meeting. It's been really tough scheduling the meetings because of so many out-of-town caucus meetings. Initially we're not planning to have a meeting in February, because of the out-of-town caucus meetings. However, I just found out yesterday that our usual meeting date of February 21st, now there has been some shift in the dates for one of the caucuses and it is now available. We would be able to meet on the 21st of February if the committee is agreeable to that.

That would be our only option for some time because now there is an out-of-town caucus meeting on our regular March meeting date. So it would be either February 21st or perhaps we are not sure when the next meeting might take place. It's up to you if you would like to have the meeting.

MR. CHAIRMAN: Okay, basically the option is now available - it wasn't before - for the committee to meet on the 21st of February. So we have to make a decision if we want to meet then? Obviously March now is out, because of some changes, so I'm just looking for some consensus? (Interruption) Okay, we'll meet on the 21st of February.

Now that will, of course, depend upon Jana being able to get a witness, so I just wanted to make that clear, that this meeting may not happen if we can't get the witness.

Okay? Very good. So we have consensus then, we'll just ask for a motion to adjourn, please.

MR. MAT WHYNOTT: So moved.

MR. CHAIRMAN: Great, thank you.

We are adjourned.

[The committee adjourned at 10:37 a.m.]